Coastal Protection & Restoration Authority of Louisiana
Operations, Maintenance and Monitoring (OM&M) Workshop

Tuesday December 6, 2011
State Library Conference Center, Baton Rouge
9:00 a.m.-4:00 p.m.

CPRA
Coastal Protection and Restoration Authority of Louisiana

SAVE-THE DATE

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Each year, the CPRA field offices in New Orleans, Lafayette, and Thibodaux prepare Operations, Maintenance & Monitoring (OM&M) reports for completed restoration projects. These reports are produced on a rotating schedule of every three years, and thus, reports on different projects are completed every year.

The purpose of this internal CPRA OM&M workshop is to extract, summarize, and disseminate pertinent information contained within the 21 OM&M reports completed this calendar year. Additional workshop objectives include promoting project-related communication and discussion between CPRA divisions and assisting with "closing the communication loop" between project construction/evaluation and planning for future projects. The OM&M workshop will consist of a series of presentations by OM&M personnel that will summarize status, monitoring results (CRMS data), effectiveness, recommendations, and lessons learned from the 2011 OM&M reports. For additional information concerning this workshop, please contact Susan Colley at susan.colley@la.gov or 225-342-4746.

AGENDA

Coastal Protection and Restoration Authority of Louisiana
Operations, Maintenance and Monitoring (OM&M) Workshop
Tuesday December 6, 2011
Louisiana State Library Seminar Center (First Floor)
Baton Rouge, LA
9:00 a.m.-4:00 p.m.

9:00 a.m.	Introduction/Welcome Richard Raynie/Carol Parsons Richards
9:05 a.m.	Introduction to Field Operations and OM&M Reports Process David Burkholder
9:20 a.m.	Bayou LaBranche Wetland Creation (PO-17) New Orleans Field Office (NOFO) Danielle Richardi and Eva Hillmann
10:15 a.m.	BREAK
10:30 a.m.	Caernarvon Diversion Outfall Management (BS-03a) New Orleans Field Office (NOFO) Kyle Breaux and Sara Moore
11:25 a.m.	**WORKING LUNCH** (continued discussion)
12:25 p.m.	Mandalay Bank Protection Demo (TE-41) Thibodaux Field Office (TFO) Elaine Lear and Glen Curole
1:20 p.m.	Cote Blanche Hydrologic Restoration (TV-04) Lafayette Field Office (LFO) Stan Aucoin and Tommy McGinnis
2:15 p.m.	BREAK
2:30 p.m.	Additional Projects: Overview of Remaining 2011 OM&M reports Dona Weifenbach
3:25 p.m.	Wrap-Up Carol Parsons Richards
4:00 p.m.	Adjourn

Introduction by Mr. Richard Raynie,

Chief, LACES Division

One mission of LACES is to facilitate communication between CPRA divisions within project lifespan, while building institutional knowledge. We are trying to develop needed internal CPRA dialogue concerning projects. The year 2003 is the last time that CPRA had a workshop such as this. There are a lot of new people who need to learn from our past experiences in order to apply knowledge to those project phases we are presently working on.

Welcome by Carol Parsons Richards

Program Manager, Systems Assessment

LACES Division

Please sign in. This is very important. We will try to stick to our time schedule. Refreshments will be served at 10:15 a.m. We will have a working lunch served in this meeting room. Handouts are available on the welcome table in the foyer:

- *Document Reference System Brochure*
- *CRMS Data Access Brochure*
- *Workshop Agenda*
- *OM&M report schedule for next year (2012).*

Spreadsheet of this year's 2011 OM&M reported projects not specifically focused on today. This spreadsheet will be reviewed during lunch and discussed towards the end of the workshop. Twenty-one reports were produced this year. The spreadsheet contains other projects not particularly focused on. This workshop is presented to foster communication and open dialogue between CPRA divisions and to showcase OM&M efforts from the year 2011.

Groups were introduced and personnel present were asked to stand so others could familiarize themselves with divisional personnel: Operations Group BR-David Burkholder, NOFO, LFO, TFO, Planning, Project Management, LACES, Restoration and Flood Protection, NRDA, and Legal.

Presentation by Mr. David Burkholder,

Chief, Operations Division

Introduction to Field Operations and OM&M Reports Process

Introduction to Field Offices and OM&M Reports

Operations Division and Field Offices

- History – Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) and CPRA
- Staff and Locations
- What we do

Operations, Maintenance and Monitoring (OM&M) Reports

- Contents
- Report Process

CWPPRA Project Phases

Project Planning and Selection – PPL Process

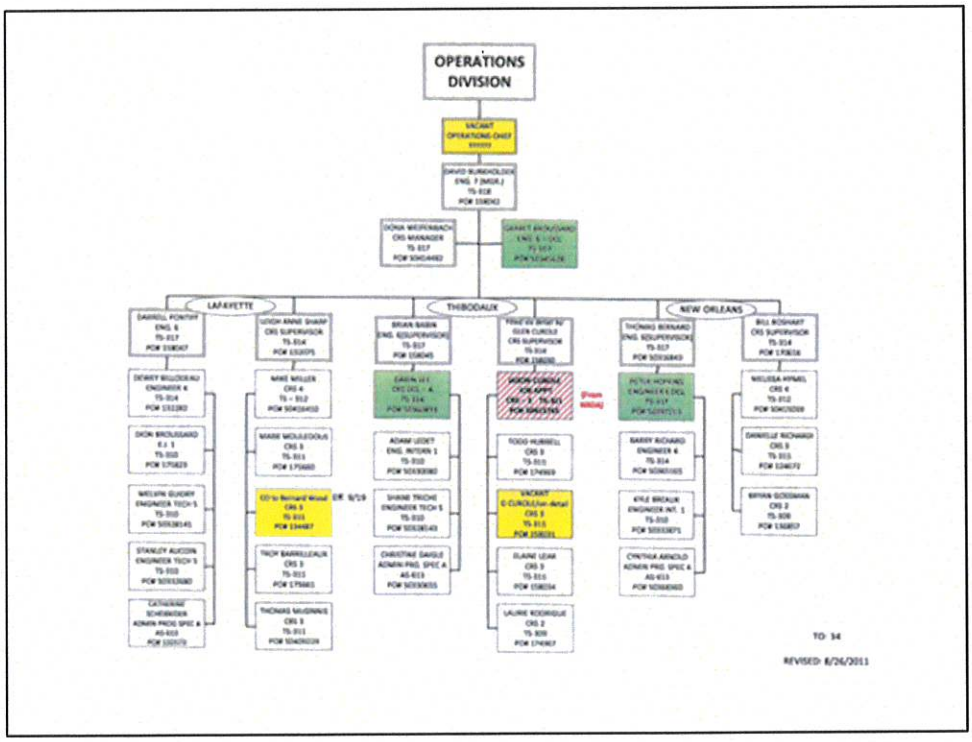
Phase 1 Engineering Design

- 30 % Design Review
- 95 % Design Review

Phase 2 Construction

Phase 2 Post-Construction

- Biological Monitoring
- Operation, Maintenance, Repair, Replacement, and Rehabilitation



What we do – Engineering Staff

- Responsible for construction administration, inspection, operations and maintenance of all federal and state coastal restoration projects.
- Work Products include : draft Operations & Maintenance Plans for 95% design reviews; Construction Completion Reports; and Annual Inspection Reports for all completed projects.
- Staff tracks O&M budgets, prepares funding requests for Fall CWPPRA meetings and develops bid packages for any needed repairs.

What we do – Engineering Staff

- Operations of water control structures are typically accomplished through contracts that are scoped and administered by engineering staff. Notable examples include the Davis Pond and Caernarvon Diversions.
- Restoration projects completed to date include 10 sites with navigation aids (lights) that are inspected and maintained through a state-wide contract.

What we do – Engineering Staff

- Some additional responsibilities include: conducting post-hurricane assessments; submitting claims to FEMA for damaged projects and making repairs; and overseeing the Marine Debris Removal Program.

What we do – Scientific Staff

- Responsible for the management of all monitoring activities. These activities provide "a scientific evaluation of the effectiveness of the coastal wetlands restoration projects carried out ... in creating, restoring, protecting and enhancing coastal wetlands." Data collected is also used to determine if existing projects require modifications, and to support future decisions on selection of proposed coastal protection or restoration projects.

What we do – Scientific Staff

- Activities include Monitoring Plan development for 95% design reviews, implementation (data collection, statistical analysis, quality control and data interpretation), and report generation.
- Key components are the Coastwide Reference Monitoring System (CRMS) and Barrier Island Comprehensive Monitoring (BICM) programs, in addition to CWPPRA project specific and monitoring of projects funded solely by the state.

What we do – Scientific Staff

- Staff works with USGS, the federal cost share partner, on development of the CRMS website.
- Project scientists track monitoring budgets, and prepare funding requests for Fall CWPPRA meetings.
- The CWPPRA Task Force has requested that a CRMS status report be presented at every meeting to provide an update on the evaluation of CWPPRA projects and program.

2011 Operations, Maintenance, and Monitoring Report
For
Grand-White Lake Land Bridge Protection (ME-19)

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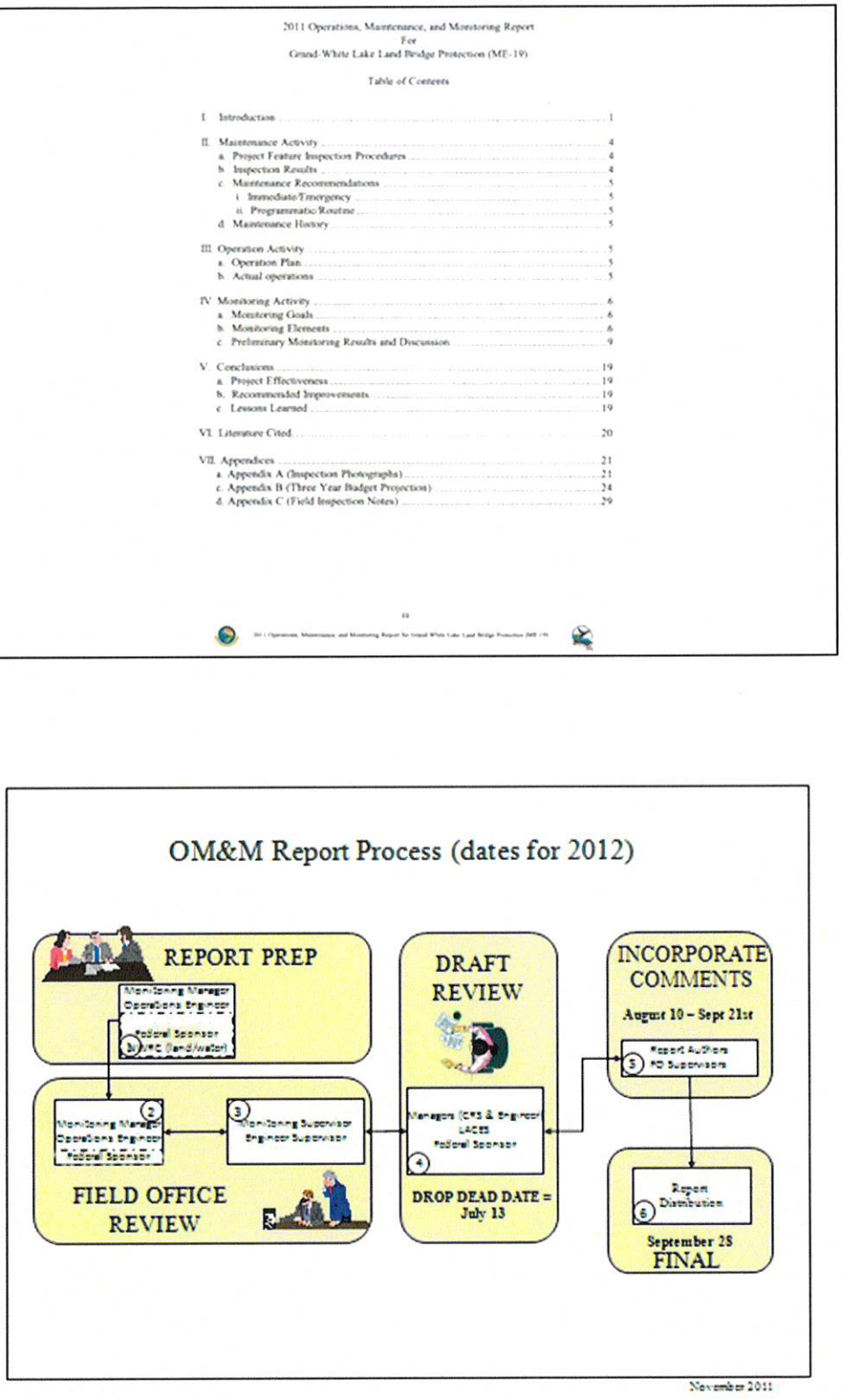


Report Preparation

- Initial discussion by monitoring manager and operations engineer to discuss report outline, due dates, and other responsibilities. NWRC provides land/water analyses. Federal sponsors (NRCS) may request to participate in this step and provide contact names to assist in preparation of first draft.

Field Office Review

- Draft report prepared by monitoring manager and operations engineer. Draft submitted to monitoring and engineering supervisors . Any comments or revisions are sent to the appropriate monitoring manager or operations engineer for incorporation.

Draft Review

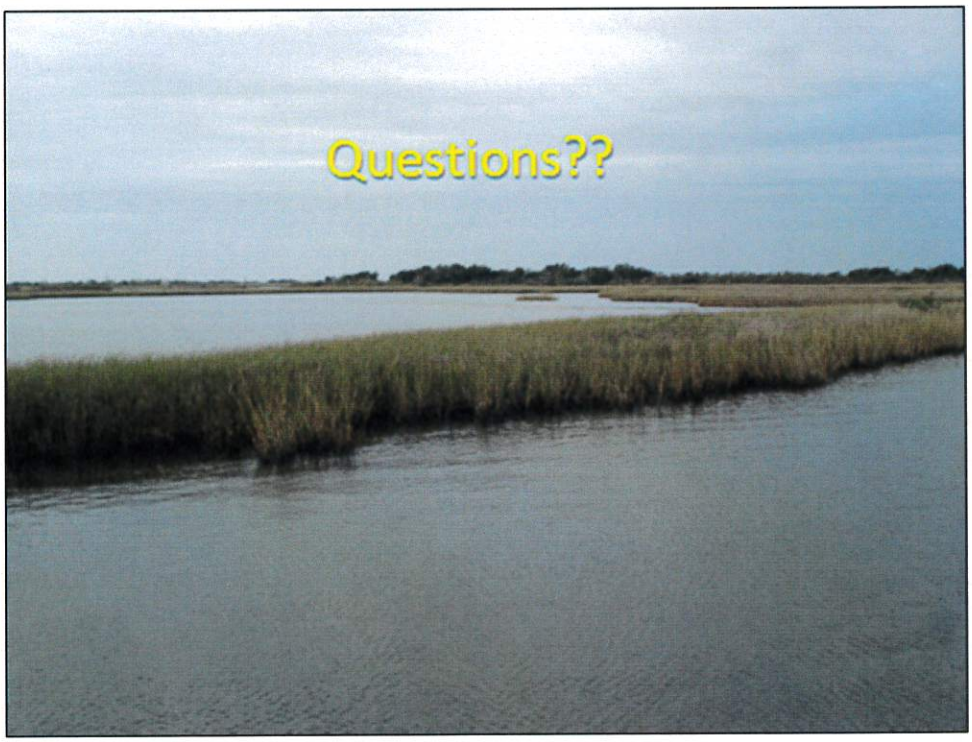
- Upon completion of step 3, and revisions by report authors, multiple distribution for review and comment. July 13th is DROP DEAD DATE. Monitoring supervisor notifies all reviewers by email. Reports are posted on G:\Common\OM&M Reports \..... for internal review, and on ftp site for external review. Comments to be submitted to monitoring supervisors after four week review

Incorporate Comments

- Report authors and field office supervisors review and incorporate comments before being sent to CRS Manager (Weifenbach) and Engineer Manager (Burkholder) for Final Approval. Steps 4 and 5 may be repeated depending on comments received. If conflicts cannot be resolved, Managers (CRS and Engineer) will facilitate resolution

Final

- Managers (CRS and Engineer) will approve with or without changes .Final digital copies will be posted on the Internet (www.lacoast.gov) and SONRIS Document Referencing System (DRS).



Presentation by Ms. Danielle Richardi and Ms. Eva Hillmann

New Orleans Field Office

Bayou LaBranche Wetland Creation (PO-17)

Introduction

- Bayou LaBranche Wetland Creation (PO-17) was the first project constructed through CWPPRA
- Proposed in October 1991 for inclusion on PPL 1
- Construction completed ~ 3.5 years later in early April 1994
- Federal sponsor: USACE
- Project comprises 436 acres in St. Charles Parish on the SW shore of Lake Pontchartrain

Project Description

- Wetland creation from sediment dredged from Lake Pontchartrain
  - Well-suited for project area due to close proximity to borrow site, small, shallow project area (average depth of 1 ft.)
- 2.7 million yds^3 of sediment dredged from the lake bottom and pumped into the northern project area (completed in 1 month)
  - Sediment could not be discharged within 1000 feet of I-10
  - Resulted in an elevation gradient: highest N, lowest S

Vegetative Plantings

- Plantings conducted to reduce sediment transport (wind)
- Aerially seeding with 8,000 lbs. of Japanese millet (*Echinochloa esculenta*) in July 1994, provided by NRCS/St. Charles Parish
- 1600 trade gallons of California bulrush (*Schoenoplectus californicus*) planted May 1996, through the Vegetative Planting Program (LDAF)

Echinochloa esculenta
http://www.globaltwitcher.com/photo/005668.JPG

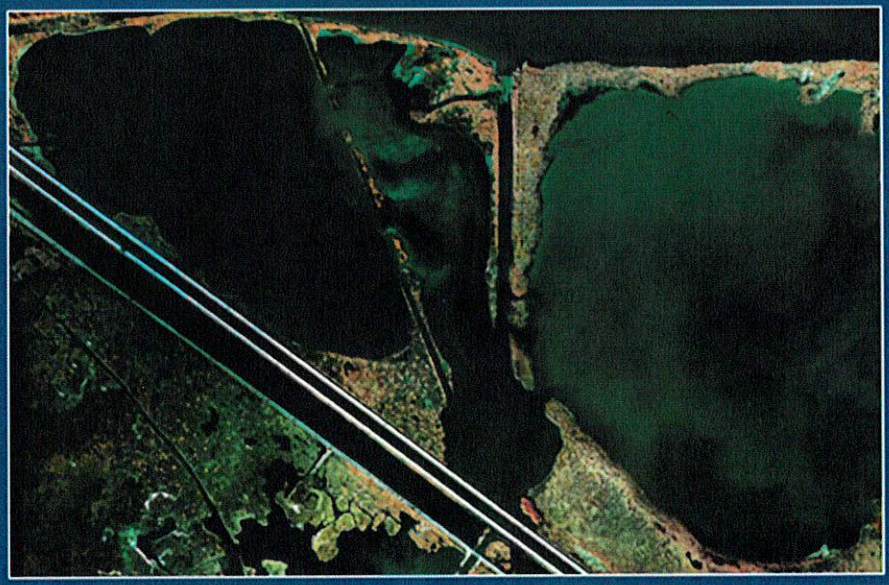
Schoenoplectus californicus
http://www.researchlearningcenter.com/blo om/mobile/pics/3A0984aFV3L.jpg

Why was this project needed?

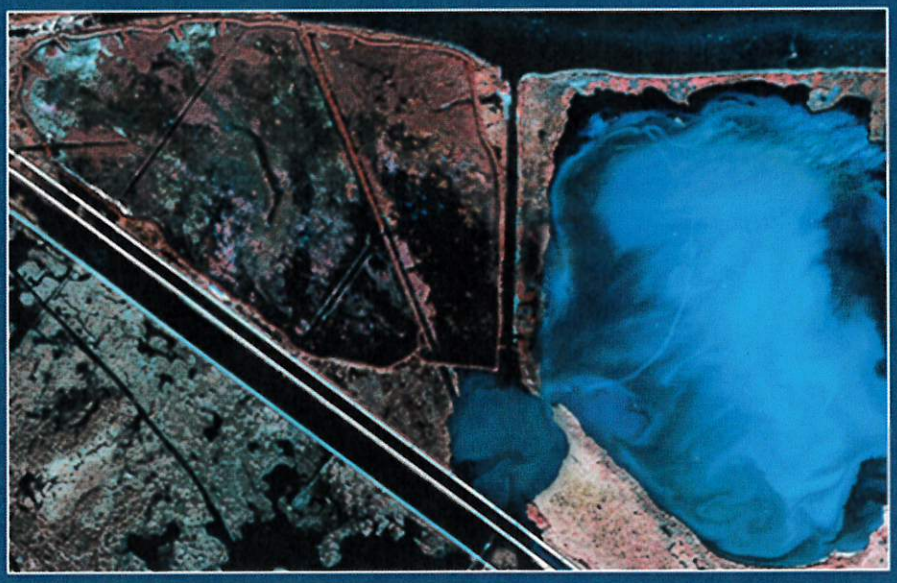
- Area drained for agriculture production (1905–1910)
  - Hurricane with wind speed 140 mph struck in September 1915
  - Tidal surge into Lake Pontchartrain broke the levees and flooded the farm
- Soil compaction and subsidence
- Shoreline erosion
  - Fragile boundary between Lake and wetlands
- Construction of Illinois Central Gulf Railroad (1830s)
  - Interruption of sheet flow
- Construction of I-10 (late 1960s)
  - Canals increased influx of salt water from Lake Pontchartrain
- Pipeline construction

ICGR train near Hammond, LA, Sept. 1976. http://www.railpics.com

PO-17 Project Area 1993 (Pre-Fill)



PO-17 Project Area 1997 (Post-Fill)



Objective and Goals

Objective

Create new vegetated wetlands in the Bayou LaBranche area utilizing dredged sediments

Goals

1. Create approximately 305 acres of shallow water habitat conducive to the natural establishment of emergent wetland vegetation
2. Increase marsh:open water ratio in the project area to a minimum of 70% marsh to 30% water after 5 years

Monitoring Elements

- GIS Habitat Mapping
  Necessary to quantify wetland creation

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  Necessary to determine sediment consolidation and project effectiveness
  Expected elevation range of 0.65 ft. to 1.62 ft. NAVD

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- **Salinity and Water Elevation**
  Useful indicators of plant community structure

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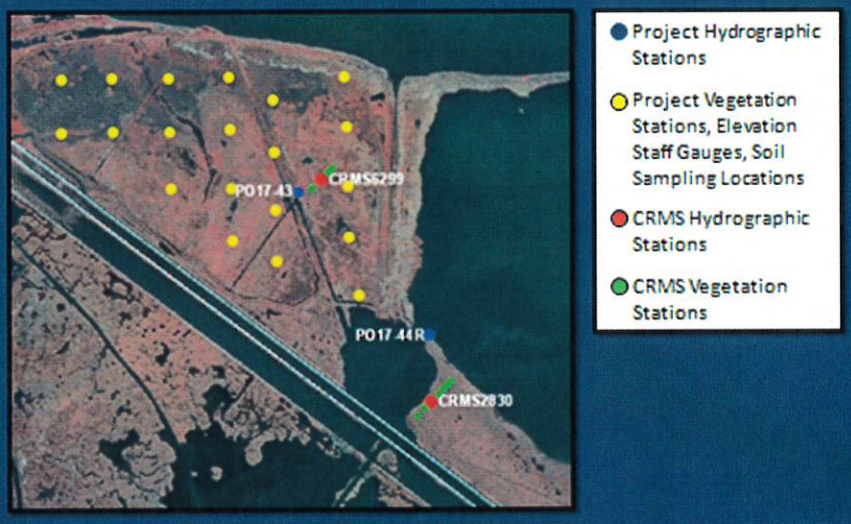
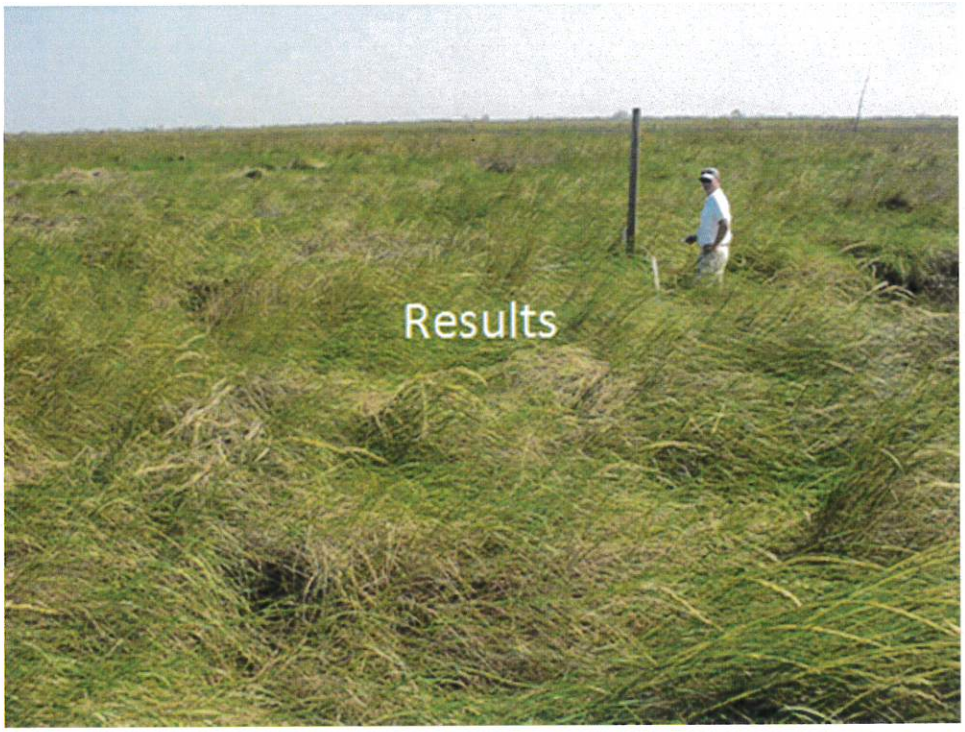
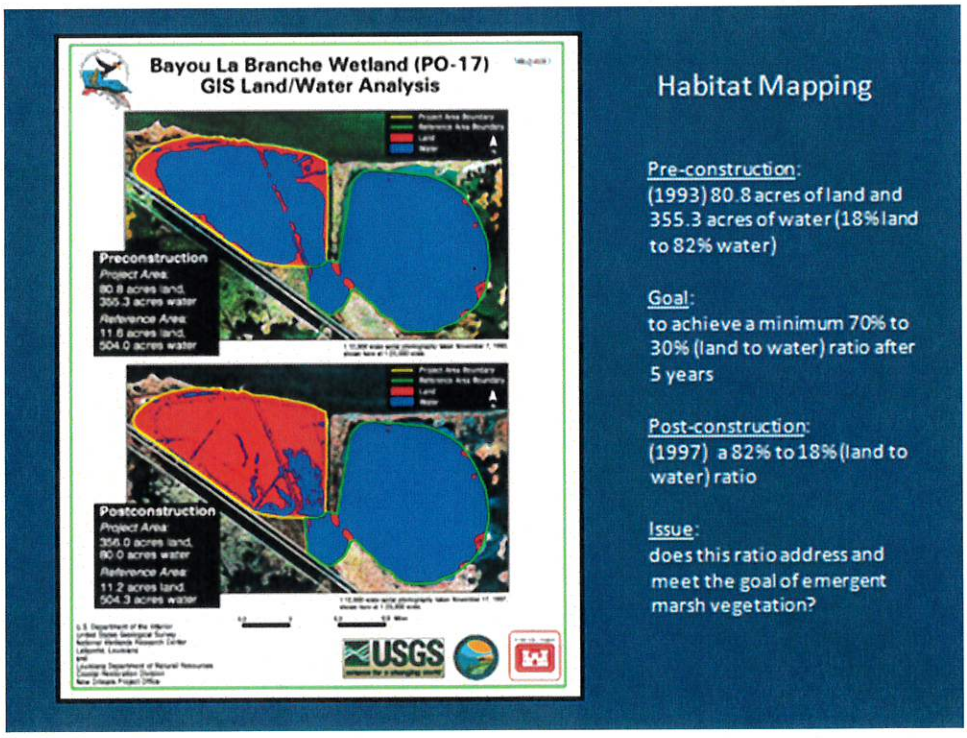
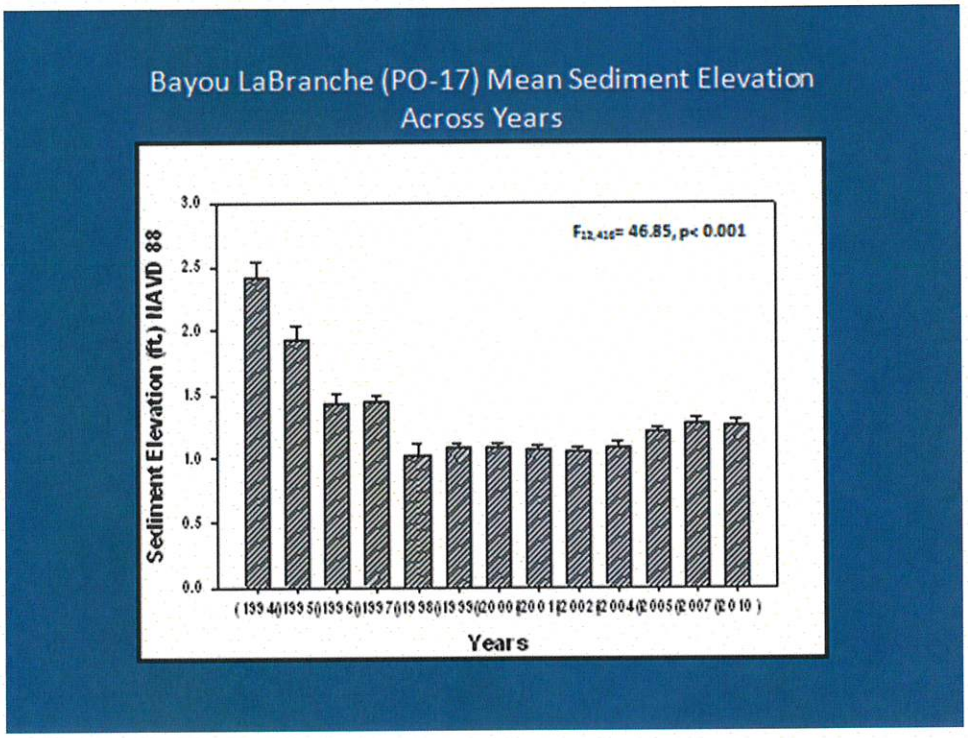
- Soil Properties
  Necessary to determine whether project area is characteristic of a natural wetland
- Salinity and Water Elevation
  Useful indicators of plant community structure
- Vegetation Surveys and FQI's
  Quantify vegetation trends and project effectiveness

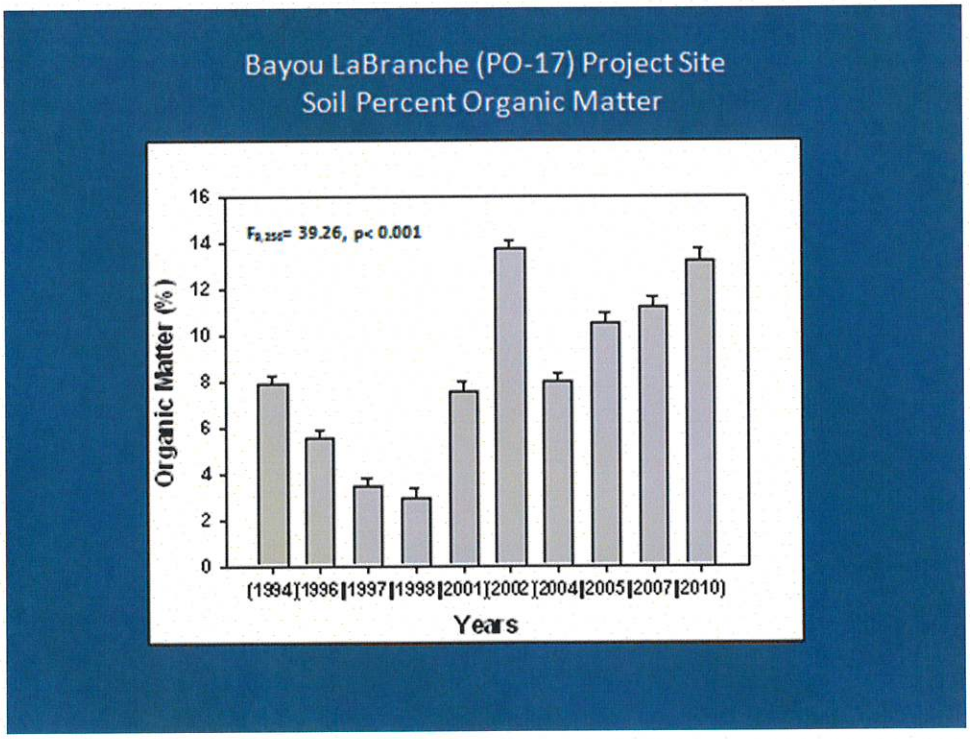
Monitoring Stations



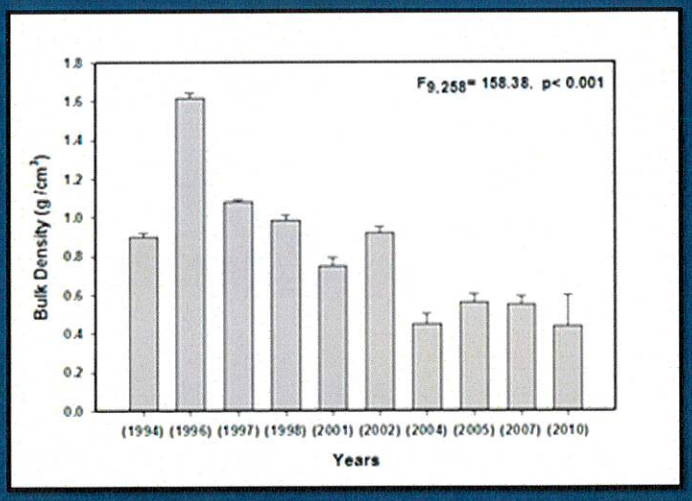

Results


Bayou La Branche Wetland (PO-17)
GIS Land/Water Analysis
Preconstruction
Project Area:
80.8 acres land,
355.3 acres water
Reference Area:
11.6 acres land,
504.0 acres water
Postconstruction
Project Area:
356.0 acres land,
80.0 acres water
Reference Area:
11.2 acres land,
504.3 acres water
USGS
Habitat Mapping
Pre-construction:
(1993) 80.8 acres of land and 355.3 acres of water (18% land to 82% water)
Goal:
to achieve a minimum 70% to 30% (land to water) ratio after 5 years
Post-construction:
(1997) a 82% to 18% (land to water) ratio
Issue:
does this ratio address and meet the goal of emergent marsh vegetation?

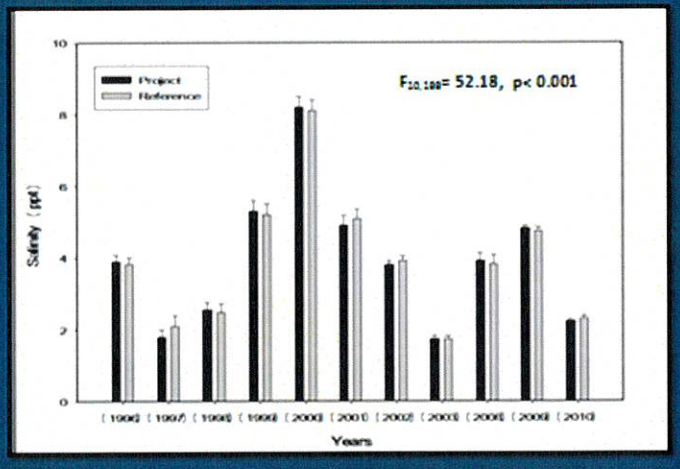

Bayou LaBranche (PO-17) Mean Sediment Elevation Across Years
$F_{12,416}$= 46.85, p< 0.001
Sediment Elevation (ft.) NAVD 88
3.0
2.5
2.0
1.5
1.0
0.5
0.0
Years

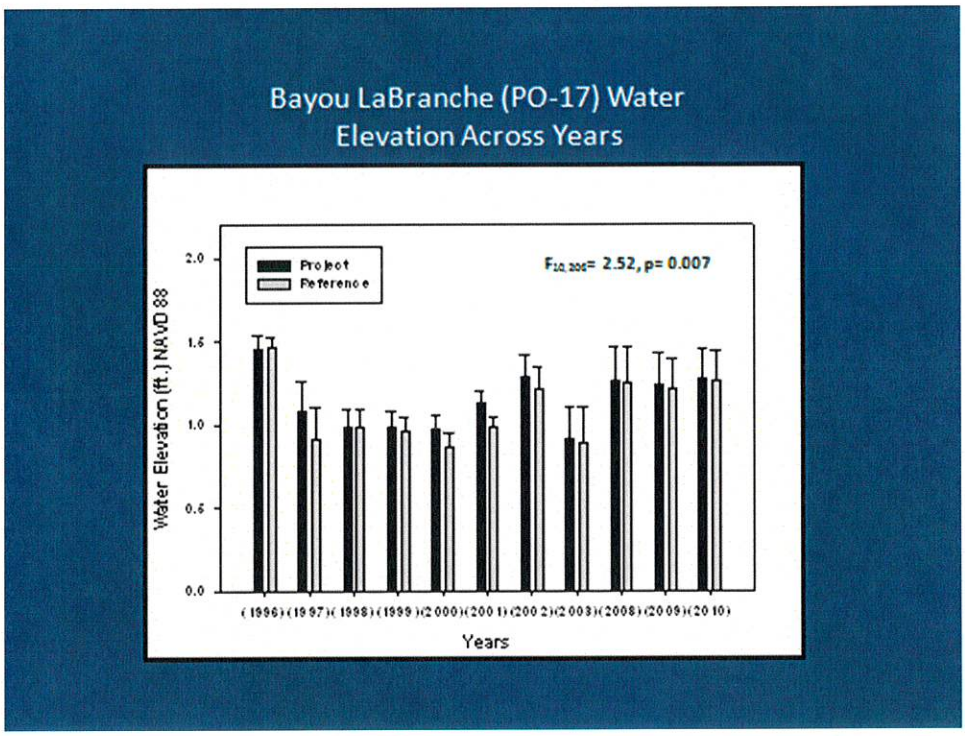

Bayou LaBranche (PO-17) Project Site Soil Percent Organic Matter
$F_{9,252}$= 39.26, p< 0.001
Organic Matter (%)
16
14
12
10
8
6
4
2
0
(1994|1996|1997|1998|2001|2002|2004|2005|2007|2010)
Years

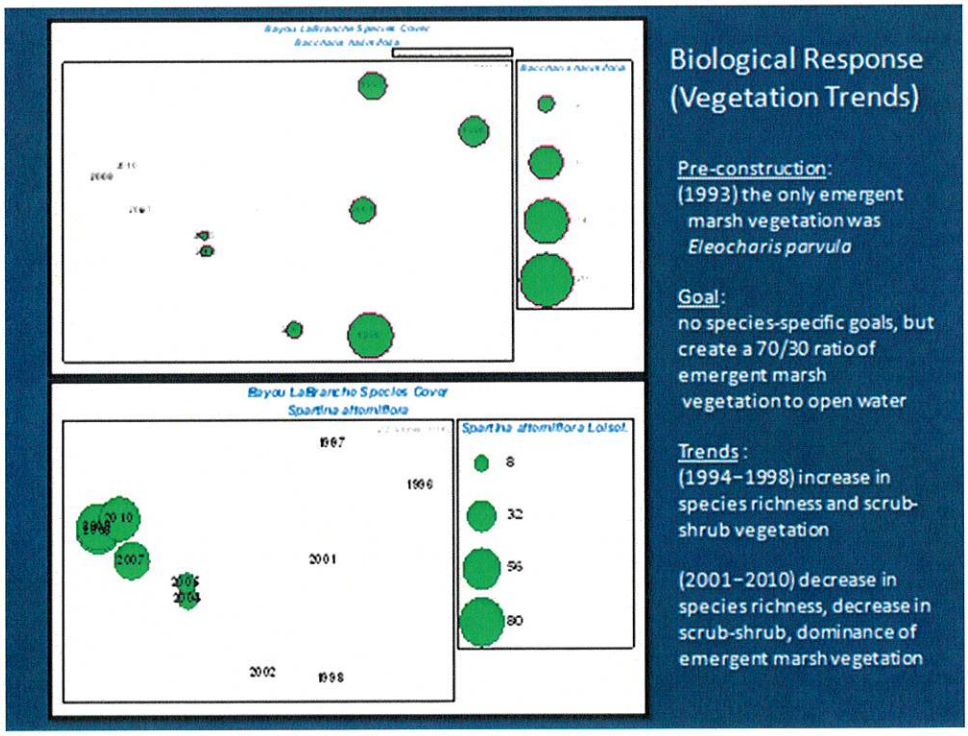
Bayou LaBranche (PO-17) Bulk Density Across Years

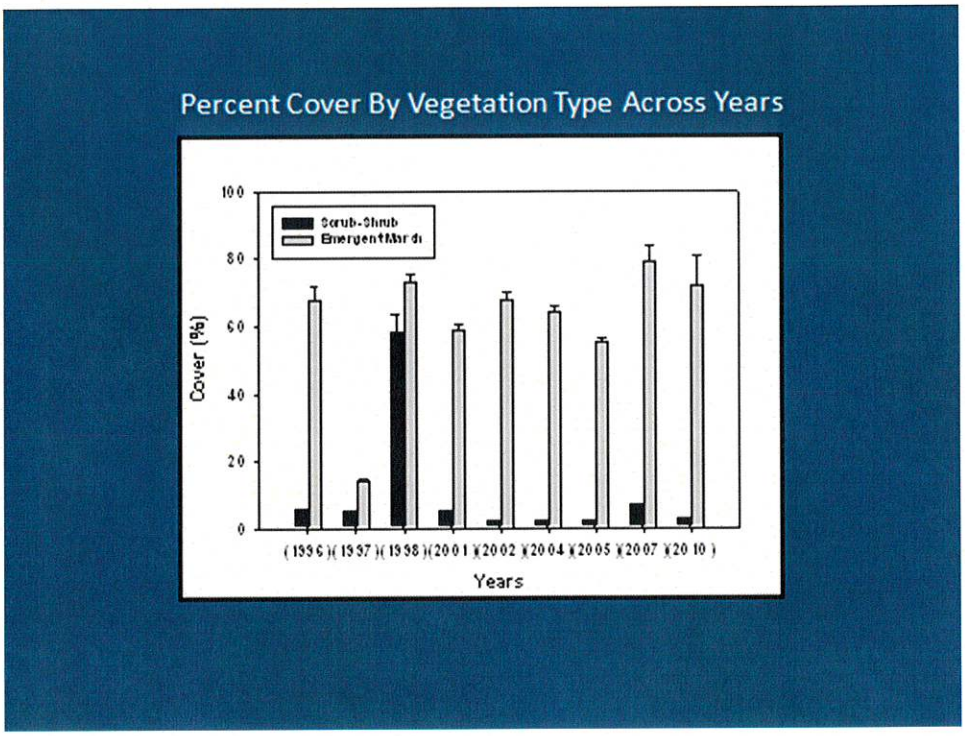


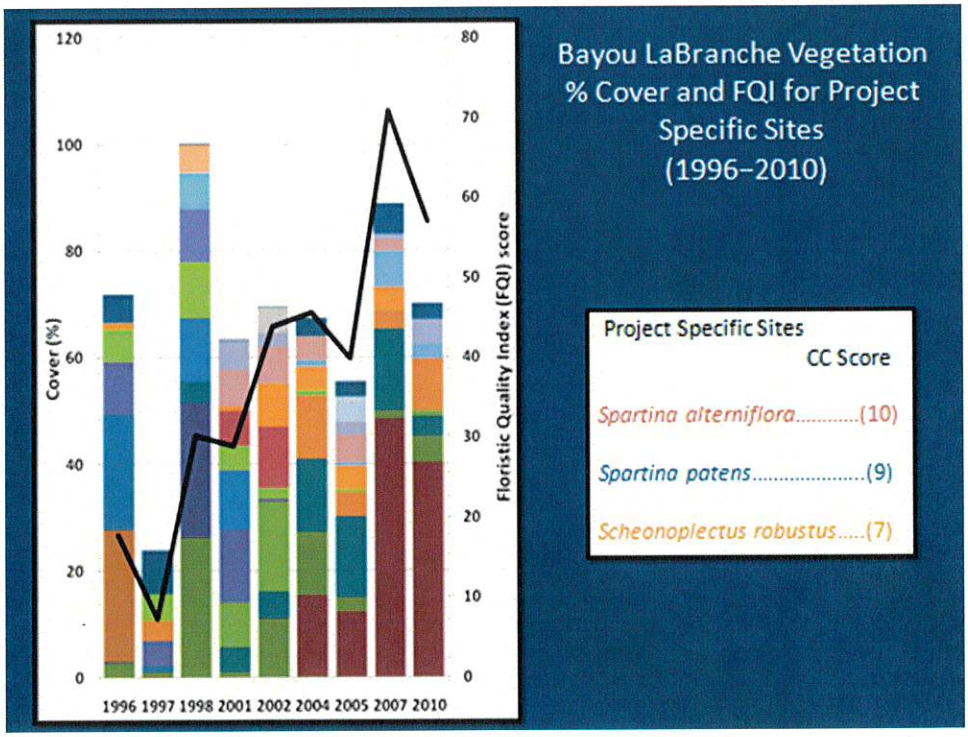
Bayou LaBranche (PO-17)
Project and Reference Salinity Across Years



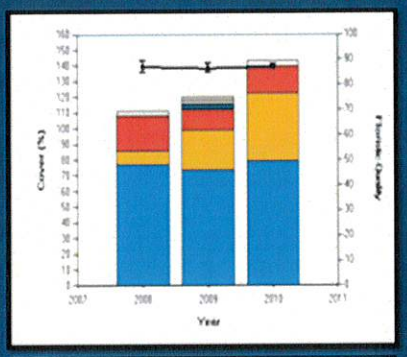

Bayou LaBranche (PO-17) Water Elevation Across Years
Project
Reference
$F_{10,206}$= 2.52, p= 0.007
Water Elevation (ft.) NAVD 88
2.0
1.5
1.0
0.5
0.0
(1996) (1997) (1998) (1999) (2000) (2001) (2002) (2003) (2008) (2009) (2010)
Years

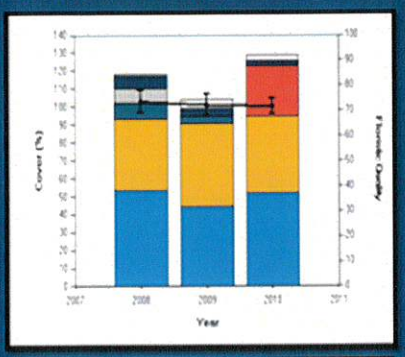

Bayou LaBranche Species Cover
Spartina alterniflora
1997
1998
2001
2002
1998
Spartina alterniflora Loisel.
8
32
56
80
Biological Response (Vegetation Trends)
Pre-construction:
(1993) the only emergent marsh vegetation was Eleocharis parvula
Goal:
no species-specific goals, but create a 70/30 ratio of emergent marsh vegetation to open water
Trends:
(1994–1998) increase in species richness and scrub-shrub vegetation
(2001–2010) decrease in species richness, decrease in scrub-shrub, dominance of emergent marsh vegetation


Percent Cover By Vegetation Type Across Years
Scrub-Shrub
Emergent Marsh
Cover (%)
100
80
60
40
20
0
1996 1997 1998 2001 2002 2004 2005 2007 2010
Years


Bayou LaBranche Vegetation
% Cover and FQI for Project
Specific Sites
(1996–2010)
Cover (%)
Floristic Quality Index (FQI) score
120
100
80
60
40
20
0
80
70
60
50
40
30
20
10
0
1996 1997 1998 2001 2002 2004 2005 2007 2010
Project Specific Sites
CC Score
Spartina alterniflora.....(10)
Spartina patens.....(9)
Scheonoplectus robustus.....(7)

Vegetation % Cover and FQI for CRMS Sites in the Bayou LaBranche Project and Reference Areas (2008–2010)





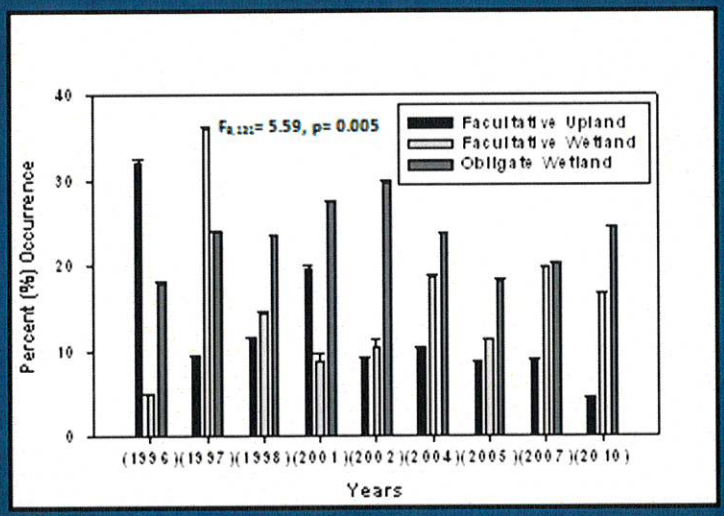
CRMS6299 (Project)
FQI in high 80s

	CC score
Spartina alterniflora	(10)
Schoenoplectus robustus	(7)
Spartina patens	(9)

CRMS2832 (Reference)
FQI in low to mid 70s

	CC score
Spartina patens	(9)
Ipomoea sagittata	(8)
Polygonum punctatum	(5)

Frequency of Occurrence of Wetland Index Species Across Years



Discussion

- Has this project met the goal of creating and then maintaining a land to water ratio of 70 % to 30 % ?

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- **Do the soil properties in the project area mimic natural, regional wetlands?**

Discussion

- Has this project met the goal of creating and then maintaining a land to water ratio of 70 % to 30 % ?
- Has this project met the objective of maintaining sediment elevation that supports emergent wetland vegetation?
- Do the soil properties in the project area mimic natural, regional wetlands?
- **What are the differences in water quality and hydrology between the project and reference areas ?**

Discussion

- Has this project met the goal of creating and then maintaining a land to water ratio of 70 % to 30 % ?
- Has this project met the objective of maintaining sediment elevation that supports emergent wetland vegetation?
- Do the soil properties in the project area mimic natural, regional wetlands?
- What are the differences in water quality and hydrology between the project and reference areas ?
- **What have been the overall trends in emergent wetland vegetation and have they met the goals of the project?**

Conclusions

- **Project Effectiveness: As of 1997, the project area contained approximately 82% land and 18% water, exceeding the minimum goal of 70% land and 30% water. Further, the soil properties and the vegetation community are developing into characteristic wetland habitat.**

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- Project Effectiveness: As of 1997, the project area contained approximately 82% land and 18% water, exceeding the minimum goal of 70% land and 30% water. Further, the soil properties and the vegetation community are developing into characteristic wetland habitat.
- Recommended Improvements: Gaps in the containment dikes and spoil banks to increase tidal exchange and productivity. Sediment elevation should continue to be monitored, but maintenance is expected to be minimal.

Conclusions

- Project Effectiveness: As of 1997, the project area contained approximately 82% land and 18% water, exceeding the minimum goal of 70% land and 30% water. Further, the soil properties and the vegetation community are developing into characteristic wetland habitat.
- Recommended Improvements: Gaps in the containment dikes and spoil banks to increase tidal exchange and productivity. Sediment elevation should continue to be monitored, but maintenance is expected to be minimal.
- Lessons Learned: The data gathered for calculating and maintaining the correct sediment elevations of dredge material and its placement were the most important aspects in creating wetlands for this project.


Questions and Comments

Q: Are you able to maintain and preserve the lake shoreline?

A: The shoreline is heavily reinforced and holding. We might need to do separate projects that focus on stabilizing the shoreline.

Q: What is the next phase? This is the 'perfect' project.

A1: There is a new project proposed through CWPPRA near this site; however, there are sediment issues with this project. We should build right next door to the project because we did this one right.

A2: There was another project in the vicinity but was de-authorized due to land rights issues with the airport.

Q: Should projects be designed to build elevation quickly or longer?

A: This project is a big success story now. It was not seen that way at first.

Q: Ways to measure programmatic success is to compare goals. Other issues to be concerned about is sustainability of a project. We were not as concerned about hurricanes in the past. Is that something being considered now in the CWPPRA process?

A: Landowner did not allow gapping containment so that affected desired elevation.

Q: This area was owned by the Waterfowl club. Was the elevation issue from them? Did the containment dike benefit the area or would its removal have spread out sediment more?

A: Culverts and landowners did not manipulate the elevation range. The higher marsh hits the elevation range and lasts that much longer. Summer: Federal agencies are interested in quickly building land, not necessarily focusing on sustainability.

Q: What are the benefit metrics for federal agencies? Fish access?

A1: FWS and EPA feel different about containment dikes.

A2: WVA scores are the main mission of federal agencies.

A3: Someone should consider wildlife beyond fish. EPA is concerned about water quality but no one is fighting for the land side.

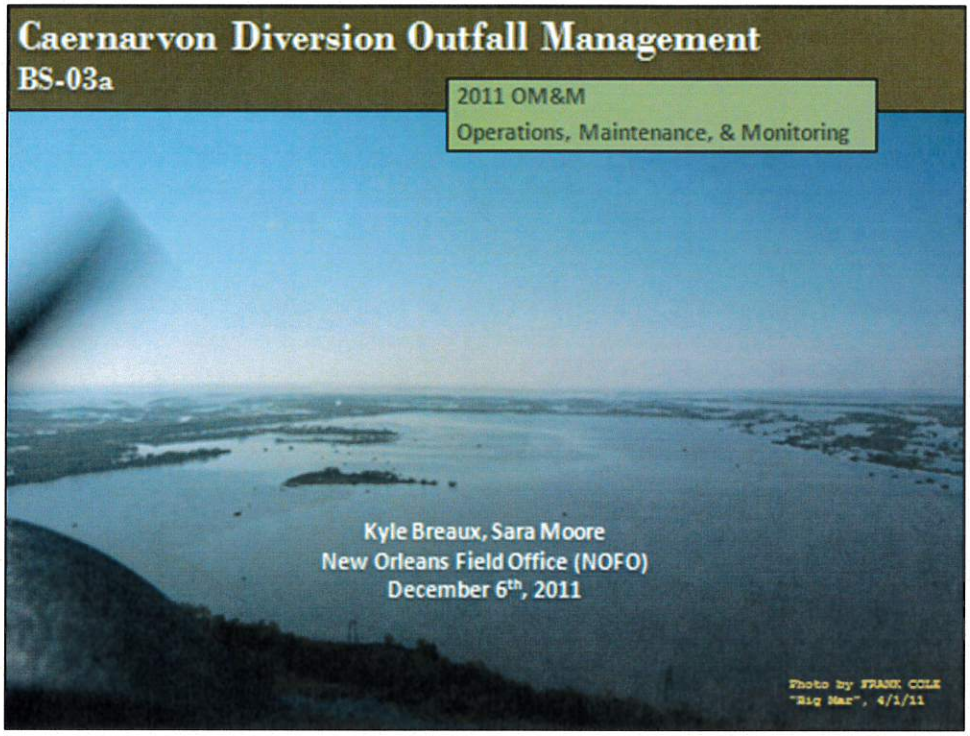
Q: The gradient difference-is there opposition of a natural gradient? Was there any question about this at end of project?

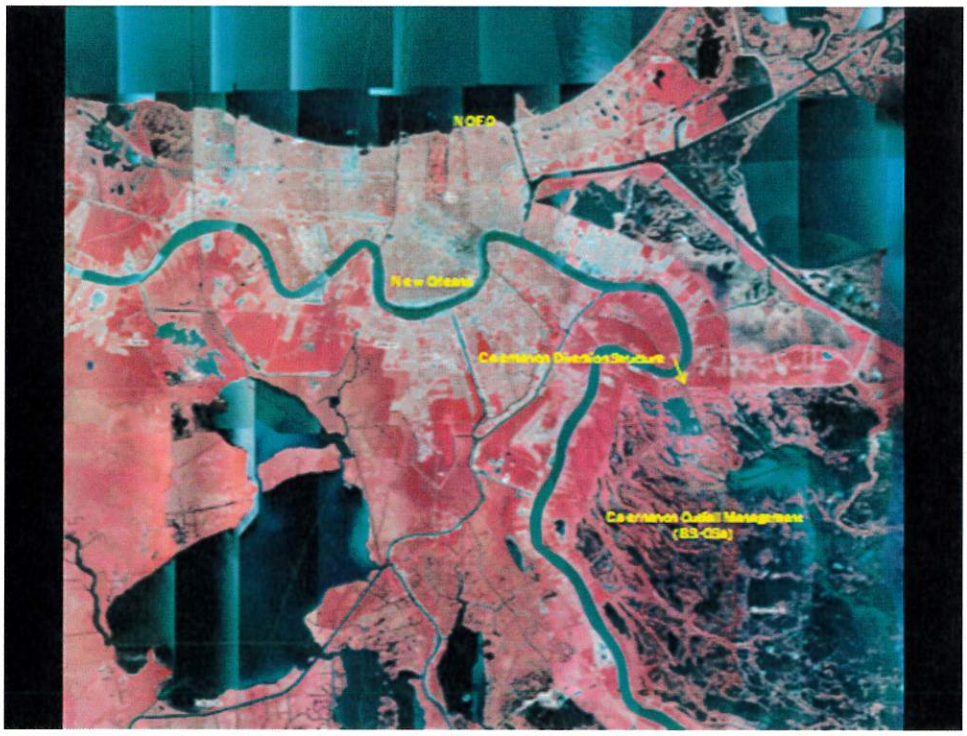
A: Area became upland/scrub-shrub habitat. Gradient might not be achievable. It is predominantly marsh now, some roseau cane but no more scrub-shrub.

Presentation by Mr. Kyle Breaux and Ms. Sara Moore

New Orleans Field Office

Caernarvon Diversion Outfall Management (BS-03a)


Caernarvon Diversion Outfall Management
BS-03a
2011 OM&M
Operations, Maintenance, & Monitoring
Kyle Breaux, Sara Moore
New Orleans Field Office (NOFO)
December 6th, 2011
Photo by FRANK COLE
"Big Mac", 4/1/11


NOFO
New Orleans
Caernarvon Diversion Structure
Caernarvon Outfall Management
(BS-03a)


Big
Mar
Caernarvon
Freshwater Diversion
Structure
LADNR


Mississippi River
Big Mar
Ref 1
Bayou Mandeville
Delacroix Canal
DP Canal
Lake Lery
Ferry Access Canal
Reggio Canal
Tigers Ridge
Ref 2
Location – Plaquemines Parish; south and west of Big Mar, a failed agricultural impoundment
Area – 18,200 acres
Federal Sponsor – NRCS

History

Caernarvon Diversion Outfall Management (BS-03a)

- Land loss & altered hydrology
  - Exceeded 270 ac/yr between 1958-1974
  - Oil & gas exploration
- Hurricane Betsy, 1965
  - Salt water infiltration, impoundment
- Short circuiting of water flow from the **Caernarvon Freshwater Diversion (BS-08, 1991)** structure through pipeline and access canals to the lower basin
- Resulted in **BS-03a (PPL 2)**
  - Construction start: July 2, 2001
  - Completed: June 14, 2002

Intro...

Objectives

Caernarvon Diversion Outfall Management (BS-03a)

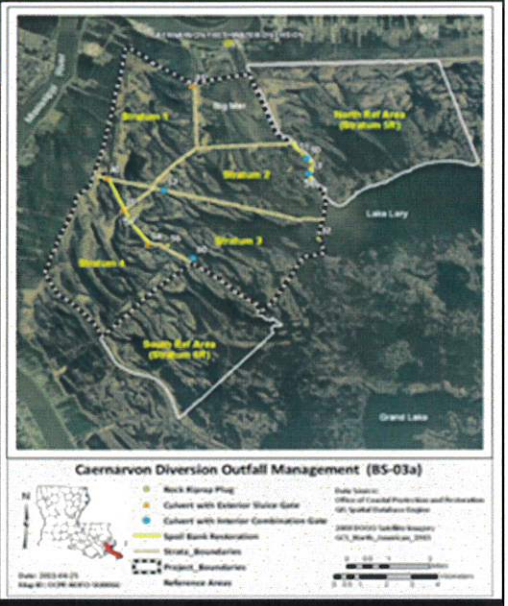
- Promote better utilization and distribution of Mississippi River water from the Caernarvon diversion structure during periods low diversion discharge (0 – 2,000 cfs)
- Increase retention time yielding increased nutrient assimilation
- Improve water quality by reducing salinity
- Increase occurrence of emergent and submerged marsh vegetation
- Create four "strata" and two reference areas for monitoring

Intro...

Project Features

Caernarvon Diversion Outfall Management (BS-03a)

- System of pipes, gates, and plugs
- Sluice gates (4)
  - Exterior
  - 48' corrugated aluminum pipes
- Combination gates (4)
  - Interior, prevents backflow
  - 48' corrugated aluminum pipes
- Rock riprap plugs (2)
  - Canal Closures
- Spoil Bank restorations (2)
  - 10,539 LF
- Flow meters
  - structures 28, 40, 54
- **Structure placement?**
  - **Combination Gates – gapped spoil banks into open water areas**
  - **Sluice Gates – installed at closures of old canals**

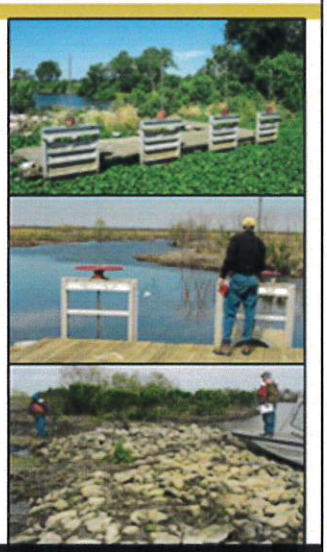


Intro...

Operations

Caernarvon Diversion Outfall Management (BS-03a)

- **Develop O&M Plan**
  - Project Features
  - Items requiring maintenance
  - ***Federal sponsor and CPRA responsibilities***
  - Cost Sharing Agreement
  - ***OM&M Budget***
  - As-builts
  - Permits
  - ***Structure Operation Plan***
  - ***Annual Inspection Requirements***
- **Contractor Obligations**
  - Contractor required to perform preventative maintenance and minor repairs to structures
  - Retrieve flow meter data
  - Abide by the structure's operation plan
  - Emergency Operation
    - 24-hour response for tropical weather events
    - 6-hour response for chemical leaks or oil spills



Operations...

Operations

Caernarvon Diversion Outfall Management (BS-03a)

BS-03a Operation Plan

- Passive operation of all water control structures.
- All sluice gates will be fully opened to maximize flow exchange. Results from monitoring will dictate the operation plan.
- Combination gates 52 and 60 will be locked open except during waterfowl season. Percent open is at the discretion of the landowner.
- Extreme conditions allow for deviation from normal operating procedures.

Operations...

Maintenance

Caernarvon Diversion Outfall Management (BS-03a)

- Annual Inspections
  - CPRA, NRCS
  - Document condition of each 'structure'
- Inspection Reports
  - Annually
  - Cumulative OM&M report every 3 years
  - Submit to federal sponsor
  - Outlines upcoming three year budget
- Contractor Obligations
  - Ensure operability of each structure and its components (i.e. flow meter, deck, pilings, bracing, etc)
  - Clean, lubricate, and operate water control structures every four months

Maintenance...

Maintenance

Caernarvon Diversion Outfall Management (BS-03a)

Delacroix Canal Dredging

Hurricane Damage

Maintenance...

History

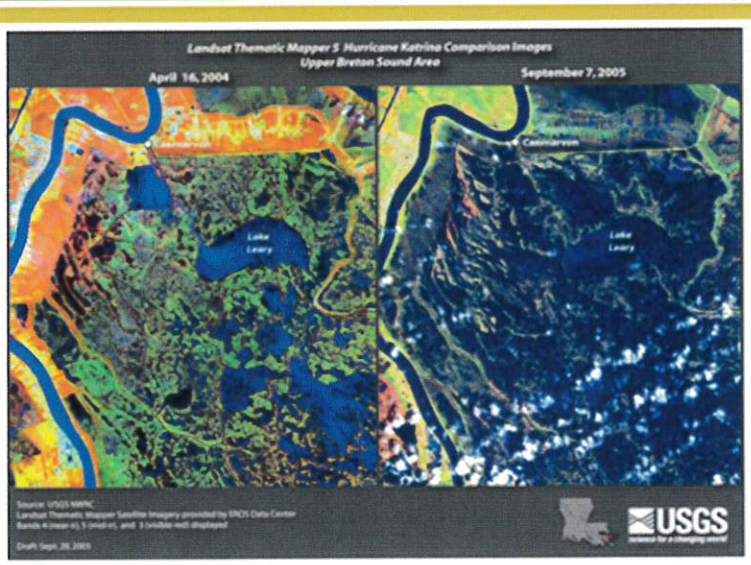
Caernarvon Diversion Outfall Management (BS-03a)

- Salt water intrusion in the area
  - Caused by subsidence, storm induced erosion, channelization of streams and rivers, & canal dredging
  - Hurricane Betsy (1965)
    - Transformed the area from intermediate in late 60's to brackish marsh by 1978
    - By 1988 all but ~3% was brackish
  - Vegetation surveys from BS-08 between 1988 & 1990 show:
    - Spartina patens was dominant
    - In more saline areas, Spartina alterniflora, Distichlis & Juncus
  - Hurricanes Katrina and Rita (2005)
    - Once again, rearranged the hydrology of the area
    - Destroyed all monitoring stations

Monitoring...

Monitoring

Caernarvon Diversion Outfall Management (BS-03a)



Monitoring

Caernarvon Diversion Outfall Management (BS-03a)

- Monitoring Goals
  - Increase freshwater and nutrient dispersion during low discharge periods, and to promote better retention and distribution of freshwater
- Monitoring Elements
  - Reduce marsh loss rates
  - Reduce salinity variation in the interior marshes
  - Increase occurrence and abundance of fresh/intermediate marsh plant species
  - Increase the occurrence of submerged aquatic vegetation (SAV) in shallow open water areas

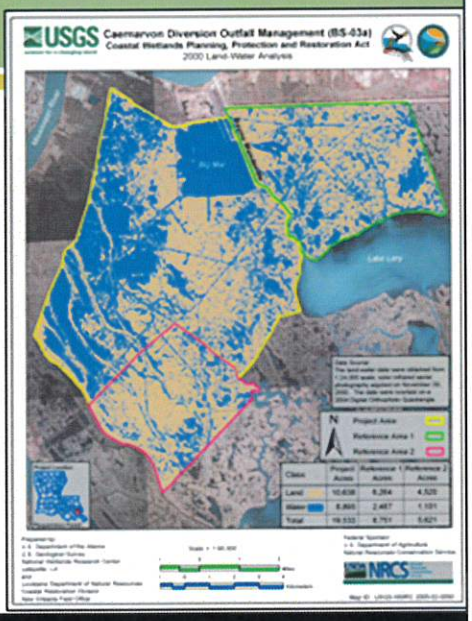
Monitoring...

Monitoring

Caernarvon Diversion Outfall Management (BS-03a)

- Reduce marsh loss rates
  - Color-infrared aerial photography was obtained by USGS in 2000 and 2006, and will be collected again in 2018
  - 2006 imagery could not be analyzed due to extensive damage from Hurricane Katrina
  - USGS (Barras 2006) noted 90% of new water area occurred within fresh/intermediate marshes

http://pubs.usgs.gov/of/2006/1274



Monitoring...

Monitoring

Caernarvon Diversion Outfall Management (BS-03a)

- Increase the occurrence of submerged aquatic vegetation (SAV) in shallow open water areas
  - Methods to determine frequency of SAV along two transects within each project and reference stratum
  - SAV was sampled in Spring of 2000 and 2003
  - Discontinued due to the effects of Hurricane Katrina on the marsh ponds used for sampling
  - This monitoring goal will no longer be assessed

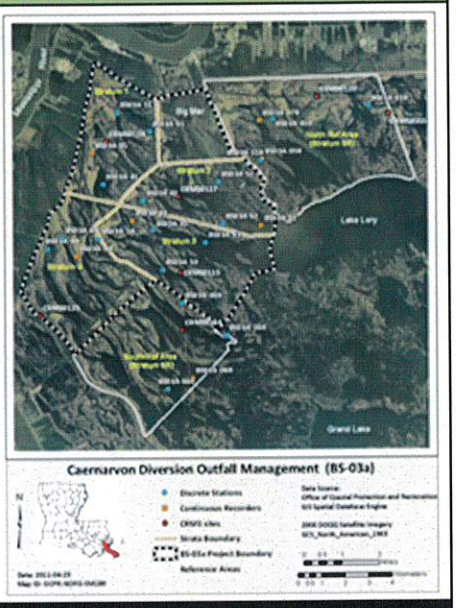
Monitoring...

Salinity

Caernarvon Diversion Outfall Management (BS-03a)

- Reduce salinity variation in the interior marshes
  - Measured at project specific stations from 2000-2005
  - Replaced by CRMS in 2007
  - CRMS0114 and CRMS0117 were installed as marsh well stations
  - CRMS0115 and CRMS0120 were converted from well stations in 2009

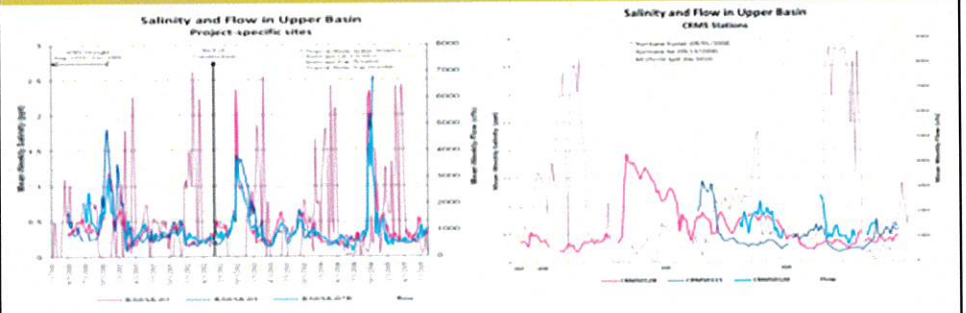
CRMS Station Monitorin[illegible] Dates – Salinity		
Stratum 1	CRMS0128	10/29/2007-12/31/2010
Stratum 2	CRMS0117	Well data
Stratum 3	CRMS0115	04/09/2009-12/07/2010
Stratum 4	CRMS0125	01/21/2008-10/14/2010
Stratum 5R	CRMS0120 CRMS4355	08/18/2009-12/13/2010
Stratum 6R	CRMS0144 CRMS0114	Well data



Salinity...

Salinity

Caernarvon Diversion Outfall Management (BS-03a)



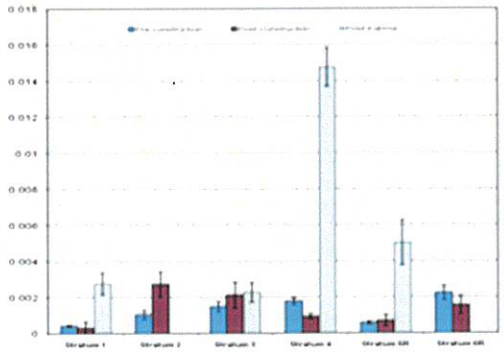
- Mean salinity is typically <1ppt
- Salinity levels are suppressed by diversion waters when the river stage and operational plan allows
- Drought, tropical storms, oil spill

Salinity...

Salinity

Caernarvon Diversion Outfall Management (BS-03a)

- Reduce salinity variation in the interior marshes
  - Mean daily salinity (±SE) during pre-construction (3/27/00–8/14/02), post-construction (8/15/02–8/09/05), and post-Katrina (Oct 2007–2010).
    - Storm activity, vandalism, PULSES
    - Hurricane Katrina, increase in open water and less-restricted hydrologic flow

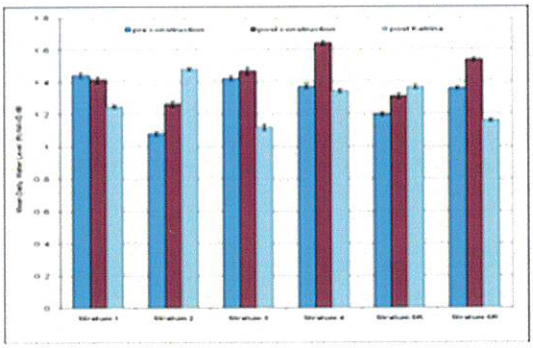


Salinity...

Water Level

Caernarvon Diversion Outfall Management (BS-03a)

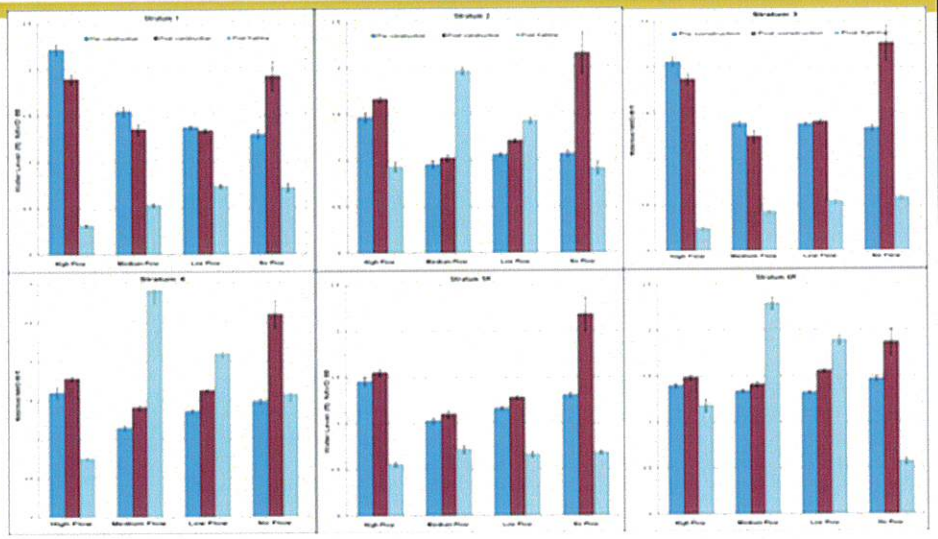
- Increase freshwater dispersion and retention of diversion waters
  - Pre- to post-construction period increase
    - Project effectiveness?
    - Drought, storm activity
  - Post-Katrina decreases
    - Blockages and low flow
  - Strata 2 and 5R



Water Level...

Water Level

Caernarvon Diversion Outfall Management (BS-03a)

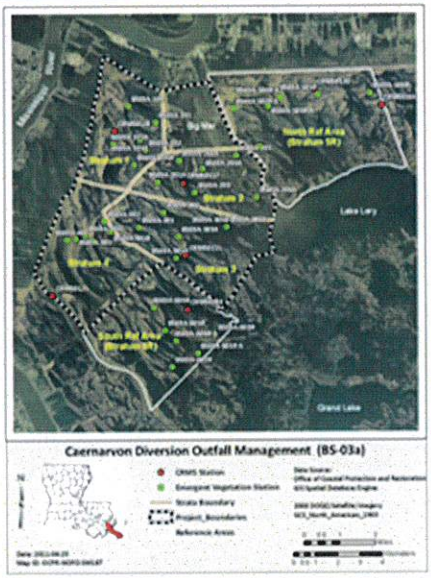


*low flow (0–2000 cfs), medium flow (2000–4000 cfs), and high flow (>4,000 cfs)

Vegetation

Caernarvon Diversion Outfall Management (BS-03a)

- Increase occurrence and abundance of fresh/intermediate marsh plant species
  - Species composition and abundance was surveyed in 2000, 2003, 2005, 2006 and 2007
  - Six plots (4m²) in each project and reference stratum
  - Beginning in 2007, surveys conducted annually along 283m transects at CRMS stations
  - Supplemented with Floristic Quality Index (FQI)



Vegetation...

Vegetation

Caernarvon Diversion Outfall Management (BS-03a)

- Spartina patens was dominant in nearly all strata in 2000, 2003 and 2005
- Other prominent vegetation includes:
  - *Alternanthera philoxeroides* in 2000 (4): fresh-intermediate
  - *Sesbania herbacea* in 2003 (4): intermediate
  - *Eleocharis parvula* in 2003 (6R): intermediate-brackish
  - *Bacopa monnieri* in 2005 (5R): fresh-intermediate
- Many stations were relocated after Hurricane Katrina
- In 2006, *Polygonum sp.* increased in percent cover and was dominant in most strata, while Spartina patens declined
- Since CRMS monitoring began in 2007, *Polygonum punctatum* (dotted smartweed) has notable increase
- In 2010, *P. punctatum* remains dominant in nearly all strata
  - *Echinochloa walteri* (coast cockspur grass) slightly greater in stratum 4
- CRMS vegetation surveys have continued to show a general downward trend for FQI.

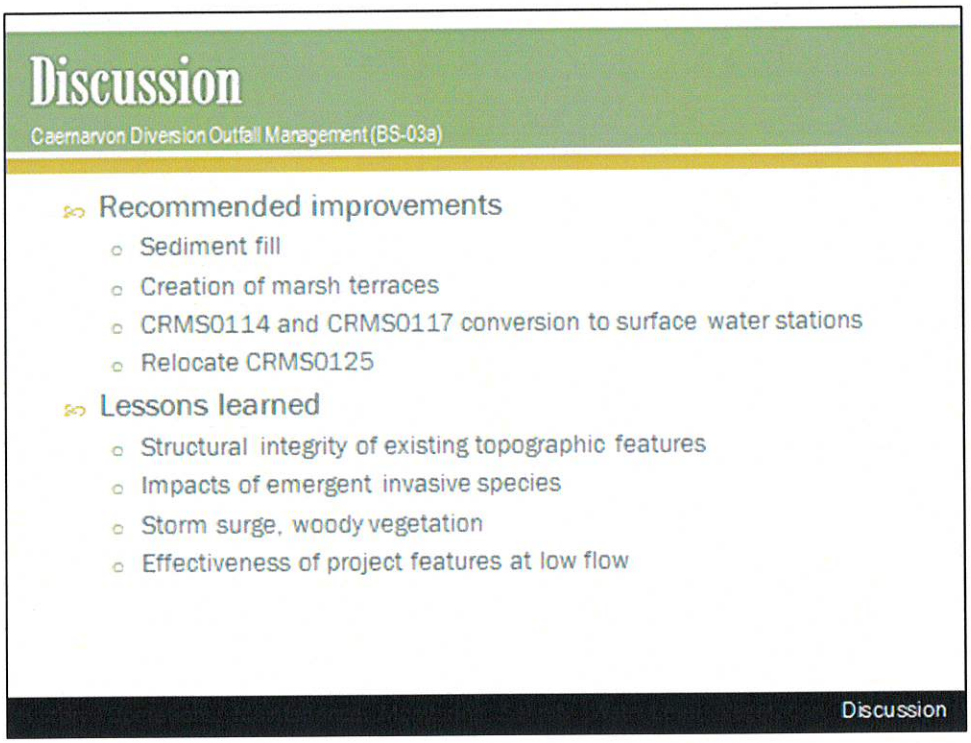
Vegetation...

Discussion

Caernarvon Diversion Outfall Management (BS-03a)

- Some project goals could not be assessed
- Salinity variation in some strata decreased during the post-construction period
  - Drought, pre-construction or project effectiveness?
- Increased salinity variation in all strata post-Katrina
  - Rearranged topology and hydrology of the area
- Spartina patens, a intermediate-brackish species, has been nearly eliminated in all strata in 2010; *P. punctatum*, a fresh-intermediate species now dominates nearly all strata

Discussion


Discussion
Caernarvon Diversion Outfall Management (BS-03a)
Recommended improvements
Sediment fill
Creation of marsh terraces
CRMS0114 and CRMS0117 conversion to surface water stations
Relocate CRMS0125
Lessons learned
Structural integrity of existing topographic features
Impacts of emergent invasive species
Storm surge, woody vegetation
Effectiveness of project features at low flow
Discussion

With the LCA diversion, increasing flows are being proposed. We need to be concerned about retention of water. High flow can bypass project features; however, salinity regulation is better at high flow. High flow gets restricted to canals and exits out of the Lake. It bypasses the northern strata. We should add adaptive management and allow flow to be dictated by monitoring results. We choose TSP to run the diversion all the time but we want maximum flexibility. The diversion probably won't run all the time. LCA affects basin vs strata with this project.

Q: Impacts of emergent invasive species: land owners are interested in water hyacinth control. Is that something OM&M can control and fund?

A. We should allow a period of time for the sediment to dry out that would prevent inundation for too long. There was evidence of good benefits (Day article) for occasional flooding and then dewatering of marshes to help let the nutrients assimilate. We don't want saltwater intrusion. This area only has salt water intrusion from major storms passing through. Salinity is not really important here.

Q: Is hyacinth control a priority? Can this be an OM&M responsibility?

A: Plaquemines parish restricts what can be used for hyacinth control. They only allow methods that are expensive. Maybe this is something that needs to be taken into account with OM&M costs for future diversions?

Higher water can also lead to more nutria. Higher flows may be beneficial but it will take a longer amount of time. The basin will have to fill up on the east side before flows hit the west side. There is some sheet flow to the west. ~2000-3000 cfs flow through the culverts. We want higher flows.

Northwest portion of the site has only the Scarsdale pump station for freshwater input. This pump drains the east side of Plaquemines Parish.

Q: Where is the resistance to applying money for invasive species control? Is there hyacinth removal in project budgets? In LCA projects, there was money for monitoring invasive species but is it in the final version?

A. We need better management of diversions. OM&M have control of pump station into drainage canal but no budget for the entire project area.

Q: OM&M Budgets: is there money for improvements or contingency (or unexpected) costs?

A: You usually have to beg for more money depending on what year the project is in. There is no line item for contingency. We have to request for additional money.

There should be a move to put in OM&M funds, money for invasive species control. Hyacinth herbicides cannot be used in Plaquemines Parish; they are banned. Other options are 10-15X more expensive. Frost or breezes can kill hyacinth. Weevils were used in the Everglades to control hyacinths. They are a natural predator of hyacinth. The procedure did not seem to work.

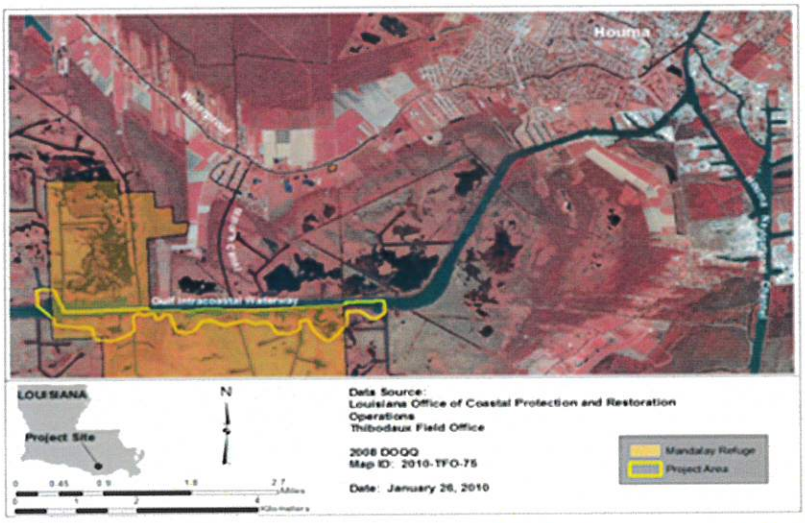
Presentation by Ms. Elaine Lear and Mr. Glen Curole

Thibodaux Field Office

Mandalay Bank Protection Demo (TE-41)

TE-41 Mandalay Bank Protection Demonstration Project
(CWPPRA Priority List IX)
End Construction: September 2003

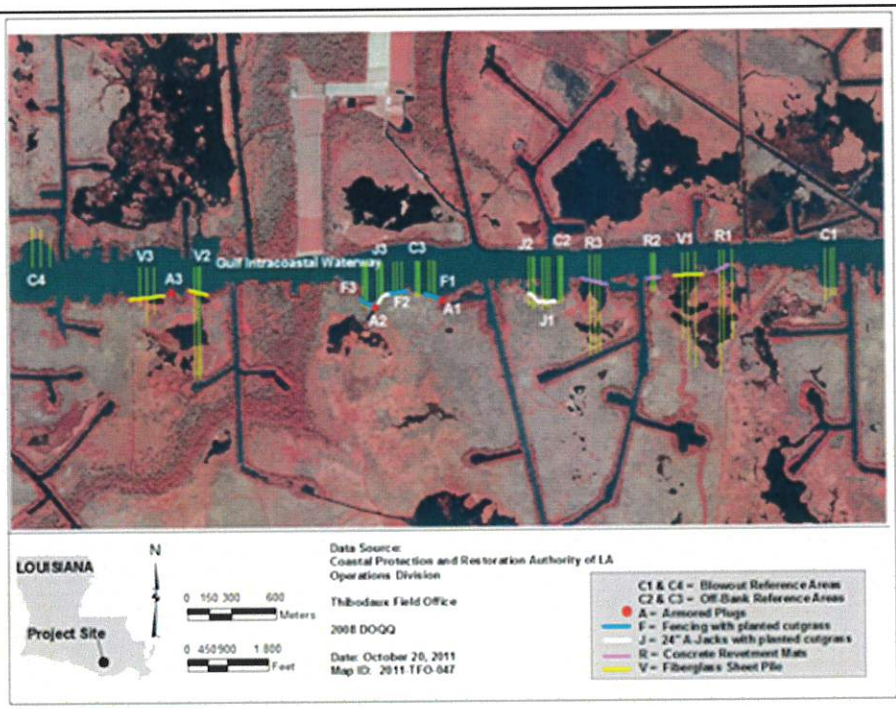
Project Location:



The project is located along a 3.4-mi (5.5- km) segment of the Gulf Intracoastal Waterway (GIWW) inside the Mandalay National Wildlife Refuge.

Shoreline Segments, Treatment Types, and Replicates

Blowout Shoreline Segments	Replicates
Concrete Revetment Mats	R1, R2, R3
Fiberglass Sheetpile	V1, V2, V3
Blowout References	C1, C4
Off-Bank Shoreline Segments	**Replicates**
A-Jacks® with Cutgrass	J1, J2, J3
Fencing with Cutgrass	F1, F2, F3
Off-Bank References	C2, C3



Project Goals:

All Treatments

- Stop shoreline erosion in specified areas along the south shores of the GIWW.
- Increase elevation in shallow open water areas behind treatments.
- Evaluate the cost effectiveness of different treatments.
- Evaluate the integrity of the structures associated with treatments.

Blowout Treatments

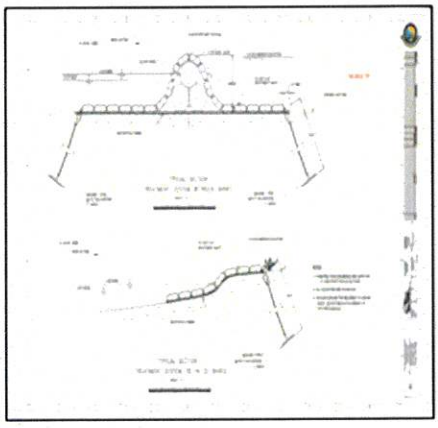
- Increase mean cover of emergent vegetation within shallow open water blowouts.
- Maintain/increase the frequency of occurrence of submerged aquatic vegetation (SAV) within shallow open water blowouts.

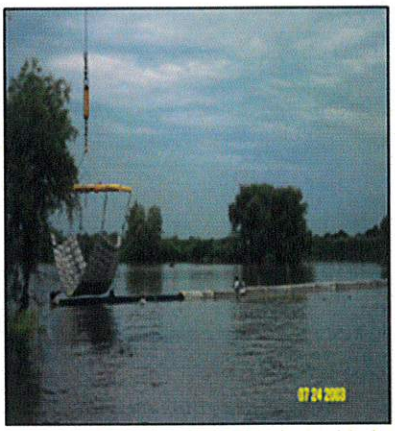
Off-Bank Treatments

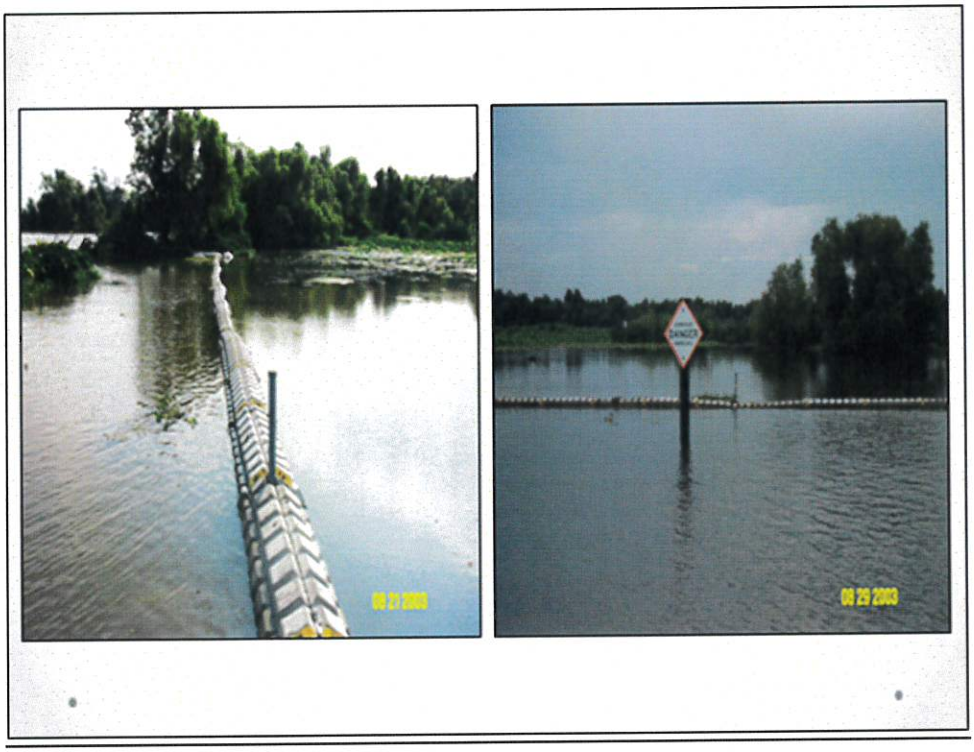
- Increase mean cover of *Z. miliacea* to 50% or greater after five growing seasons in planted areas adjacent to eroding shorelines.

Principal Project Features Constructed:

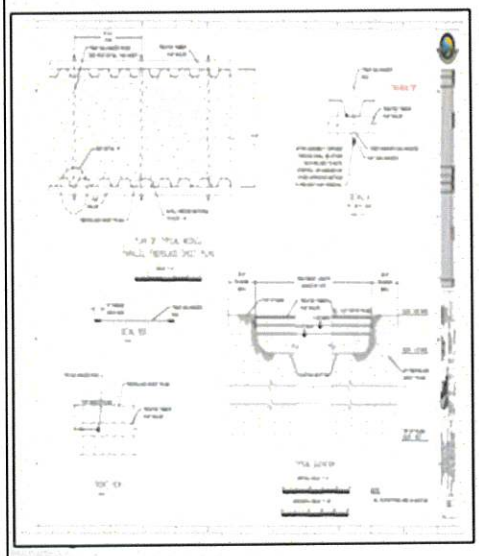
- Approximately 1,223 ft (373 m) of submerged articulated concrete revetment mats divided among three replicate blowout treatments (R1, R2, R3).

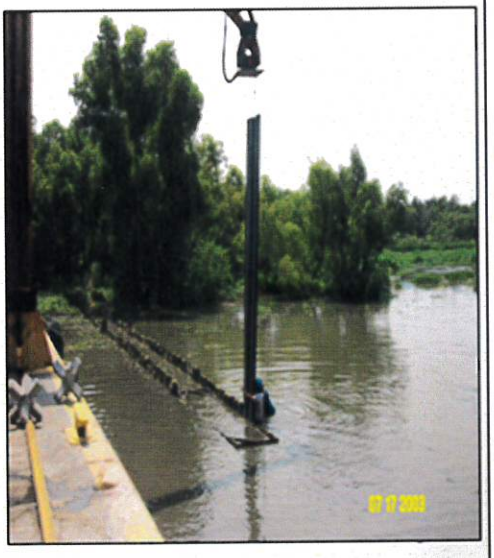




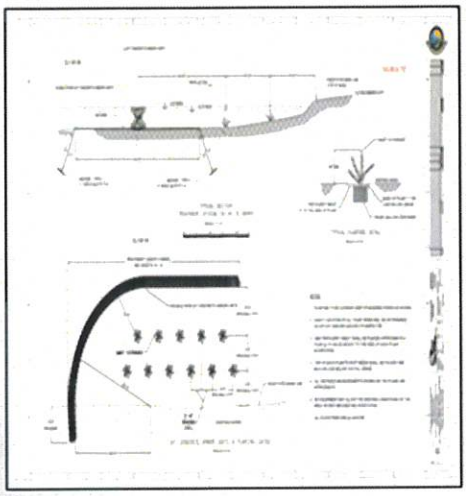


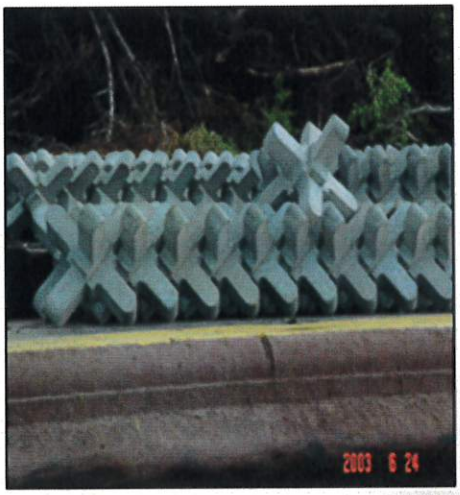
- **Approximately 1,857 ft (566 m) of parallel straight-walled fiberglass sheet pile divided among three replicate treatment blowouts (V1, V2, V3).**



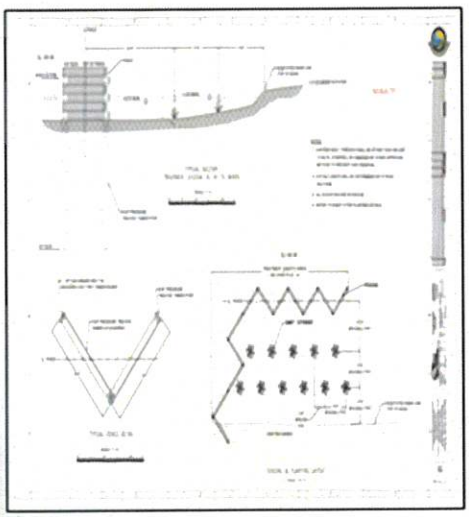


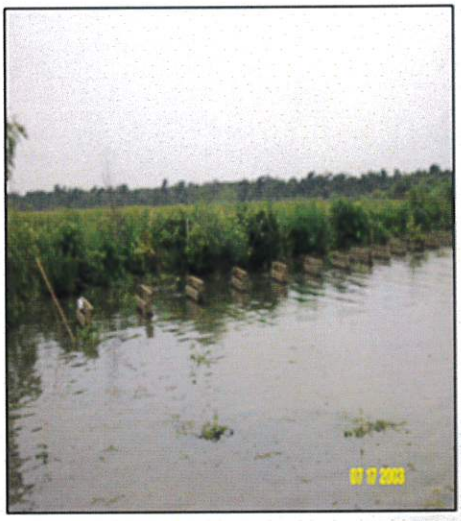
- **Approximately 1,283 ft (391 m) of 24 inch (0.61 m) high A-Jacks® concrete blocks in an interlocking double row with two staggered rows of *Zizaniopsis miliacea* (Michx.) Doell & Aschers. planted on five foot centers between it and the shoreline divided among three replicate off-bank treatments (J1, J2, J3).**





- **Approximately 1,910 ft (582 m) of staggered treated lumber fencing with two staggered rows of *Z. miliacea* planted on five foot centers between it and the shoreline divided among three replicate off-bank treatments (F1, F2, F3).**





Monitoring Variables

Shoreline Position

Shoreline surveys to determine emergent vegetated shoreline position at each elevation transect. Collected in 2003, 2005, and 2010. Determining shoreline position in a floating marsh was met with challenges.

Elevation

Bathymetric and Topographic elevation surveys along three transects per treatment and reference area. Collected in 2003, 2005, and 2010.

Vegetation

Vegetation cover and species composition data collected inside of 140 plots randomized along the same transects used in the elevation survey. Collected in the fall of 2001, 2002, 2003, and 2005.

SAV

Data collected along three randomized transects located inside treatment and reference blowouts. Collected in 2001, 2002, 2003, and 2005.

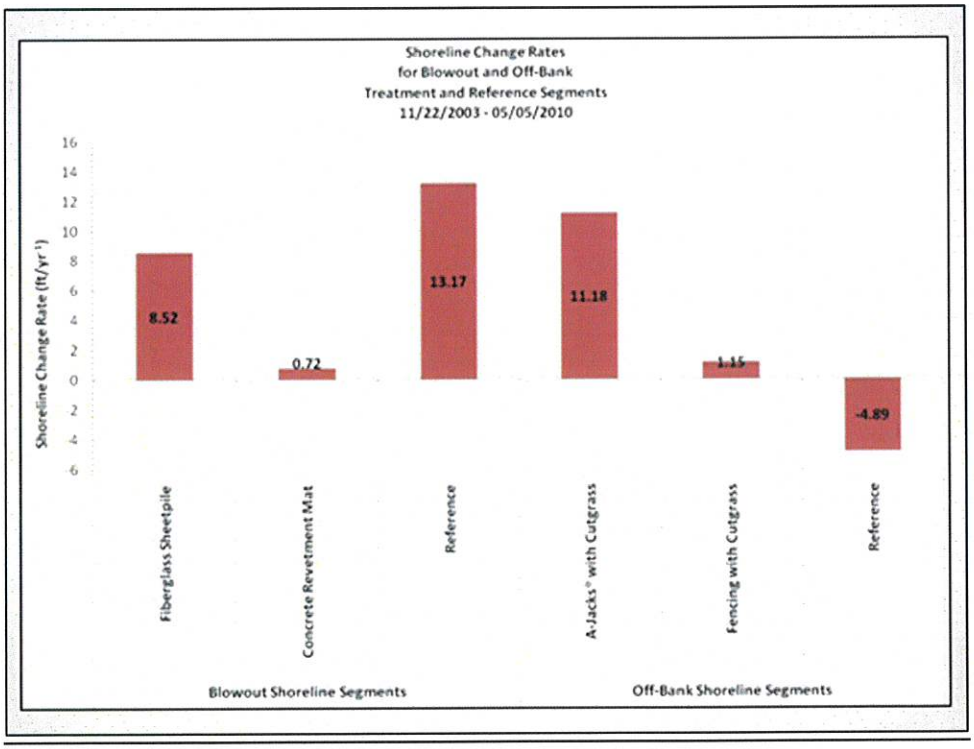
Shoreline Position Survey Results

Blowouts (V1, V2, V3, R1, R2, R3, C1, C4)

- **Statistical analysis (ANOVA) indicated that there were significant differences among the treatments.**
- **The concrete revetment mat performed poorer than the reference.**
- **The fiberglass sheetpile performed the same as the reference.**

Off-Bank (J1, J2, J3, F1, F2, F3, C2, C3)

- **Statistical analysis (ANOVA) indicated that there were significant differences among the treatments.**
- **A-Jacks® with giant cutgrass performed better than both the fencing with giant cutgrass and the reference.**
- **The fencing with giant cutgrass performed the same as the reference.**



Cost Effectiveness:

Treatments	Constructed Linear ft/m	2002 Approximate Structure Cost $/ft ($/m)	Post-Construction Shoreline Change Rate ft/yr^{-1} (m/yr^{-1})	2011 Approximate Structure Cost $/ft ($/m)
Blowout Treatments				
Concrete Revetment Mats	1,223 (373)	$298 (978)	0.72 (0.22)	535 (1755)
Fiberglass Sheetpile	1,857 (566)	$296 (971)	8.52 (2.62)	508 (1667)
Blowout References	0	0	13.17 (4.01)	0
Off-Bank Treatments				
A-Jacks®with Cutgrass	1,283 (391)	$163 (535)	11.18 (3.41)	284 (932)
Fencingwith Cutgrass	1,910 (582)	$64 (210)	1.15 (0.35)	129 (423)
Off-Bank References	0	0	-4.89 (-1.49)	0
Conventional Treatments				
Rock Dike	1,000 (305)	NA	NA	457 (1499)
Rock Dike With Lightweight Aggregate Core	1,000 (305)	NA	NA	487 (1598)

Elevation and Sedimentation Survey Results

Blowouts (V1, V2, V3, R1, R2, R3, C1, C4)

- **Statistical analysis (ANOVA) indicated that there were no significant differences among the treatments.**
- **The concrete revetment mat performed the same as the fiberglass sheetpile, and both treatment types performed the same as the reference.**

Off-Bank (J1, J2, J3, F1, F2, F3, C2, C3)

- **Statistical analysis (ANOVA) indicated that there were no significant differences among the treatments.**
- **The A-Jacks® with giant cutgrass performed the same as the fencing with giant cutgrass both treatment types performed the same as the reference.**

Elevation Survey Results

Mean Elevation Change by Treatment Type in Foreshore and Leeward Positions

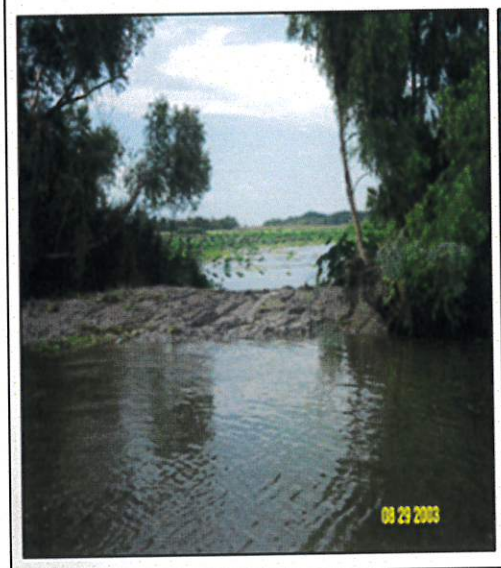
Treatment	Foreshore Elevation Change 2003-2005 ft (m)	Leeward Elevation Change 2003-2005 ft (m)	Foreshore Elevation Change 2003-2010 ft (m)	Leeward Elevation Change 2003-2010 ft (m)
Revetment Mats (R)	-0.20 (-0.06)	0.13 (0.04)	-0.40 (-0.12)	0.40 (0.12)
Fiberglass Sheet Pile (V)	0.07 (0.02)	-0.03(-0.01)	0.10 (0.03)	-0.10 (-0.03)
Reference Blowout (C)	0.10 (0.03)	0.52 (0.16)	0.75 (0.23)	1.18 (0.36)
Treated Lumber Fencing (F)	-0.20 (-0.06)	0.30 (0.09)	-0.13 (-0.04)	-0.23 (-0.07)
A-Jacks (J)	0.40 (0.12)	0.03(0.01)	0.30 (0.09)	0.00 (0.00)
Reference Off-bank (C)	0.03(0.01)	-0.26 (-0.08)	-0.13 (-0.04)	-0.40 (-0.12)

Structure Settlement

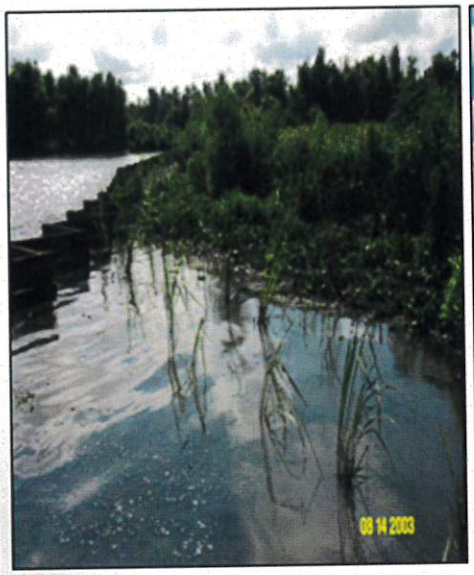
Structure	Structure Settlement 2003-2005 ft (m)	Structure Settlement 2003-2010 ft (m)	Structure Settlement Rank
Treated Lumber Fencing (F)	0.036 (0.011)	0.010 (0.003)	1
Fiberglass Sheet Pile (V)	0.007 (0.002)	-0.003 (-0.001)	2
Revetment Mats (R)	-0.118 (-0.036)	-0.417 (-0.127)	3
A-Jacks (J)	-0.725 (-0.221)	-0.866 (-0.264)	4

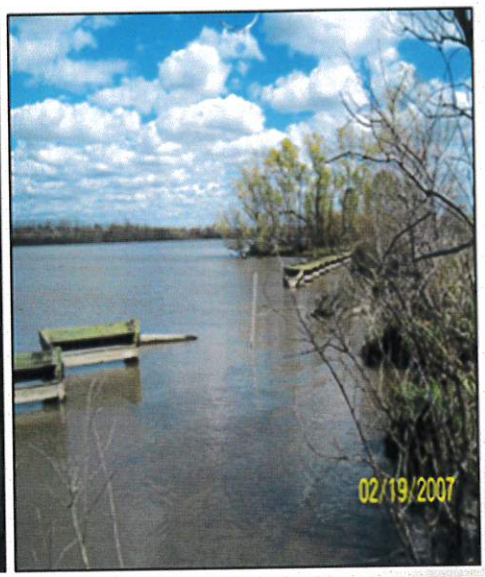
Impacts on Structure Stability:

- Earthen Plug just east of concrete revetment mat structure R1 eroded. Plugged in September 2003. 2 foot breach by October 2005 and 25 foot breach by October 2009.

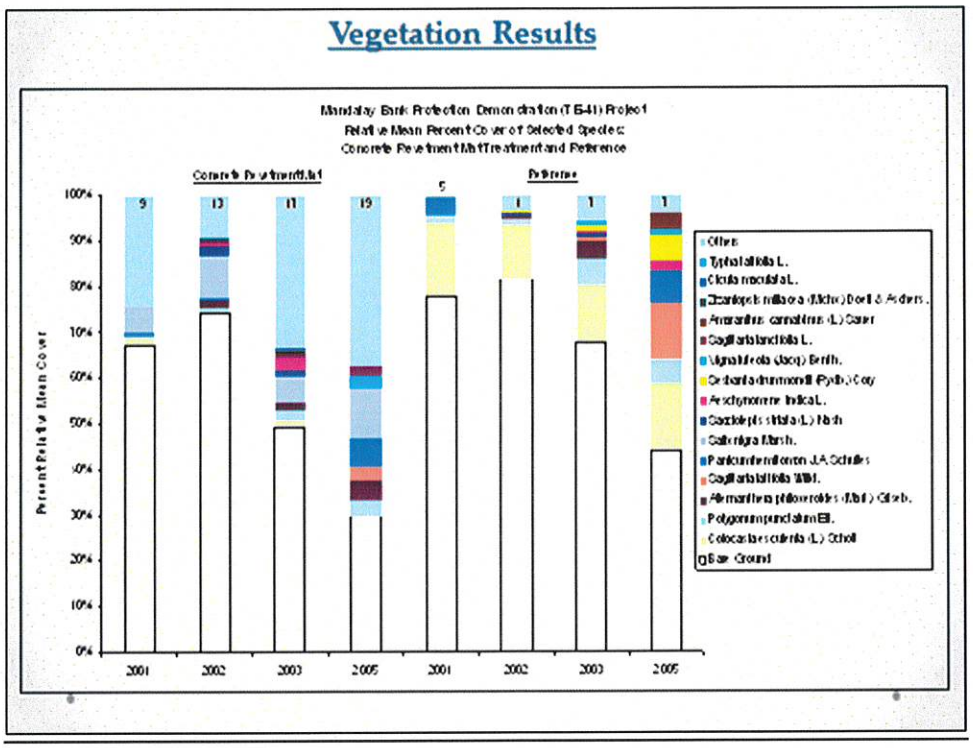


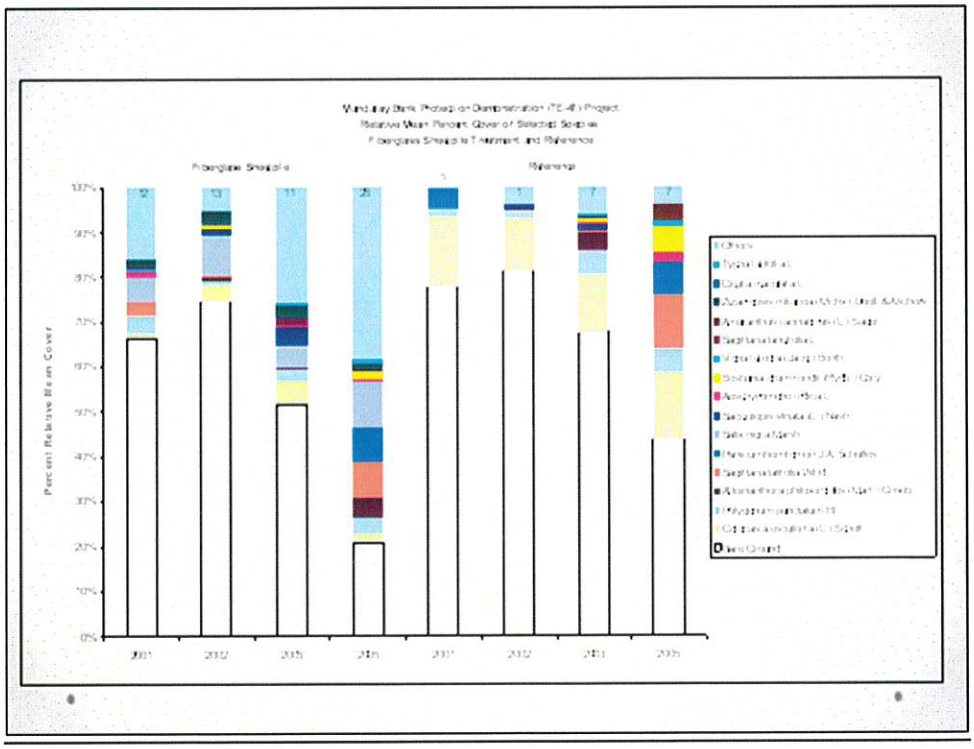
- At structure F2, several fence spans were struck by a barge prior to May 2006 and after the October 2005 Katrina/Rita inspections.

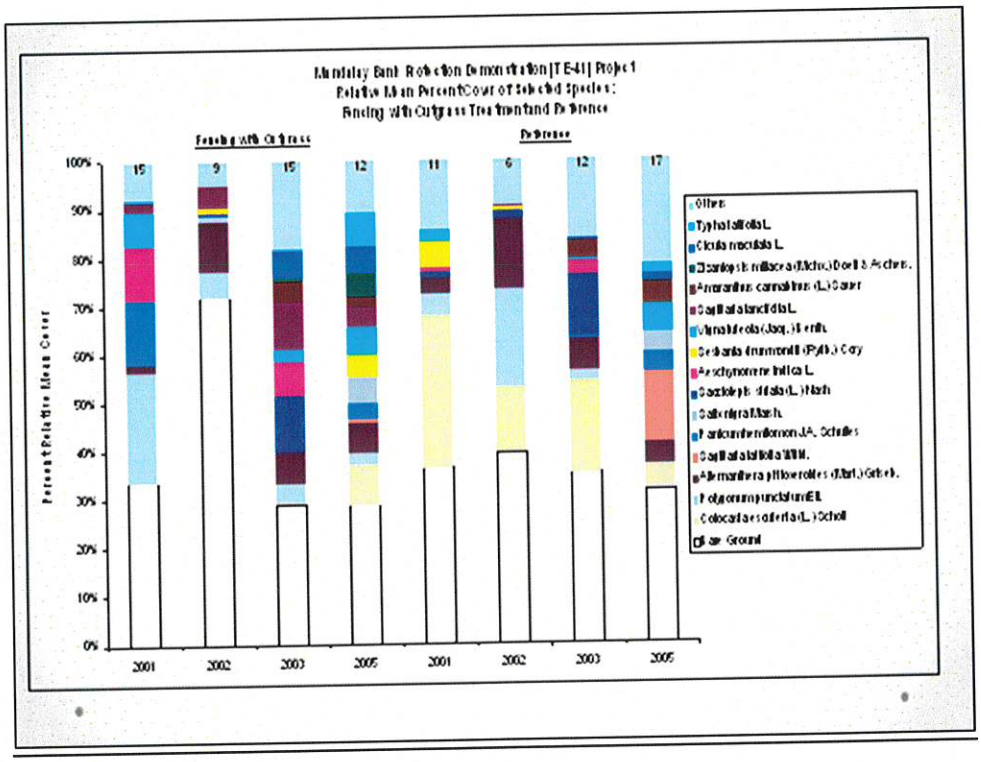


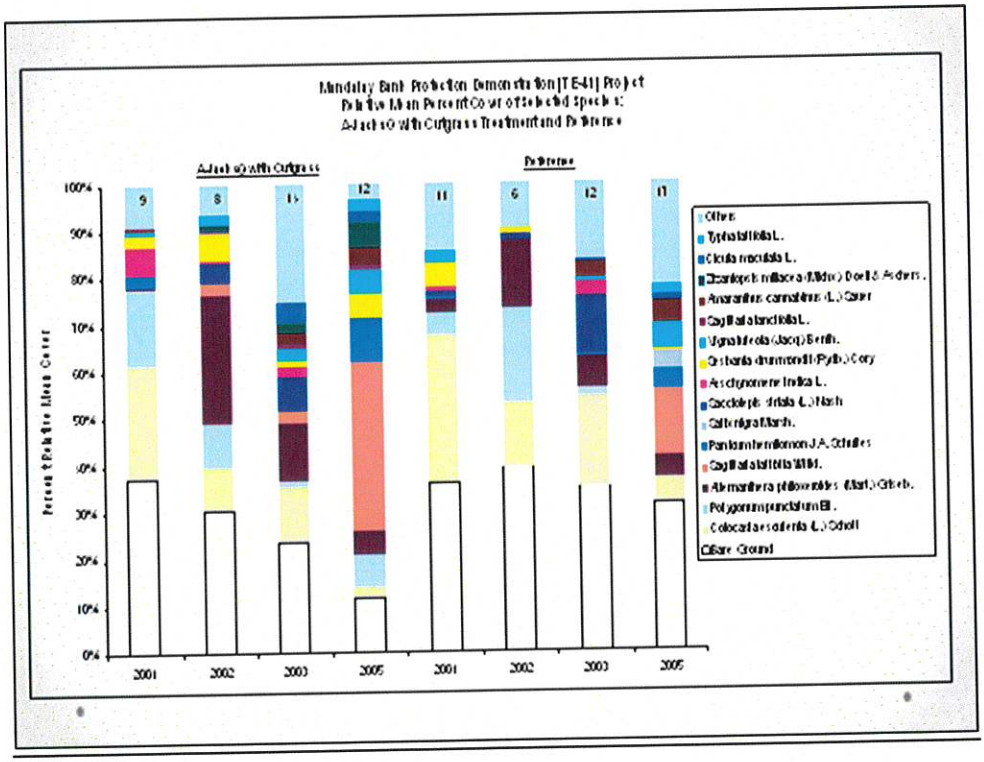


Vegetation Results






Mandalay Bank Protection Demonstration (TE-41) Project
Relative Mean Percent Cover of Selected Species:
Fencing with Cutgrass Treatment and Reference
Fencing with Cutgrass
Reference
Percent Relative Mean Cover
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
15
9
15
12
11
6
12
17
2001
2002
2003
2005
2001
2002
2003
2005
Others
Typha latifolia L.
Cicuta maculata L.
Eleocharis palustris (L.) Roem. & Schult.
Amaranthus cannabinus (L.) Sauer
Sagittaria latifolia L.
Vigna luteola (Jacq.) Benth.
Distichlis spicata (L.) Greene
Aeschynomene indica L.
Bacopa monnieri (L.) Wettst.
Salix nigra Marsh.
Panicum hemitomon J.A. Schultes
Sagittaria lancifolia Willd.
Alternanthera philoxeroides (Mart.) Griseb.
Polygonum punctatum Ell.
Colocasia esculenta (L.) Schott
Bare Ground


Mandalay Bank Protection Demonstration (TE-41) Project
Relative Mean Percent Cover of Selected Species:
Attached with Cutgrass Treatment and Reference
Attached with Cutgrass
Reference
Percent Relative Mean Cover
100%
90%
80%
60%
30%
20%
10%
0%
9
8
12
11
6
12
11
2001
2002
2003
2005
2001
2002
2003
2005
Others
Typha latifolia L.
Cicuta maculata L.
Eleocharis palustris (L.) Roem. & Schult.
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Alternanthera philoxeroides (Mart.) Griseb.
Polygonum punctatum Ell.
Colocasia esculenta (L.) Schott
Bare Ground

Mean percent (%) cover of giant cutgrass inside of established vegetation plots located behind the structures.

Fencing with Giant Cutgrass			A-Jacks with Giant Cutgrass		
Treatment	2003	2005	Treatment	2003	2005
F1	0	8.33	J1	0	53.33
F2	1.67	0.67	J2	0	5
F3	6.67	23.33	J3	0	13.33
Average	2.78	10.78	Average	0	23.89

- The A-Jacks® treatment had a higher average percent cover than the fencing.
- The monitoring goal was to achieve 50% cover by year 2008.
- Mean cover was not documented in 2008 due to monitoring funds shortfalls, therefore it could not be determined if this goal was met.

Conclusions

Shoreline Position

- *All* treatments experienced positive gains.
- The project goal of stopping shoreline erosion was met.
- Among the blowout shoreline segments the reference areas had the highest shoreline gains.
- Among the off-bank shoreline segments the A-Jacks® treatment had significantly greater shoreline gains than all other treatments.

Treatment	Rank: Shoreline Erosion	Rank: Cost Effectiveness	Cost per foot of Shoreline gain
A-Jacks® with Cutgrass	1	1	$14.58
Fiberglass Sheetpile	2	2	$34.74
Fencing with Cutgrass	3	3	$55.65
Concrete Revetment Mats	4	4	$413.89

Elevation and Sedimentation

- The goal of increasing elevation in open water areas behind treatments was not met.
- There was no statistical difference in performance between the treatments and the references for either the blowout or the off-bank treatments.

Structure Integrity

- With the exception of the F2 and R1 structures, all of the structures have maintained their stability over the 6.5 year monitoring period.
- The largest changes in structural elevations occurred with the heaviest treatments.
- The structures experiencing very little to no settlement were those driven to resistance during construction.

Vegetation

- The goal of increasing mean cover of emergent vegetation inside open water blowouts was met for all treatments.
- Species diversity and mean cover increased within the 2001-2005 time period for both off-bank and blowout treatments.
- The mean cover consistently increased behind the A-Jacks®, whereas mean cover decreased in 2002 for all other treatment types.
- The goal of increasing the mean cover of giant cutgrass to 50% or greater behind the off-bank treatments was not met by 2005.
- Cover data was not collected in 2008 for giant cutgrass.

SAV

- The goal to maintain/increase the frequency of occurrence of SAV within blowouts was inconclusive.
- Hurricanes Katrina and Rita had a substantial impact on the SAV.

Recommended Improvements

- Standardize the size and configuration of the treatments.
- Elevation surveys of shoreline protection structures should be shorter and denser.

Lessons Learned

- Sedimentation patterns along the GIWW shorelines seem to be governed by the shoreline geometry.
- Determining shoreline position in a floating marsh can be challenging.
- As-built information for the plantings was not collected.
- Pre-construction survey data is necessary.
- The structures were relatively durable.
- The blowout reference performed better or as well as the treatments.
- The A-Jacks® treatment performed the best among the off-bank types.

Q: The blowout reference area had blown out originally for a reason but now is accreting the most? Is there an explanation? There is something about the geometry of this shoreline that is trapping sediment in this area. Are there other areas this can be applied to? Is there another area that has a channel with sediment nearby?

A: Shoreline may continue to erode but the blowout area may continue to recover.

Q: Was there difficulty in accounting for shoreline due to floating marsh?

A: They relied on elevation data to tease out shoreline.

Q: How much floating marsh was there?

A: There were thick islands of floating marsh. Other areas had transition floating marshes and hyacinth mats. Characterizing vegetation is an important role.

Q: How do the A-jacks work?

A: They are stacked and water can go over and it dampens wave energy. The revetments allowed water to go over it, too.

Q: Does it slow water velocity? There is heavy traffic flow with GIWW.

A: There was settlement of the A-jacks quickly. The J1 replicate trapped sediment. Tropical storm Bill dropped sediment behind this structure. These structures sank and were barely above the substrate; it was mostly underwater. There was variability in replicates of the A-jacks. The other 2 replicates did not do as well. There is also lots of land in the J1 area.

Q: Is the project closed out? Was the structure built to last 20 years?

A: The monitoring budget did not budget enough. The transition from state employee to contractor monitoring ate up the budget. Monitoring is important in Demo projects. We should be monitoring for 5-7 years to answer questions.

Presentation by Mr. Stanley Aucoin and Mr. Tommy McGinnis

Lafayette Field Office

Cote Blanche Hydrologic Restoration (TV-04)

TV-04 Cote Blanche Hydrologic Restoration

PPL 3 Project

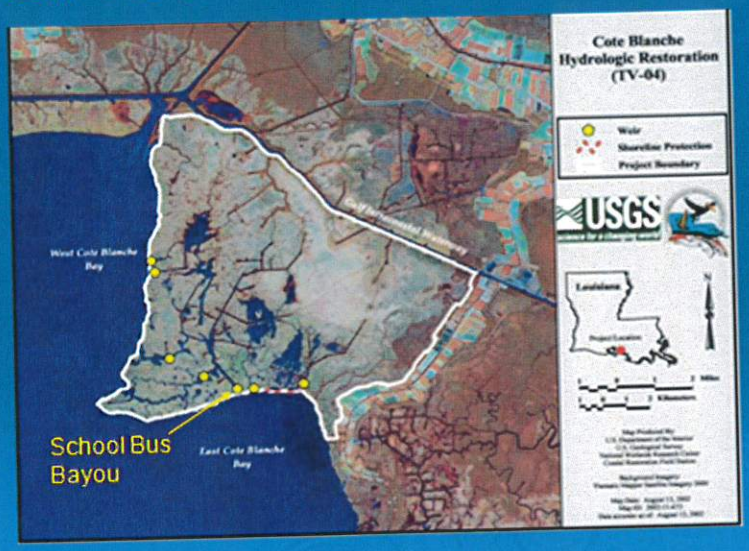
Stanley Aucoin and Tommy McGinnis
Operations – Lafayette Field Office

December 06, 2011

Historical Information

- The Cote Blanche Hydrologic Restoration project area consists of 31,637 acres of freshwater marsh in the Teche/Vermilion Basin in St. Mary Parish. The project boundaries include the GIWW to the north, Hwy 317 to the east, East Cote Blanche Bay to the south, and West Cote Blanche Bay to the west.
- Land loss in the area has been caused by several factors including subsidence, shoreline erosion, and rapid tidal fluctuations.
- Project goals were to create a lower energy environment by reducing the larger openings that penetrate fragile interior marsh and act as direct conduits for increased tidal influences and provide shoreline protection in the most critical areas.
- Initial construction was completed in 1999. Maintenance events were completed in 2001, 2005, & 2007 with another one to be completed in early 2012.

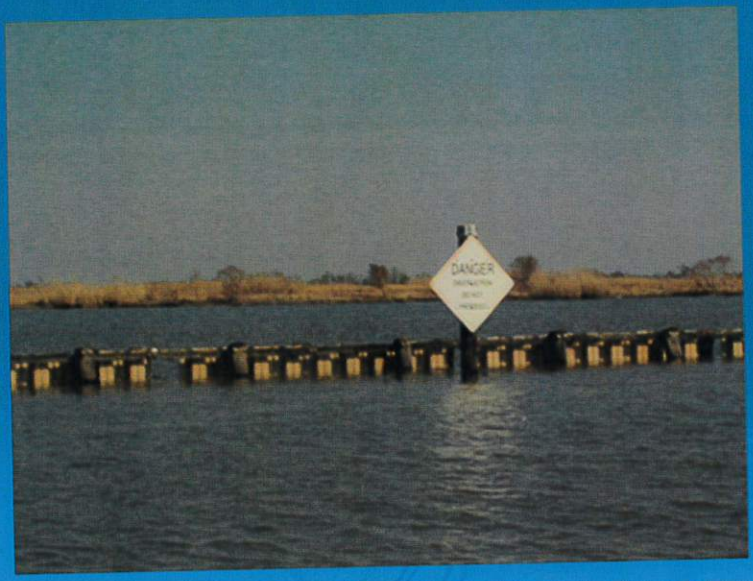
Plan View of TV-04 Cote Blanche



Initial Construction Details

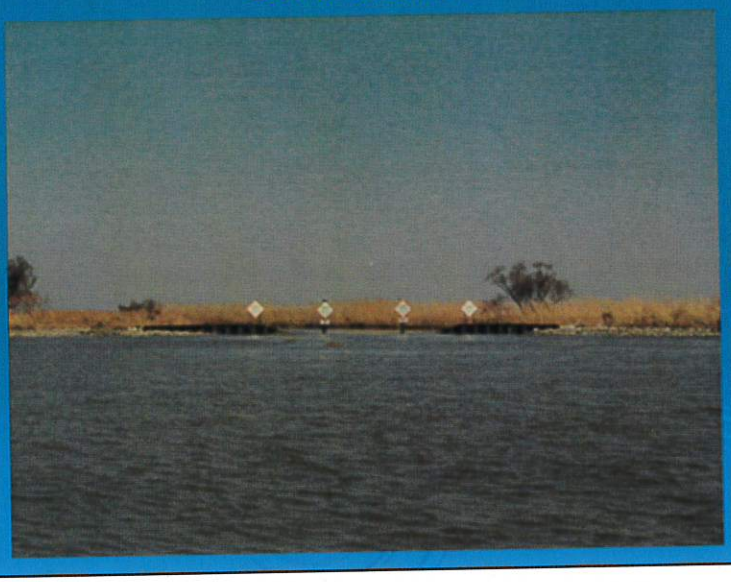
- The project was completed in January 1999 at a constructed cost of $3,875,018.
- The project consisted of low level weirs at Mud Bayou, Humble-F Canal, Bayou Long, Bayou Carlin, Humble Canal, Jackson Bayou and British American Canal. Approximately 3,500 L.F. of PVC shoreline protection was constructed along the southern boundary.
- Problems with the design of the PVC wall became apparent early on during construction. A change order was issued correcting the issues.

PVC Wall



PVC Wall

Ground view of typical TV-04 structure



Aerial view of Humble Canal structure

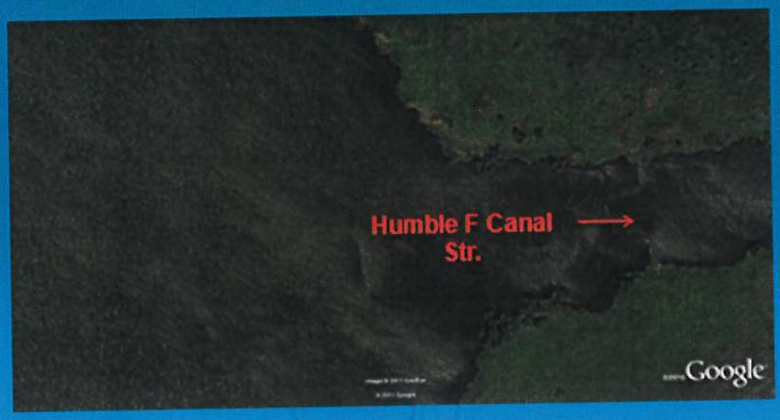
Bank Scouring

2001 Maintenance Event Details
(work consisted of)

- Placing 12-14" paving stone around the wingwalls of the weir at:

2001 Maintenance Event Details
(work consisted of)

- Placing 12-14" paving stone around the wingwalls of the weir at:



2001 Maintenance Event Details
(work consisted of)

- Placing 12-14" paving stone around the wingwalls of the weir at:

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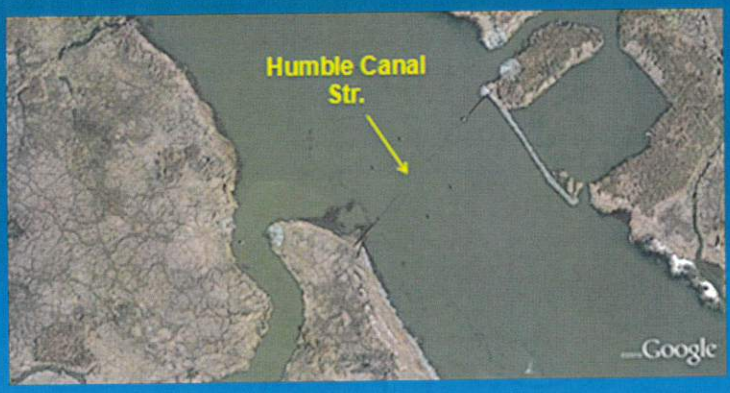
- Placing 12-14" paving stone around the wingwalls of the weir at:

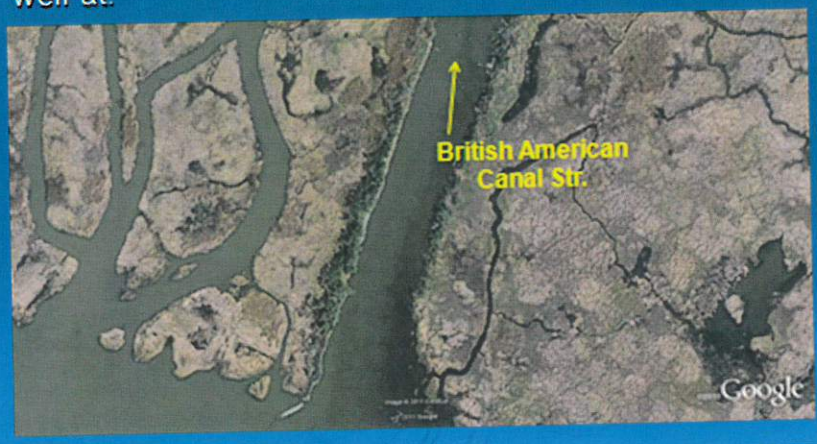


2001 Maintenance Event Details
(work consisted of)

- Placing 12-14" paving stone around the wingwalls of the weir at:

2001 Maintenance Event Details
(work consisted of)

- Placing 12-14" paving stone around the wingwalls of the weir at:

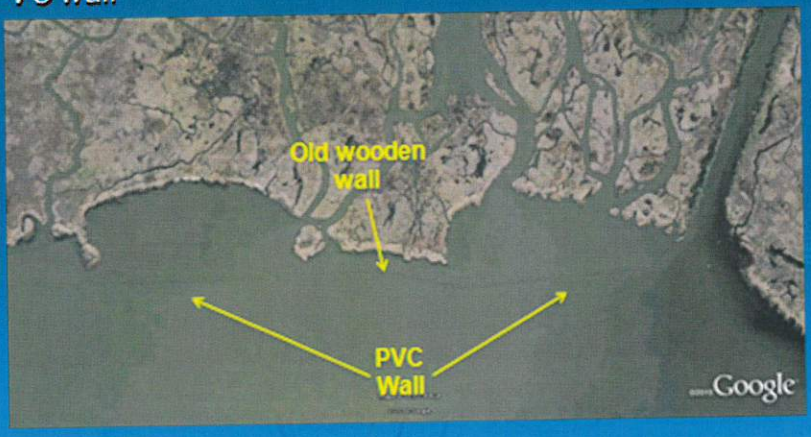


2001 Maintenance Event Details
(work consisted of)

- Construction of a revetment/foreshore dike along the western bank of British American Canal

2001 Maintenance Event Details
(work consisted of)

- Replacement of approximately 100 pile caps along the PVC wall

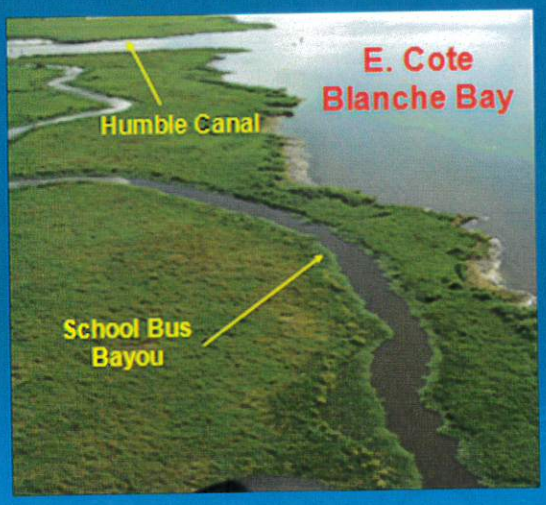


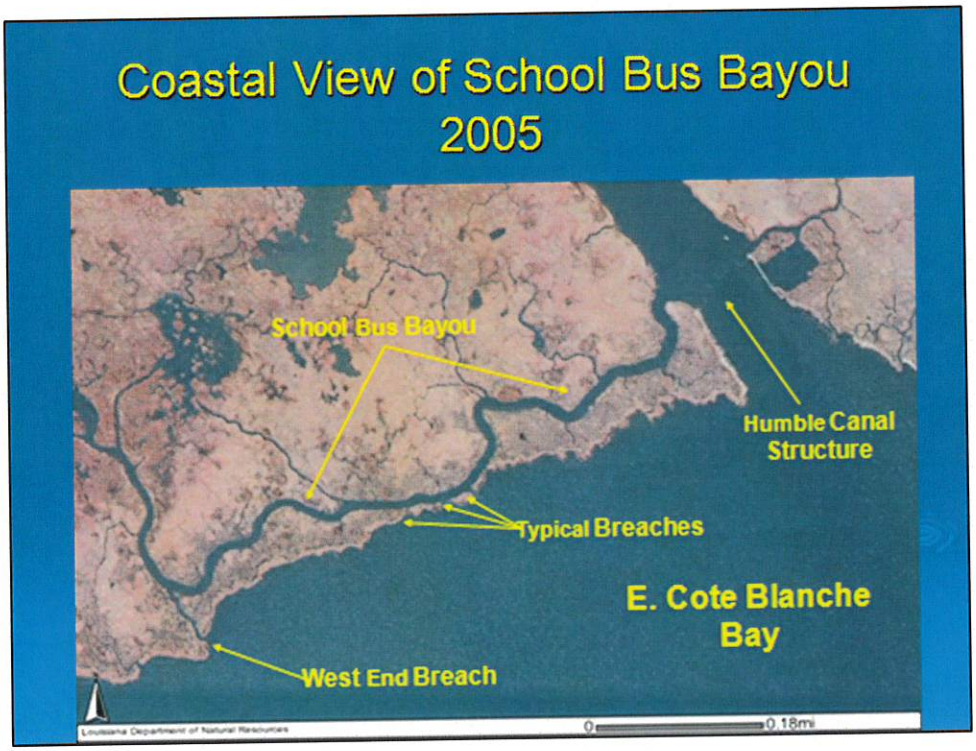
Aerial view of repairs

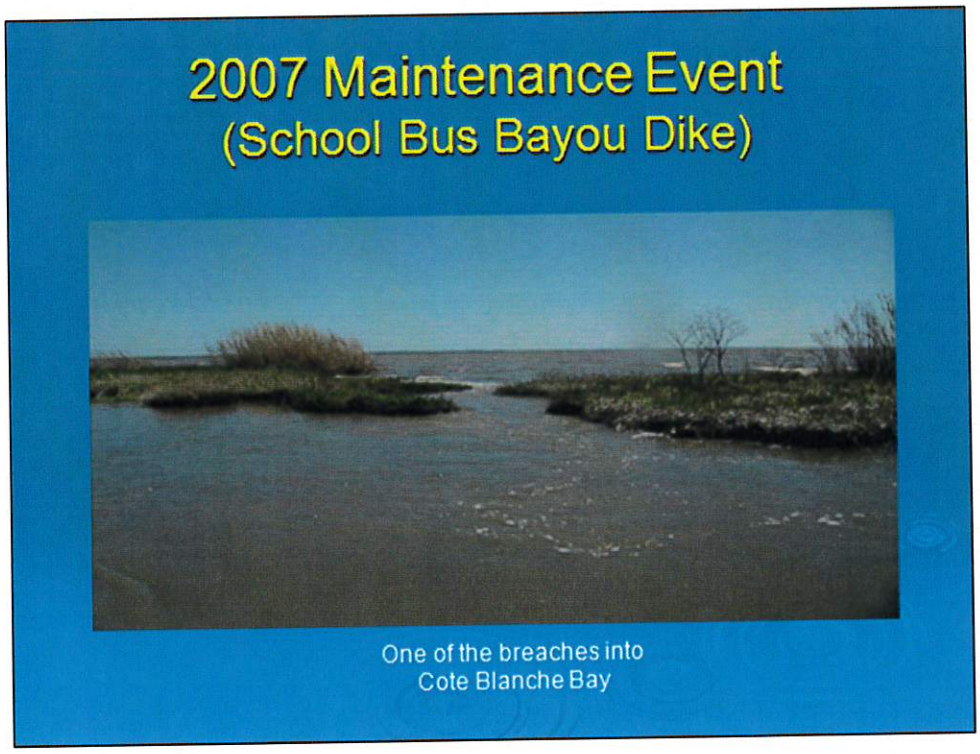
2005 Maintenance Event Details
(work consisted of)

- Maintenance was required due to the effects of Hurricane Lili and consisted of:
  - Replacement/relocation of USCG signs, warning signs, and channel markers from timber piles to structures
  - Rock repair at six of the weirs
  - The costs associated with this event were reimbursed by FEMA

Aerial View of School Bus Bayou September 2001




Coastal View of School Bus Bayou
2005
School Bus Bayou
Humble Canal
Structure
Typical Breaches
E. Cote Blanche
Bay
West End Breach
0
0.18mi


2007 Maintenance Event
(School Bus Bayou Dike)
One of the breaches into
Cote Blanche Bay

2007 Maintenance Event Details
(For School Bus Bayou Dike)

- Work consisted of installing a foreshore dike approximately 3,300 LF in length along the northern shore of Cote Blanche Bay in front of School Bus Bayou.
- Construction of two low level rock weirs at the intersection of School Bus Bayou and Humble Canal.
- Installation of warning signs.
- Work was completed in Sep. 2007.

2007 Maintenance Event
(Schoolbus Bayou Dike)

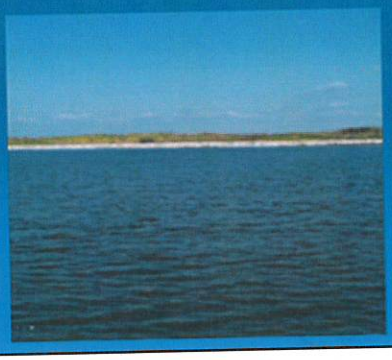
Digging access—spoil being placed on the landward side of the dike to be constructed

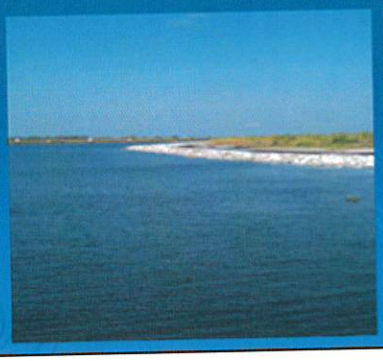
Constructed dike with what's left of the spoil behind it. Dike has already begun to settle which was expected.

2011 Maintenance Event
(School Bus Bayou Dike)

Event consisted of raising the School Bus dike back to original constructed elevation, extending the rock dike on the eastern bank of Humble Canal, replacing rock at the intersection of School Bus Bayou and Humble Canal, and replacing various signs and posts.

Construction is ongoing with the completion date set for mid January.





TV-04 Monitoring

Monitoring Elements

Water-level Variability:
Calculate water-level ranges to quantify changes in water-level variability.

Shoreline Erosion:
Map shorelines over time to compare change rates over time among shoreline reaches with and without protection.

Marsh Loss:
Calculate land loss rates from Land to Water analyses since project construction to compare to historical and regional rates.

TV-04 Monitoring Water-Level Variability

Goal is to quantify the change in the water-level fluctuations within the project area.

Different Sonde Sets
TV-04 Sondes (1997 - 2004)
- 2 Project Sondes
- 1 Reference Sonde

CRMS Sondes (2006 - 2010)
- 2 Project Sondes
- Collective of Reference Sondes (3)

Calculated a daily water-level range for each sonde:

WL Range = Max WL – Min WL

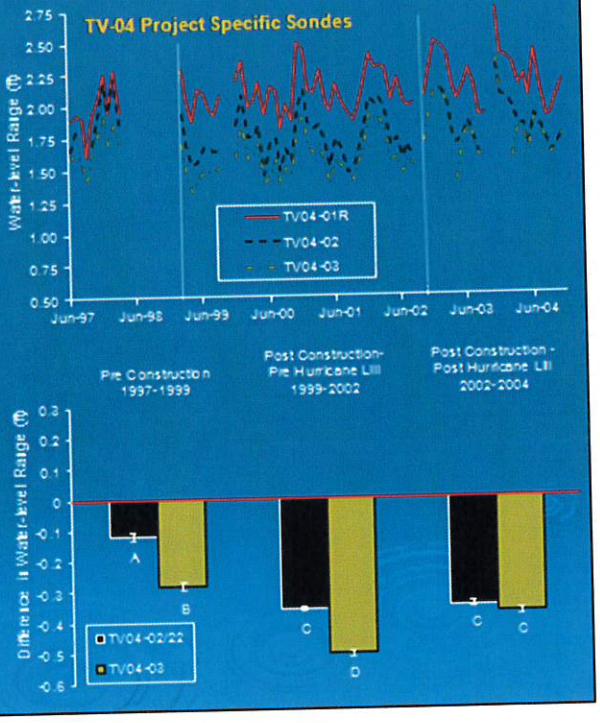
TV-04 Monitoring Water-Level Variability

Ranges were closer together during pre construction than post construction.

The difference in water-level ranges between project and reference sondes on a daily basis:

$$Diff = Proj_i - Ref$$

Relative to the reference, water-level range decreased at the project sondes after project construction.

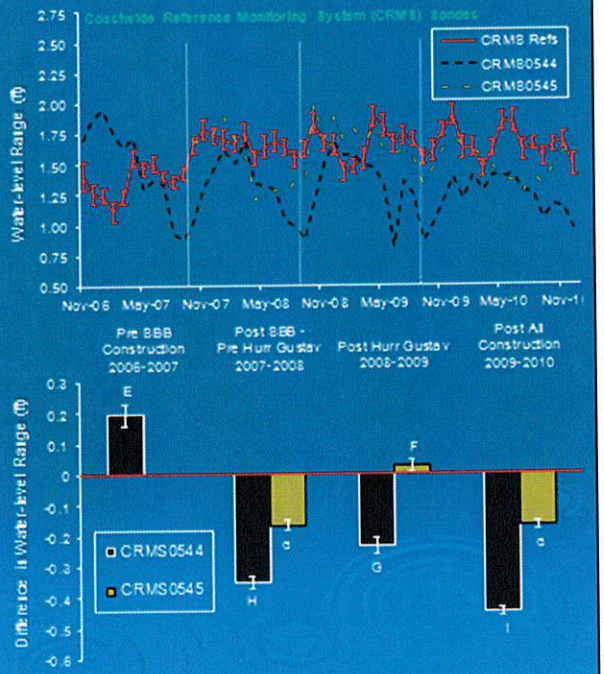


TV-04 Monitoring
Water-Level Variability

The reference sondes surround the project area and are not in the bays.

Water-level variability decreased substantially at Humble Canal sonde (CRMS0544) after the SBB structures were installed.

The hydrology at Humble B Canal and Mud Bayou sonde (CRMS0545) is also connected to a smaller bayou that reaches WCBB.



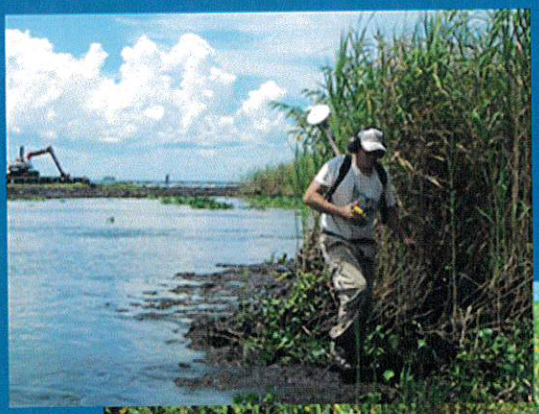
TV-04 Monitoring
Shoreline Change

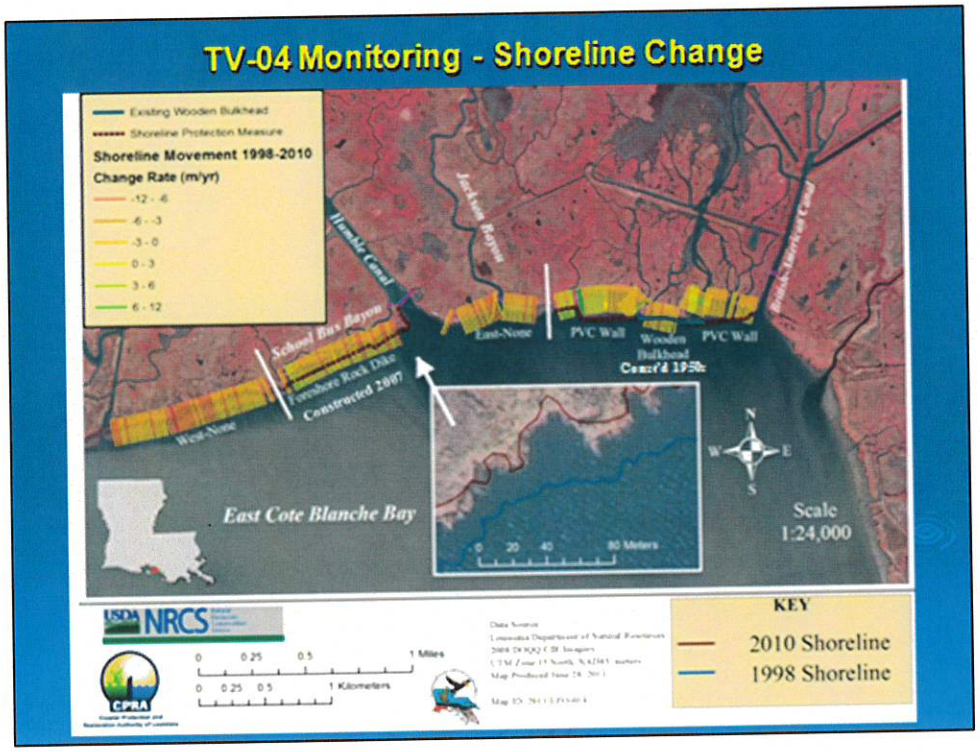
Mapped vegetated shoreline along ECBB using a differential GPS.

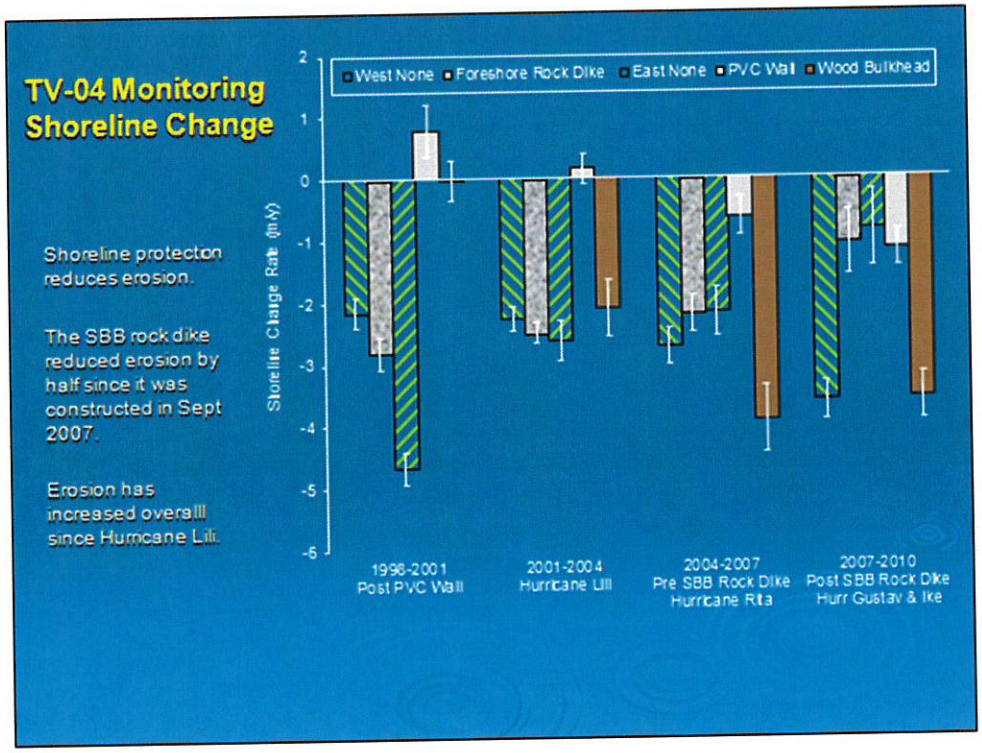
Pre construction: 1998

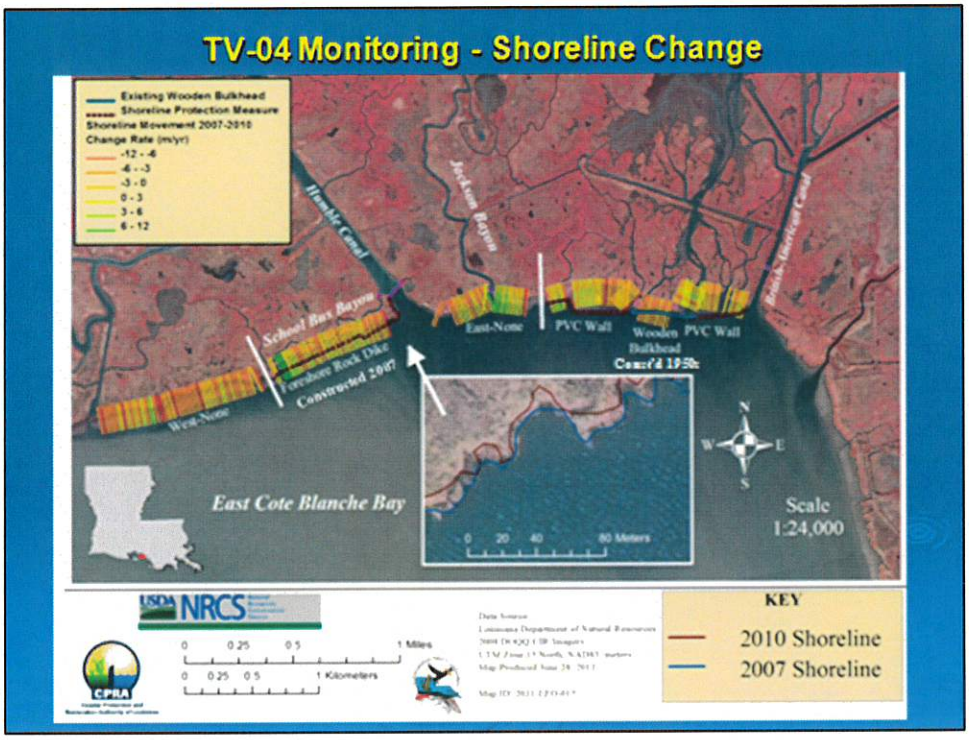
Post Construction:
2001, 2004, 2007, 2010

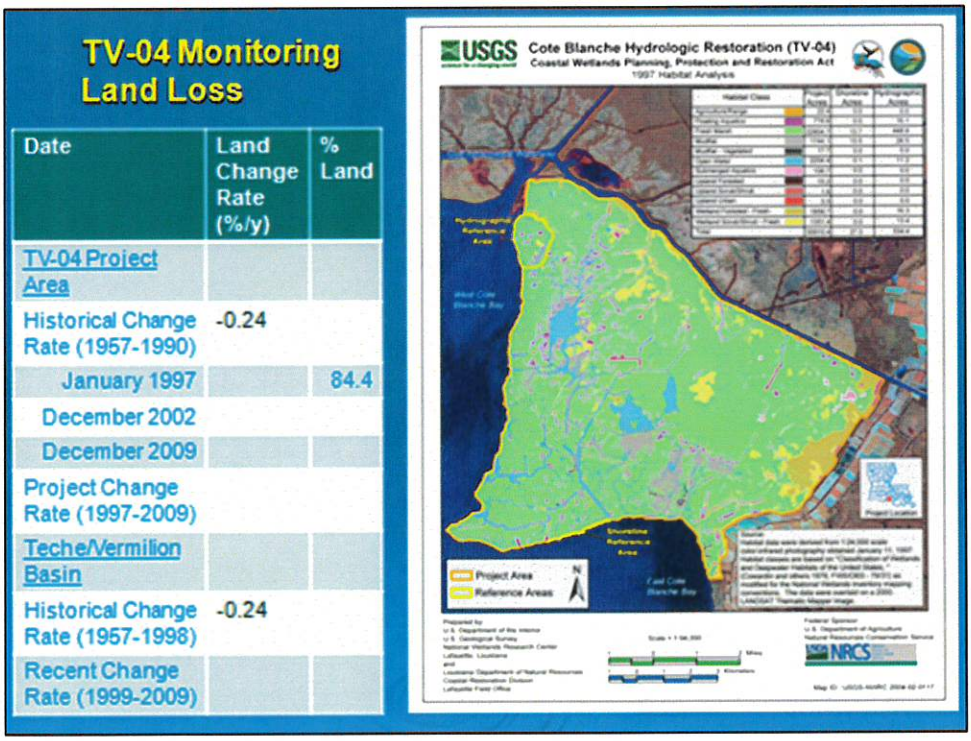
Planned:
2013, 2016




TV-04 Monitoring - Shoreline Change
Existing Wooden Bulkhead
Shoreline Protection Measure
Shoreline Movement 1998-2010
Change Rate (m/yr)
-12 - -6
-6 - -3
-3 - 0
0 - 3
3 - 6
6 - 12
Humble Canal
Jackson Bayou
Bayou Sauvage Canal
School Bus Bayou
Foreshore Rock Dike
Constructed 2007
West-None
East-None
PVC Wall
Wooden Bulkhead
Const'd 1950s
PVC Wall
East Cote Blanche Bay
N
W
E
S
Scale
1:24,000
0 20 40 80 Meters
USDA NRCS
0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers
CPRA
KEY
2010 Shoreline
1998 Shoreline

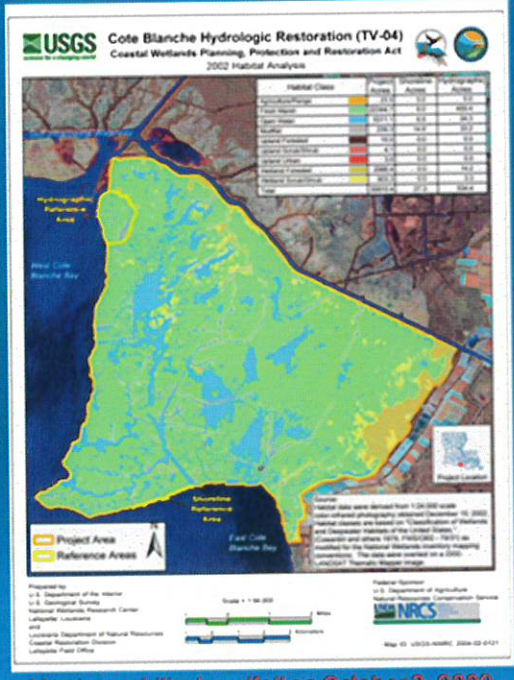

TV-04 Monitoring
Shoreline Change
Shoreline protecton reduces erosion.
The SBB rock dike reduced erosion by half since it was constructed in Sept 2007.
Erosion has increased overall since Hurricane Lili.
West None
Foreshore Rock Dike
East None
PVC Wall
Wood Bulkhead
Shoreline Change Rate (m/y)
2
1
0
-1
-2
-3
-4
-5
-6
1998-2001
Post PVC Wall
2001-2004
Hurricane Lili
2004-2007
Pre SBB Rock Dike
Hurricane Rita
2007-2010
Post SBB Rock Dike
Hurr Gustav & Ike


TV-04 Monitoring - Shoreline Change
Existing Wooden Bulkhead
Shoreline Protection Measure
Shoreline Movement 2007-2010
Change Rate (m/yr)
-12 - -6
-6 - -3
-3 - 0
0 - 3
3 - 6
6 - 12
Humble Canal
Jackson Bayou
Petit's Harbor Canal
School Bus Bayou
Foreshore Rock Dike
Constructed 2007
West-None
East-None
PVC Wall
Wooden Bulkhead
PVC Wall
Const'd 1950s
East Cote Blanche Bay
N
W
E
S
Scale
1:24,000
0 20 40 80 Meters
USDA NRCS
0 0.25 0.5 1 Miles
0 0.25 0.5 1 Kilometers
CPRA
KEY
2010 Shoreline
2007 Shoreline


TV-04 Monitoring
Land Loss
Date
Land Change Rate (%/y)
% Land
TV-04 Project Area
Historical Change Rate (1957-1990)
-0.24
January 1997
84.4
December 2002
December 2009
Project Change Rate (1997-2009)
Teche/Vermilion Basin
Historical Change Rate (1957-1998)
-0.24
Recent Change Rate (1999-2009)
USGS
Cote Blanche Hydrologic Restoration (TV-04)
Coastal Wetlands Planning, Protection and Restoration Act
1997 Habitat Analysis
Project Area
Reference Areas
NRCS

TV-04 Monitoring Land Loss

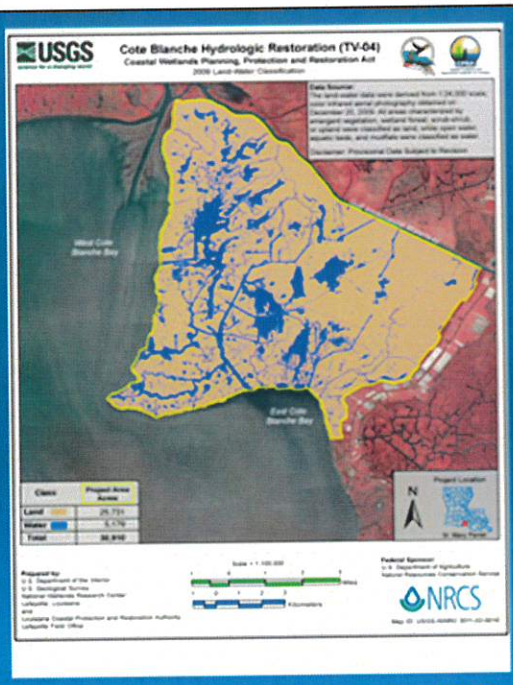
Date	Land Change Rate (%/y)	% Land
TV-04 Project Area		
Historical Change Rate (1957-1990)	-0.24	
January 1997		84.4
December 2002		82.0
December 2009		
Project Change Rate (1997-2009)		
Teche/Vermilion Basin		
Historical Change Rate (1957-1998)	-0.24	
Recent Change Rate (1999-2009)		



Hurricane Lili - Landfall on October 3, 2002

TV-04 Monitoring Land Loss

Date	Land Change Rate (%/y)	% Land
TV-04 Project Area		
Historical Change Rate (1957-1990)	-0.24	
January 1997		84.4
December 2002		82.0
December 2009		83.2
Project Change Rate (1997-2009)	-0.08	
Teche/Vermilion Basin		
Historical Change Rate (1957-1998)	-0.24	
Recent Change Rate (1999-2009)	-0.40	



Final Scheduled Aerial Photography - 2015

TV-04 Conclusions – Project Effectiveness

Cote Blanche Hydrologic Restoration (TV-04) project has been achieving the specific goals of decreasing water-level variability, shoreline erosion, and the rate of marsh loss.

- The low-level weirs are decreasing water-level variability within the TV-04 area when surrounding conditions are within the design specification such as being free from hurricanes and water not bypassing around the weirs.
- Shoreline protection measures have significantly reduced erosion relative to unprotected shorelines.
- The rate of marsh loss has decreased by two-thirds in the TV-04 project area since construction relative to the historical (1957-1990) land-loss rate.

Reducing the cross section of large pipeline canal and bayou openings decreases daily hydraulic energy which reduces daily export of vulnerable organic soils and allows the marsh interior to recuperate following storm-surge disturbances.

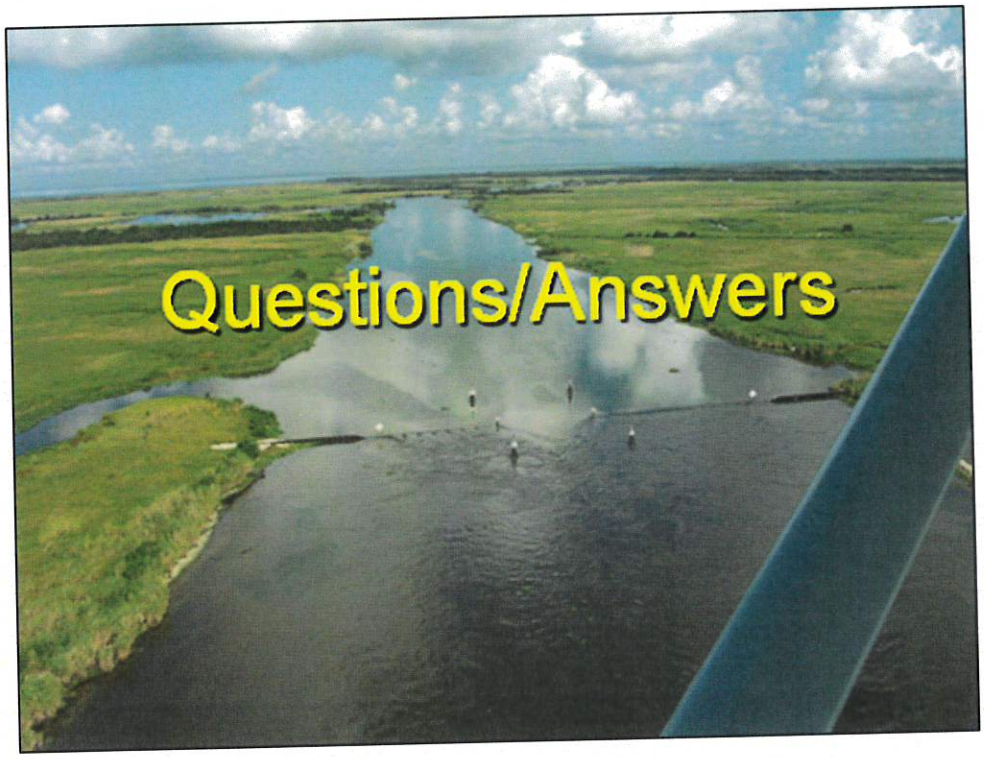
TV-04 Conclusions

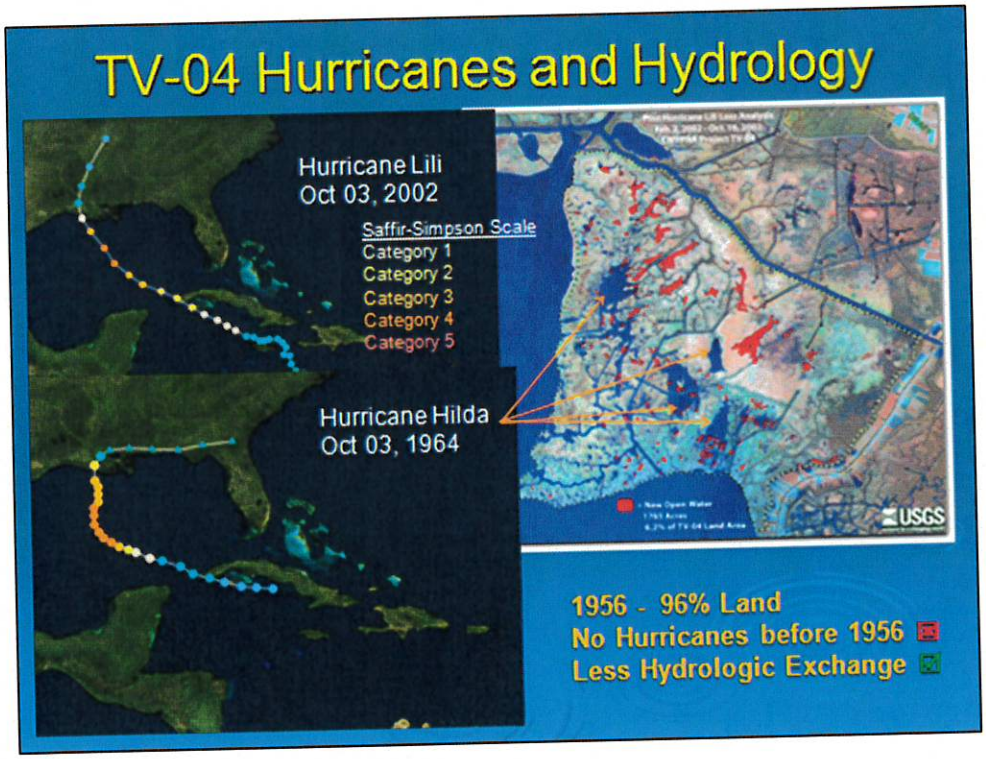
Recommendations

- Increase O&M cost estimates during project planning to account for dynamic conditions and projects with multiple structures.
- Land-to-Water Change Analyses would be beneficial for displaying where land gains and losses are occurring within the project area.

Lessons Learned

- PVC walls, designed properly, provide shoreline protection but are difficult to maintain.
- Marsh areas around structures should be paved with large rock at an elevation that will allow significant tidal events to pass around the structure without scouring the bank.
- The rock dike at School Bus Bayou still reduced erosion relative to unprotected shoreline reaches although it settled to below design specifications.


Questions/Answers


TV-04 Hurricanes and Hydrology
Hurricane Lili
Oct 03, 2002
Saffir-Simpson Scale
Category 1
Category 2
Category 3
Category 4
Category 5
Hurricane Hilda
Oct 03, 1964
USGS
1956 - 96% Land
No Hurricanes before 1956
Less Hydrologic Exchange

Q: I was involved in the preceding project. We put down shell and it didn't last. There is a huge problem with scouring from tidal exchange. Is the project more effective now? Was it an under designed project?

A: The maintenance of the School Bus Bayou dike: rocks were too small at the end of the structures. They were not tied to the bank. What is there now seems to be working. The PVC wall was built based on the soil composition and was under-designed. They had doubled the size and this has held up well. Some spots have blown out and this would be hard to repair.

Q: Habitat analysis was done?

A. The eastern side of the project is swamp forest and expanding out to marsh. So this area is getting better. Habitat type change analysis would be interesting.

Q: Need additional indicators of what's going on in this area?

A: It's a different area now: in the 1940's it was brackish marsh, now with the GIWW, it is fresher. You can see the succession of habitat. Shrub-scrub area is open water now due to the 1964 hurricane.

There is no reference area with this project. There was originally one chosen but it was in the project boundary. The rest of the basin was used as a reference for land loss. There wasn't much choice in choosing a reference site in this area.

Maintenance events included asking for additional funding for School Bus Bayou. The smaller repairs had used up the money already.

The habitat map should be able to be converted to a land: water map. That shouldn't be hard. USGS could do this.

Overview of Remaining 2011 OM&M Reports and Discussion

Dona Weifenbach

Q: What can OM&M give to planners to help out with new projects?

A: Recurrent themes on shoreline protection: Some project conclusions are that we need more accurate geotechnical data prior to construction.

Q: Is that still a problem now?

A: The evolution on collecting geotechnical data has been made on a project by project basis.

Q: Is pre-project work done? Surveys should be added to the list as part of the construction contract?

A1: The timing of the money does not work out sometimes.

A2. NOAA is starting to put money in pre-construction monitoring, mostly for WVA calculations. There was geotechnical data taken in Lake Borgne. It still did not help in the building of the shoreline protection. They like to sink.

Q: We are soliciting needs from project managers. We would like to know the uncertainties of projects so that we can help answer your questions. At one time, doing less geotechnical data was the answer. On projects that have unexpected results, are there data that can educate us about the problems?

A: More geotechnical data would not have helped us in Lake Borgne.

A2: Historic tributary channels are known to cause weak spots. If these areas are known, we can test to see where weak spots are. In Mandalay, highly organic soils are compressible. Some areas are worse than others. There was also a short shoreline.

A3: It's hard to know where the weak spots are in certain areas. You will see this in all areas, really. We should just plan for it to sink. Some level of geotechnical data is needed for the preliminary design. Extensive geotechnical data is not worth it. Contingencies should be added for sinking.

Q: There are site specific conditions. Does the state have minimum standards for design or monitoring of projects?

A: No set protocol because there are lots of funding sources. State funded projects have no OM&M and federal levee projects have local sponsor monitoring.

Q: LACES can help extract information that can be used for planning and design. Some projects will have no OM&M report. There are CWPPRA standards from OM&M. Do we need a policy level position? What reports need to be written, if not required?

A1: There is data collection going on that is not the state's. This data should all be in a database system.

A2: Procite is integrated with internal documents. We do need to centralize data collection to one spot using sonris.

Q: Geotechnical data-is this being kept somewhere else?

A: The information is accessible but it is not conspicuous that it is there. We need to make people aware of what is available. We need to exchange institutional knowledge. We could use the LACES newsletter to disseminate information. We wouldn't know what's going on for data collection in other divisions.

Q: What do we want to communicate? Should we use a fact sheet or acquire more in depth knowledge that would require a meeting or other verbal communication?

A1: We could use a LACES website so people can search for the latest information. Keeping a website current is a challenge. For BA-39, there already was good communication between offices. There are internal discussions, blogs, chat rooms, and issues section in @task that can be used. The new people do not have the contacts as more senior folks have.

A2: Organization charts would be helpful. A document referencing system where you bring up a sonris map to see an area and all the data and milestone documents are displayed for that area. Also, have a lessons learned document as well. Make all the documents available in one spot.

A3: Lessons learned documents are important. We should include old lessons learned because we need to keep this information around to inform new folks of past decisions.

A4: Adaptive management section should be added to reports. What is the history of the project? Create bulleted points on how it was applied. Keep it institutionalized.

A5: There is pressure to use funds efficiently and how we are learning what we are doing.

Q: Is there a design guide for E&D staff for each project type? Does it contain guidance on what methods should be done and standards of practice?

A: LACES is involved and slowly working towards a document like this. The marsh creation process will lead into this document. It will have protocols listing why things are done a certain way. USACE have guidance for project design.

Q: What can we provide for operations to better evaluate projects?

A: There are problems with evaluating project success. One project was built into a second project. Sometimes it is hard to tease out if each individual project is meeting its goals.

Q: How can we tease out results from neighboring projects and natural variability? Naomi Outfall project: it's hard to tease out effects between the weirs, Davis Pond, and Barataria Waterway.

A: CRMS is supposed to help with this. CRMS site report cards will be out soon in Feb. showing basin-wide indices or parameters and looking at trends. We are now starting to see effects from our early projects. CRMS is helping to see large scale effects.

Discussion:

We need preconstruction data. One year pre-construction data may not be enough. The data will be skewed if we have a drought or flood year. It is hard to get baseline data.

There is usually extra monitoring added on even with CRMS sites available. Different agencies do different things. OM&M merged with project specific monitoring. There are different funding categories.

For OM&M funds, Operations meet with federal agencies and explains results, requests funding for monitoring, reviews what was spent and what is needed.

Sometimes monitoring is covered by CRMS. We should have money for a standard monitoring protocol set aside at phase 0 planning to help with budget. CRMS data does not cover shoreline protection, marsh creation, and demo projects. We still need project specific data, even with CRMS. Some projects are too small and do not include a CRMS site but should also locally monitor for adaptive management reasons. External data sources should be used, such as USGS. Engineering group has success and knows where to get this data.

CWPPRA has annual inspection of their projects. They look at project features not just project structures. They will look at marsh creation, etc.

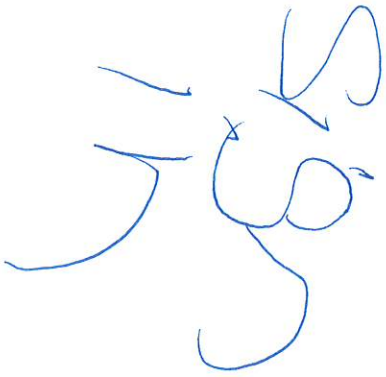
End of Discussion/Adjournment

Appendices

1. List of Attendees
2. Project Fact Sheets
3. OM&M Report Summary Spreadsheet
4. Document Reference System Instructions
5. CRMS Data Access Instructions

List of Attendees

Attendee List –OM&M Workshop December 6, 2011



1. Dewey Billodeau
2. Laurie Rodrigue
3. Mark Mouledous
4. Melvin Guidry
5. Shane Triche
6. Stanley Aucoin
7. Todd Folse
8. Todd Hubbell
9. Tommy McGinnis
10. Catherine Schexnider
11. Christine Daigle
12. Danielle Richardi
13. Darin Lee
14. Dion Broussard
15. Elaine Lear
16. Garrett Broussard
17. Mike Miller
18. Troy Barrilleaux
19. Billy Wall
20. Kristi Cantu
21. Thomas Bernard
22. Rudy Simoneaux
23. Russ Joffrion
24. Brady Carter
25. Brian Babin
26. Bryan Gossman
27. David Burkholder
28. Glen Curole
29. Dona Weifenbach
30. Cynthia Arnold

31. Carol Parsons Richards
32. Charles Killebrew
33. Christopher Robertson
34. Peter Hopkins
35. Tommy McGinnis
36. Rick Dugas
37. Sara Moore
38. Chuck Villarrubia
39. Jason Curole
40. Leigh Anne Sharp
41. John Troutman
42. Dawn Davis
43. Melissa Hymel
44. Devyani Kar
45. Dugan Sabins
46. Ed Haywood
47. Honora Buras
48. Jacquelyn A. Johnson
49. James Pahl
50. Jason Byrd
51. Jennifer Mouton
52. John Barras
53. Kristin DeMarco
54. Kristin Morgan
55. Mark Leadon
56. Meaghan Wear
57. Michael Turner
58. Natalie B. Dedon
59. Richard Raynie
60. Rocky Wager
61. Scott Hemmerling
62. Susan Colley
63. Sydney Dobson
64. Syed Khalil
65. Tim Rosen
66. Zahid Muhammad

67. Adam Ledet
68. Anthony Patin
69. Barry Richard
70. Bernard Wood
71. Bill Boshart
72. Chris Allen
73. Brad Miller
74. Andrew Beal
75. Michelle Deshotels
76. Melanie Saucier
77. Elizabeth Davoli
78. David Lindquist
79. Darrell Pontiff
80. James Wray

Project Fact Sheets

rev. February 2008
Cost figures as of November 2011

Naomi Outfall Management (BA-03c)

Project Status

Approved Date: 1996 **Project Area:** 26,603 acres
Approved Funds: $2.18 M **Total Est. Cost:** $2.18 M
Net Benefit After 20 Years: 633 acres
Status: Completed Aug. 2002
Project Type: Outfall Management
PPL #: 5

Location

The project features are located near the town of Lafitte in Jefferson Parish, Louisiana, on two streams, Goose Bayou and Bayou Dupont that connect the open water area of "The Pen" to the Barataria Bay Waterway.

Problems

Construction of the Mississippi River levee has stopped annual flooding that historically nourished surrounding marshes with sediments, nutrients, and fresh water. This river nourishment counteracted subsidence, saltwater intrusion, and subsequent marsh loss.

Restoration Strategy

The project features include two fixed crest rock weirs with boat bays, across Goose Bayou and Bayou Dupont. The purpose of the project is to manage the sediment-laden fresh water diverted by the Naomi Siphon [a state- and Plaquemines Parish-funded project (BA-03) located along the west bank of the Mississippi River near the community of Naomi]. The two fixed crest weirs will assist in the management of the siphon outfall water by reducing freshwater loss, allowing maximum sediment retention and nutrient uptake, and reducing saltwater intrusion into the project area.

Weirs constructed with a boat bay aid in the effective management of hydrology while still allowing the passage of small boats and vessels.

Progress to Date

This project was combined with the Barataria Bay Waterway East Side Shoreline Protection (BA-26) project for planning and design; however, construction was separate.

The operation of the siphon was reviewed by DNR. A hydraulic analysis was performed and the results were concurred by both agencies. Construction was completed in 2002.

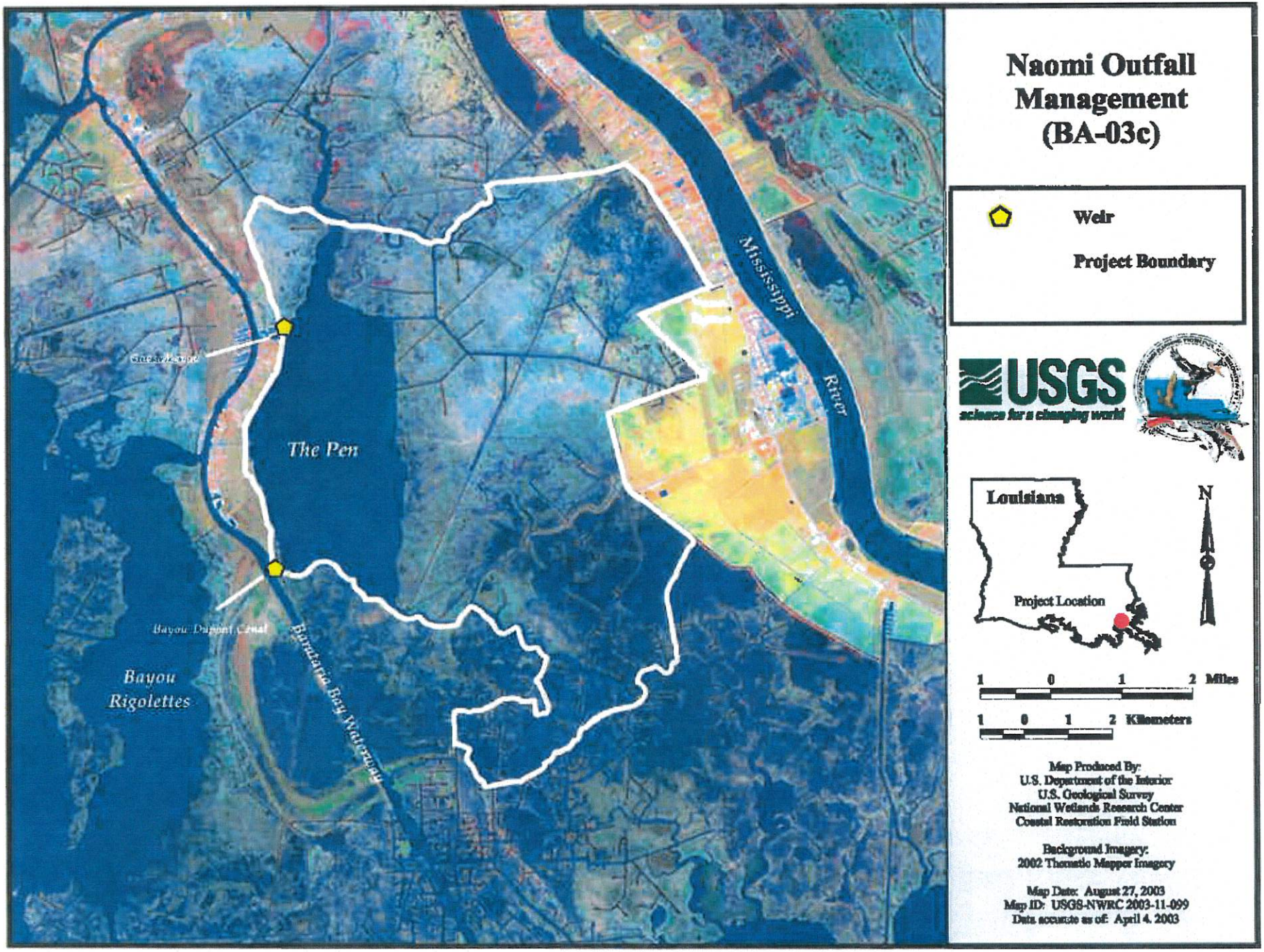
This project is on Priority Project List 5.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Naomi Outfall Management (BA-03c)
Weir
Project Boundary
Mississippi River
The Pen
Bayou Dupont Canal
Barataria Bay Waterway
Bayou Rigolettes
USGS
science for a changing world
Louisiana
Project Location
N
1 0 1 2 Miles
1 0 1 2 Kilometers
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
2002 Thematic Mapper Imagery
Map Date: August 27, 2003
Map ID: USGS-NWRC 2003-11-099
Data accurate as of: April 4, 2003

rev. February 2008
Cost figures as of November 2011

Jonathan Davis Wetland Protection (BA-20)

Project Status

Approved Date: 1993 **Project Area:** 7,199 acres
Approved Funds: aaaTF **Total Est. Cost:** $28.8 M
Net Benefit After 20 Years: 510 acres
Status: Construction
Project Type: Hydrologic Restoration
PPL #: 2

Location

The project is located in Jefferson Parish, immediately west of Lafitte, Louisiana.

Problems

Maintenance of the wetlands that separate Lake Salvador from the more saline region of the Barataria basin to the south is of paramount importance to the future of the estuary. Wetlands in the project area are increasingly threatened by a transition to more tidally influenced conditions that produce high rates of wetland loss in these low salinity marshes because of their highly organic, soft soil conditions. Due to open oil and gas canals and their position within the basin, this area is predictably at risk of high wetland loss.

Restoration Strategy

This hydrologic restoration project contains structural measures that were designed to improve hydrologic conditions and provide shoreline protection along the southern project boundary. A series of water control structures (shown on map) reduce rapid water exchange and tidal energies, and the shoreline protection provides a stable buffer for the interior marsh from the wave action along Bayou Perot and Bayou Rigolettes. The project will be constructed in four units. The first unit will install the majority of the water control structures. The second unit will install the remaining structures and a segment of shoreline protection. The remaining units will install the bank protection along the southern boundary.

Fragile, highly organic marsh is vulnerable to increased erosive energy caused by tidal fluctuation. Structural measures associated with the project will improve hydrologic conditions by decreasing the amplitude of tidal events.

Progress to Date

The construction of the first unit began in June 1998 and was completed in September 1998. Unit 2 was completed in May 2001. Construction of Unit 3 began in January 2003. Unit 4 was revised due to storm activity. Construction is now scheduled to begin in the spring of 2008 and to be completed in the spring of 2009.

This project is on Priority Project List 2.

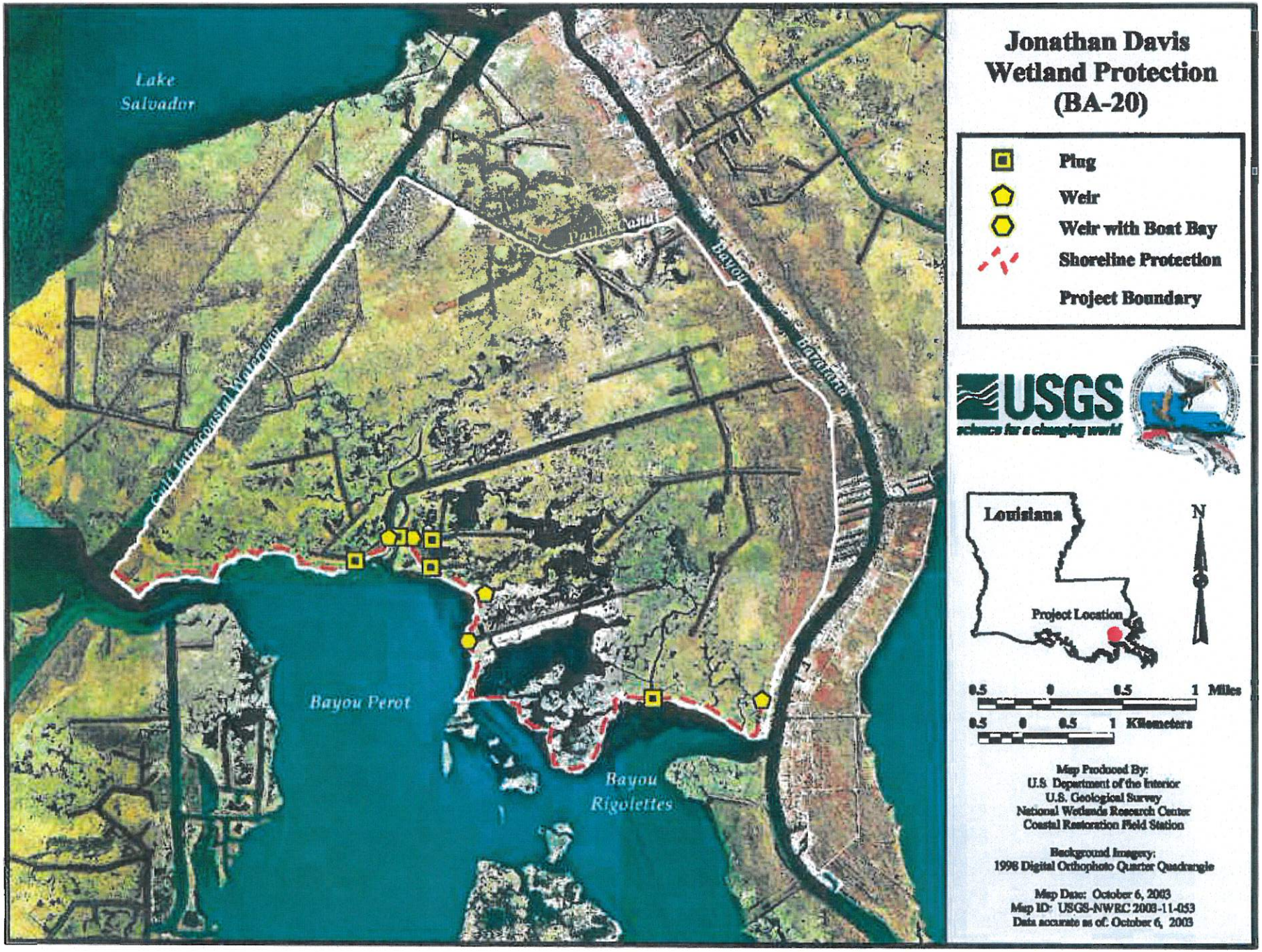
For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Jonathan Davis Wetland Protection (BA-20)

- Plug
- Weir
- Weir with Boat Bay
- Shoreline Protection
- Project Boundary

USGS
science for a changing world

Louisiana

Project Location

N

0.5 0 0.5 1 Miles

0.5 0 0.5 1 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: October 6, 2003
Map ID: USGS-NWRC 2003-11-053
Data accurate as of: October 6, 2003

rev. February 2008
Cost figures as of November 2011

Barataria Bay Waterway West Side Shoreline Protection (BA-23)

Project Status

Approved Date: 1994
Project Area: 1,789 acres
Approved Funds: $3.01 M
Total Est. Cost: $3.01 M
Net Benefit After 20 Years: 232 acres
Status: Completed Nov. 2000
Project Type: Shoreline Protection
PPL #: 4

Location

The project is located in Jefferson Parish, Louisiana, on the west bank of the Dupre Cut portion of the Barataria Bay Waterway, north of the Lafitte Gas and Oil Field and south of the subsided land reclamation effort known as "the Pen." The project encompasses 1,789 acres of brackish marsh and open-water habitat on the west bank of the Barataria Bay Waterway.

Problems

The banks of the Dupre Cut have eroded considerably as a result of vessel wakes. Large breaches in the banks have exposed the adjacent marsh to increased water exchange and rapid changes in salinity.

Restoration Strategy

9,400 linear feet of foreshore rock dike were constructed on the west bank of Dupre Cut to reduce excessive water exchange in the adjacent marshes. A water control structure was also installed to limit saltwater intrusion into the marsh area and to aid in the maintenance of favorable water levels for wintering waterfowl.

Progress to Date

This project was coordinated with the U.S. Army Corps of Engineers maintenance-dredging program to provide beneficial use of dredged material by placing it behind the armored levee in order to create new marsh. Construction was completed in November 2000. The O&M Plan was signed in July 2002. This project is on Priority Project List 4.

In order to prevent the heavy rock riprap from settling too deep in the organic soil, geo-textile cloth was first put down and used as a base.

Where existing structures were encountered, such as the crossing of the freshwater delivery system to Grand Isle pictured above, the alignment of the structure was altered.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Barataria Bay Waterway West Side Shoreline Protection (BA-23)

Water Control Structure

Shoreline Protection

Project Boundary

USGS
science for a changing world

0.5 0 0.5 Miles

0.5 0 0.5 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: August 27, 2002
Map ID: 2002-11-734
Data accurate as of August 27, 2002

rev. February 2008
Cost figures as of November 2011

Barataria Bay Waterway East Side Shoreline Protection (BA-26)

Project Status

Approved Date: 1997 **Project Area:** 2,790 acres
Approved Funds: $5.22 M **Total Est. Cost:** $5.22 M
Net Benefit After 20 Years: 217 acres
Status: Completed June 2001
Project Type: Shoreline Protection
PPL #: 6

Location

The project is located in Jefferson Parish, Louisiana, on the east bank of the Dupre Cut portion of the Barataria Bay Waterway, north of the Lafitte Gas and Oil Field and south of the subsided land reclamation effort known as "the Pen."

Problems

The banks of the Dupre Cut have eroded considerably as a result of vessel wakes. Large breaches in the banks exposed the adjacent marsh to increased water exchange, tidal energy, and saltwater intrusion.

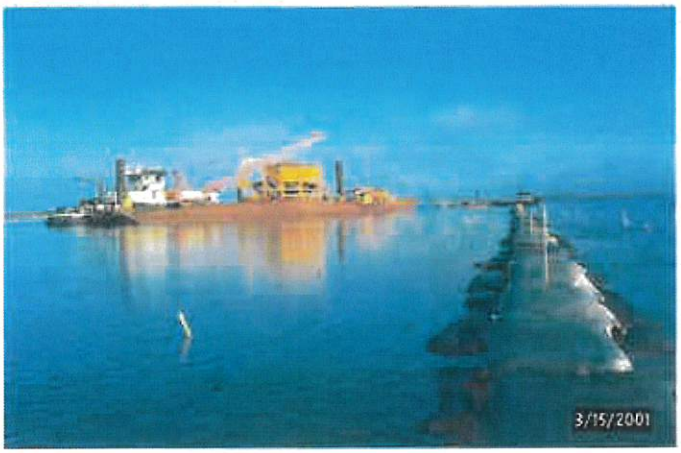
Restoration Strategy

The objective of this project was to rebuild and stabilize the east bank of the Dupre Cut. A stronger bank would reduce erosion and help reestablish wetlands by allowing sediment accretion on the leeward side of the foreshore rock dike.

The project plan involved the construction of over 3 miles of foreshore rock dike along the east bank of the Dupre Cut to protect adjacent marshes from shoreline erosion. This rock dike extends above the surface of the water and will protect the fragile marsh area from boat wakes generated within the BBWW.

Progress to Date

Construction was completed in June 2001. Baseline monitoring information has been collected and will be used to evaluate the project's effectiveness. The O&M Plan was signed in October 2002. This project is on Priority Project List 6.



Geo-textile fabric bags were filled with a lightweight aggregate and then sewn closed. These bags act as the supporting core of the shoreline stabilization structure.

This completed rock riprap structure was placed adjacent to the existing shoreline to buffer it from the erosive forces of wake-induced wave energy.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Barataria Bay Waterway East Side Shoreline Protection (BA-26)

Shoreline Protection

Project Boundary

USGS
science for a changing world

Louisiana

Project Location

N

0.5 0 0.5 Miles

0.5 0 0.5 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: August 23, 2002
Map ID: 2002-11-719
Data accurate as of: August 23, 2002

March 2010 (rev)
Cost figures as of November 2011

Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (BA-37)

Project Status

Approved Date: 2002 **Project Area:** 1,373 acres
Approved Funds: $21.9 M **Total Est. Cost:** $29.4 M
Net Benefit After 20 Years: 713 acres
Status: Completed
Project Type: Shoreline Protection and Marsh Creation
PPL #: 11

Location

The project is located in the central Barataria Basin in Lafourche Parish, Louisiana. The project area is generally bound by the East and West Forks of Bayou L'Ours and the southern shoreline of Little Lake from Plum Point westward to Breton Canal.

Problems

The Little Lake mapping unit is an area of high wetland loss caused by shoreline erosion, subsidence, and channel construction. The project is located in an area protecting approximately 3,000 acres of fragile interior marshes between the Little Lake shoreline and Bayou L'Ours Ridge. Project area wetlands currently experience two major problems: high shoreline erosion rates (20 to 40 feet per year) and subsidence that deteriorates interior marshes. The project area marsh is expected to convert to mostly open water over the next 20 years if these problems go unchecked. In addition, continued shoreline erosion and wetland loss may adversely affect large areas of adjacent marsh.

This 24-inch dredge pipe is actively rebuilding marsh by depositing sediment dredged from the lake. As the project progresses, the placed sediment will reach an elevation conducive for growing and sustaining marsh vegetation.

Restoration Strategy

The project's goals are to: 1) prevent erosion along roughly 4 miles of Little Lake shoreline; 2) create 488 acres of intertidal wetlands along the Little Lake shoreline; 3) nourish and maintain 532 acres of intermediate marsh; and 4) reduce land-loss rates by 50% over the 20-year life of the project.

Geotechnical, soil stability, and engineering evaluation will be required prior to selection of the specific structural and non-structural measures that could achieve the project's goals. However, for the purpose of evaluation, two major project features are envisioned. The first of these is 21,000 feet of shoreline protection in the open water constructed parallel to the existing shoreline at a crest elevation some 2 feet above the mean water level. The second project feature envisioned is marsh creation in the open water and broken marsh areas along the Little Lake shoreline. Borrow areas would be located in Little Lake, with preliminary data indicating that silty and clay-like sands may be located in the vicinity of Plum Point. Semi-confined disposal will likely be used, and any retaining features would be degraded or gapped as soon as the fill material has sufficiently consolidated.

Progress to Date

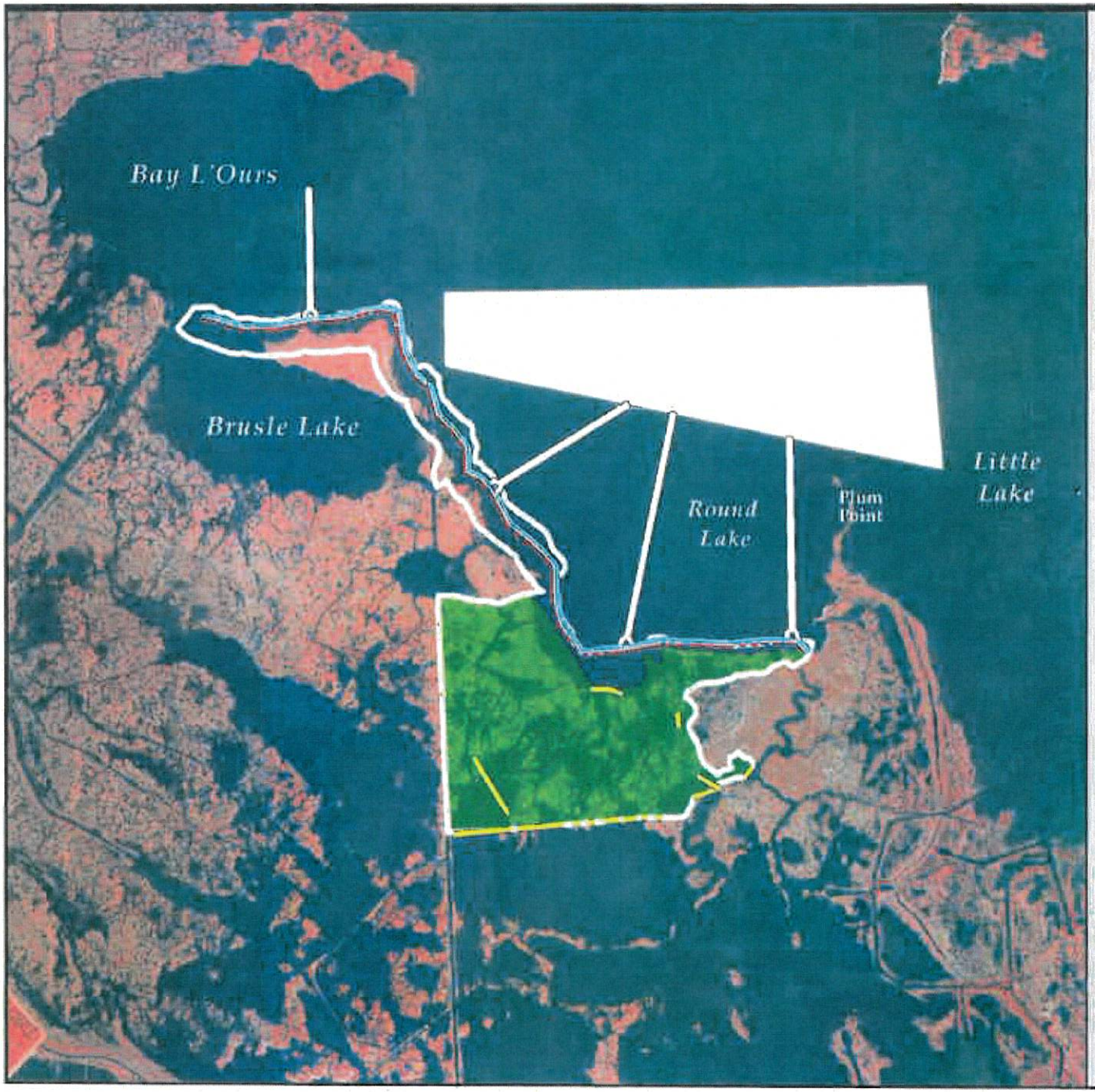
This project was selected for Phase I (engineering and design) funding at the January 2002 Breaux Act Task Force meeting and for Phase II (construction) funding in November 2003. Construction was completed in 2007.

The project is listed on Priority Project List 11.

For more project information, please contact:

Federal Sponsor:
National Marine Fisheries Service
Baton Rouge, LA
(225) 389-0508

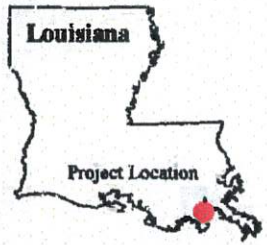
Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, La.
(225) 342-4736



Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake (BA-37)

- Rock Dike
- Access Channel
- Earthen Containment Levee
- Flotation Channel
- Borrow Site
- Disposal/Fill/Marsh Creation
- Project Boundary

USGS science for a changing world



N

0.6 0 0.6 Kilometers

0.6 0 0.6 Miles

Map Produced By
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery
2004 Digital Orthophoto Quarter Quadrangle

Map Date: June 7, 2006
Map ID: USGS-NWRC 2006-11-0376
Data accurate as of: June 7, 2006

October 2003
Cost figures as of November 2011

Caernarvon Diversion Outfall Management (BS-03a)

Project Status

Approved Date: 1993 **Project Area:** 15,556 acres
Approved Funds: $4.53 M **Total Est. Cost:** $4.53 M
Net Benefit After 20 Years: 802 acres
Status: Completed
Project Type: Outfall Management
PPL #: 2

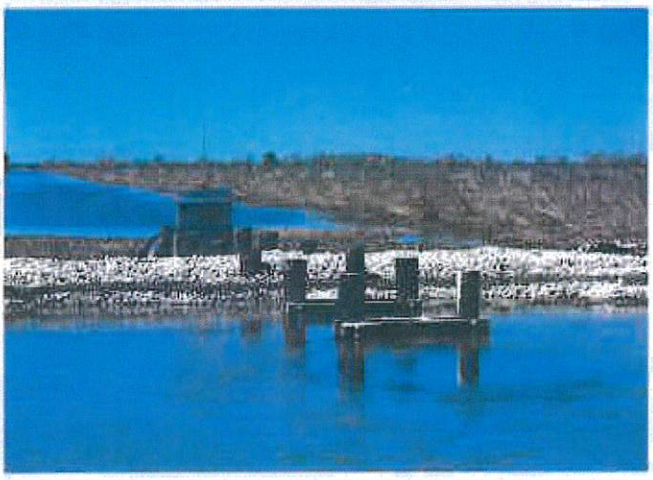
Location

This project is located south of the Braithwaite and Caernarvon communities in Plaquemines Parish, Louisiana.

Problems

Wetlands in the Breton Sound basin are being lost at alarming rates due to the adverse effects of saltwater intrusion, oil field activities, reduced freshwater inflow, and sediment and nutrient starvation.

Since 1956, approximately 3,400 acres of marsh have been lost and converted to open water in the basin. The majority of fresh water from the Caernarvon Diversion structure exits the project area through larger, natural and manmade channels so that benefits to the adjacent marshes are not maximized. These conditions are exaggerated during periods of low diversion discharges or low water levels. The existing Caernarvon Freshwater Diversion project (funded by the Water Resources Development Act) releases water into Big Mar and Bayou Mandeville but does not force water over the marsh.



Water control structures installed through existing earthen closures provide fresh water and nutrient access into previously isolated areas.

Restoration Strategy

The existing Caernarvon structure consists of 5 gated box culverts connecting the Mississippi River with the project area and has a maximum discharge of 8,000 cubic feet/second.

The objective of the project is to promote better utilization and distribution of fresh water and nutrients from the Mississippi River via the diversion structure during low-discharge periods. Management of the outfall will allow water from existing channels into the marsh interior through the placement of water control structures at strategic locations.

The outfall management project includes installing flow-through culverts with water control at 8 sites; 3 plug closures with armor protection; 13,000 feet of spoil bank restoration; and temporary/permanent vegetative plantings where applicable.

Progress to Date

The Caernarvon Diversion structure has been in operation since 1991. Construction of the outfall management features was completed in September 2002 at a cost of $1.9 million. Damage to the marsh interior resulting from Hurricane Lily in October 2002 has caused blockage in several of the channels located in the outfall area of the project management structures. Louisiana Department of Natural Resources (DNR) is in the process of assessing the damage and plans on remediation of damages of the marsh to pre-storm conditions.

Natural Resources Conservation Service and DNR has initiated the process of installing flow meters at two sites in the southwest corner of the project area to better quantify and evaluate outflow conditions from several outfall management structures.

This project is on Priority Project List 2.

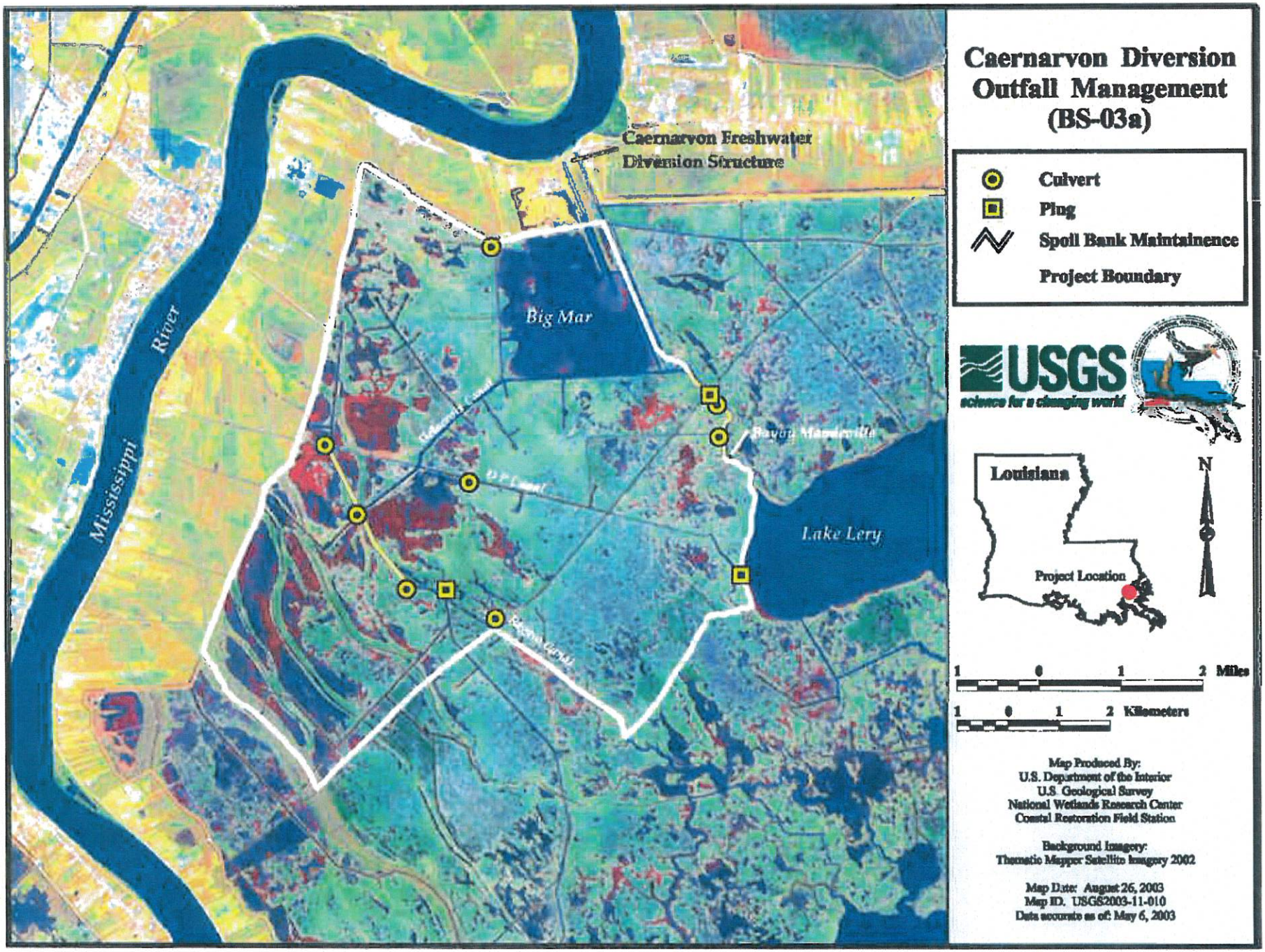
For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Caernarvon Diversion
Outfall Management
(BS-03a)
Caernarvon Freshwater
Diversion Structure
Culvert
Plug
Spoil Bank Maintainence
Project Boundary
Big Mar
Mississippi River
Lake Lery
Bayou Mazeppa
GIWW
MRGO
USGS
science for a changing world
Louisiana
Project Location
N
1 0 1 2 Miles
1 0 1 2 Kilometers
Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Background Imagery:
Thematic Mapper Satellite Imagery 2002
Map Date: August 26, 2003
Map ID. USGS2003-11-010
Data accurate as of: May 6, 2003

February 2008 (rev)
Cost figures as of November 2011

Sweet Lake/Willow Lake Hydrologic Restoration (CS-11b)

Project Status

Approved Date: 1996 **Project Area:** 5,796 acres
Approved Funds: $3.92 M **Total Est. Cost:** $3.92 M
Net Benefit After 20 Years: 247 acres
Status: Completed
Project Type: Shoreline Protection
PPL #: 5

Location

This project is located in Cameron Parish on the northern and northwestern shorelines of the Gulf Intracoastal Waterway (GIWW) at the intersection of Sweet and Willow Lakes, approximately 3 miles southwest of Sweet Lake, Louisiana. The total project area is 5,796 acres of fresh marsh and open water.

Problems

The northern shoreline of the GIWW has eroded into both Sweet and Willow Lakes. This has resulted in increased turbidity in their waters that reduces the growth of submerged aquatic vegetation due to decreased water clarity. The erosion increases the distance waves can travel (fetch), which contributes to marsh loss caused by wind and wave erosion along the shorelines.

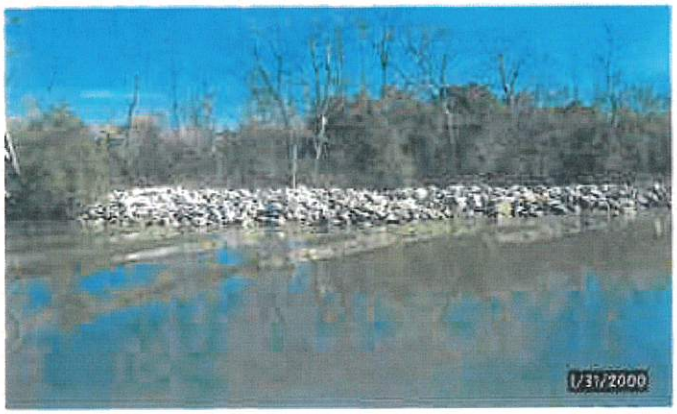
Restoration Strategy

Successful implementation of this project will conserve and restore vegetated wetlands by reestablishing a barrier between Sweet and Willow Lakes and the GIWW.

The features of the project include: installation of a 14,200-foot rock riprap embankment and 28,300 linear feet of vegetative plantings on the southern shoreline of Sweet Lake; installation of a 4,000-foot rock riprap embankment on the southern shoreline of Willow Lake; and construction of terraces in the eroded marsh between the lakes that will be planted with a double row of California bullrush (*Scirpus californicus*).

Progress to Date

The rock bank project feature was completed in January 2000. The installation of terraces and vegetation was completed in 2002.



In order to prevent the GIWW from encroaching into the lakes, the thin, eroding shorelines were protected with rock riprap.

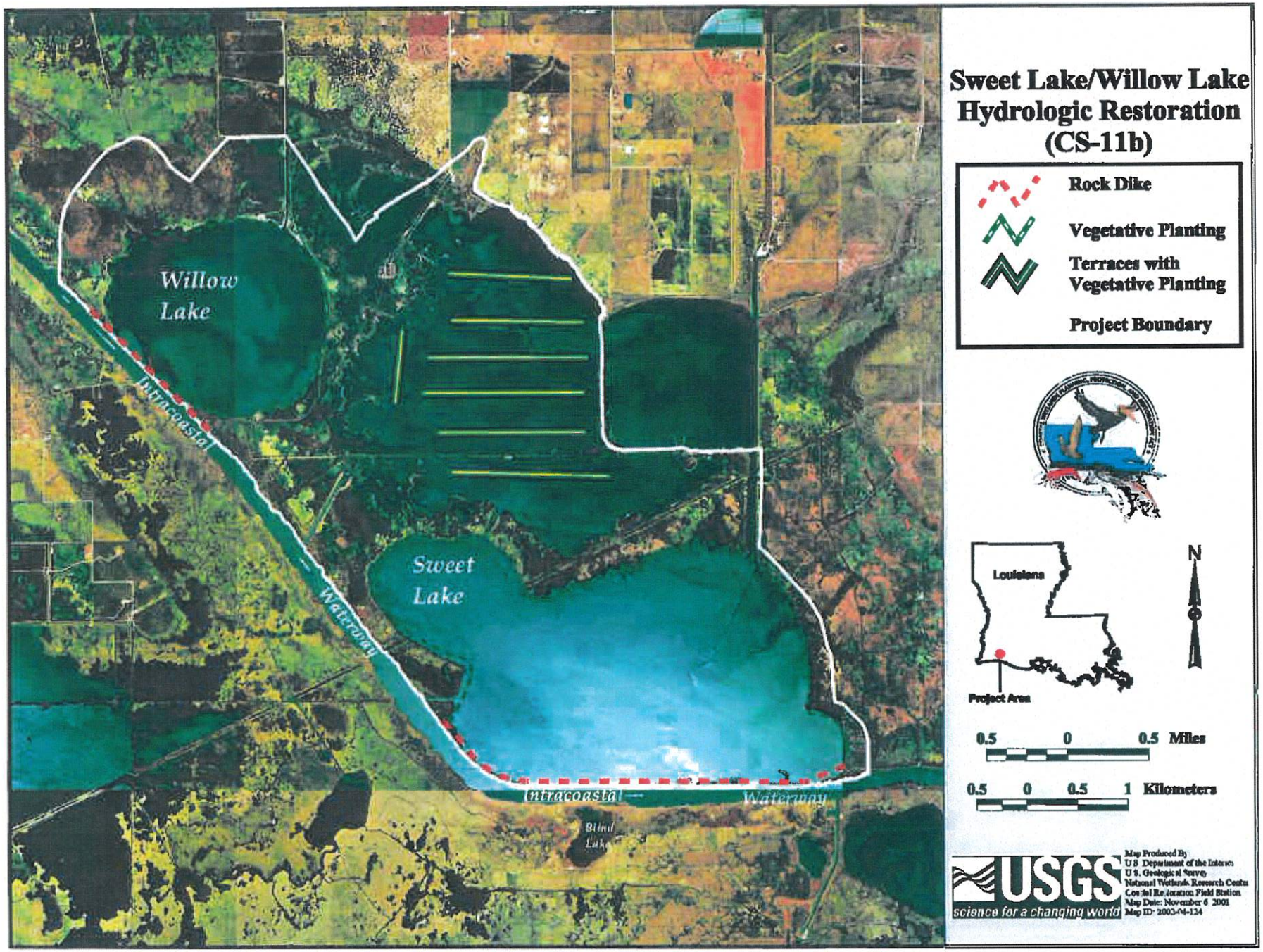
In some areas, the shoreline was non-existent, succumbing to the forces of wave erosion. A new barrier consisting of rock was constructed, ensuring a more natural water flow in the project area.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7816

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736


Willow Lake
Intracoastal Waterway
Sweet Lake
Intracoastal Waterway
Blind Lake
Sweet Lake/Willow Lake Hydrologic Restoration (CS-11b)
Rock Dike
Vegetative Planting
Terraces with Vegetative Planting
Project Boundary
Louisiana
Project Area
N
0.5 0 0.5 Miles
0.5 0 0.5 1 Kilometers
USGS
science for a changing world
Map Produced By
U S Department of the Interior
U S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Map Date: November 6 2001
Map ID: 2003-04-124

September 2010 (rev)
Cost figures as of November 2011

Sabine Refuge Marsh Creation Cycle I (CS-28-1)

Project Status

Approved Date: 1999 **Project Area:** 0 acres *
Approved Funds: $3.42 M **Total Est. Cost:** $3.42 M
Net Benefit After 20 Years: 214 acres
Status: Completed Feb. 2002
Project Type: Marsh Creation
PPL #: 8

Location

The Sabine Refuge Marsh Creation Project is located in the Sabine National Wildlife Refuge, west of LA Highway 27, in large, open water areas north and northwest of Brown's Lake in Cameron Parish, Louisiana.

Problems

The project is intended to strategically create marsh in large, open water areas to block wind-induced saltwater introduction and freshwater loss. In addition, it will increase nourishment in adjacent marshes while reducing open water fetch (distance a wave can travel) and the erosion of marsh fringe.

Restoration Strategy

Cycle I constructed 214 acres of marsh within the shallow, open water area within retention dikes. The perimeter of the created marsh was planted with smooth cordgrass. Dredged slurry obtained from the Army Corps of Engineers' dredging of the Calcasieu River Ship Channel was placed in the containment area.

Upon consolidation of the dredged material, the southern containment dike was degraded and breached to allow for water movement and restore the area to more natural conditions. Prior to the placement of dredged material, trenasses (small, man-made bayous) were constructed in the project area. These trenasses facilitate natural conditions and allow estuarine organisms to access the created marsh. This project is part of five cycles over a 10-year period with each cycle requiring individual construction approval.

* Acreage is the total for all 5 cycles.

Sabine Marsh Creation Cycle 1 on Sabine NWR looking westward. Note the constructed trenasses for fisheries and water movement can be seen.

Progress to Date

Priority Project List 8 funded $5.9 million to complete construction of a permanent pipeline and one cycle of marsh creation. Engineering analyses at the time indicated that the construction of a temporary pipeline would be more cost effective. Therefore, a temporary pipeline was utilized for Cycle I. However, further analysis determined that a permanent pipeline would be advantageous. In 2004, additional funds for engineering and design and construction were approved for Cycles II and III. Funds for Cycle II include the construction of a permanent dredged material pipeline.

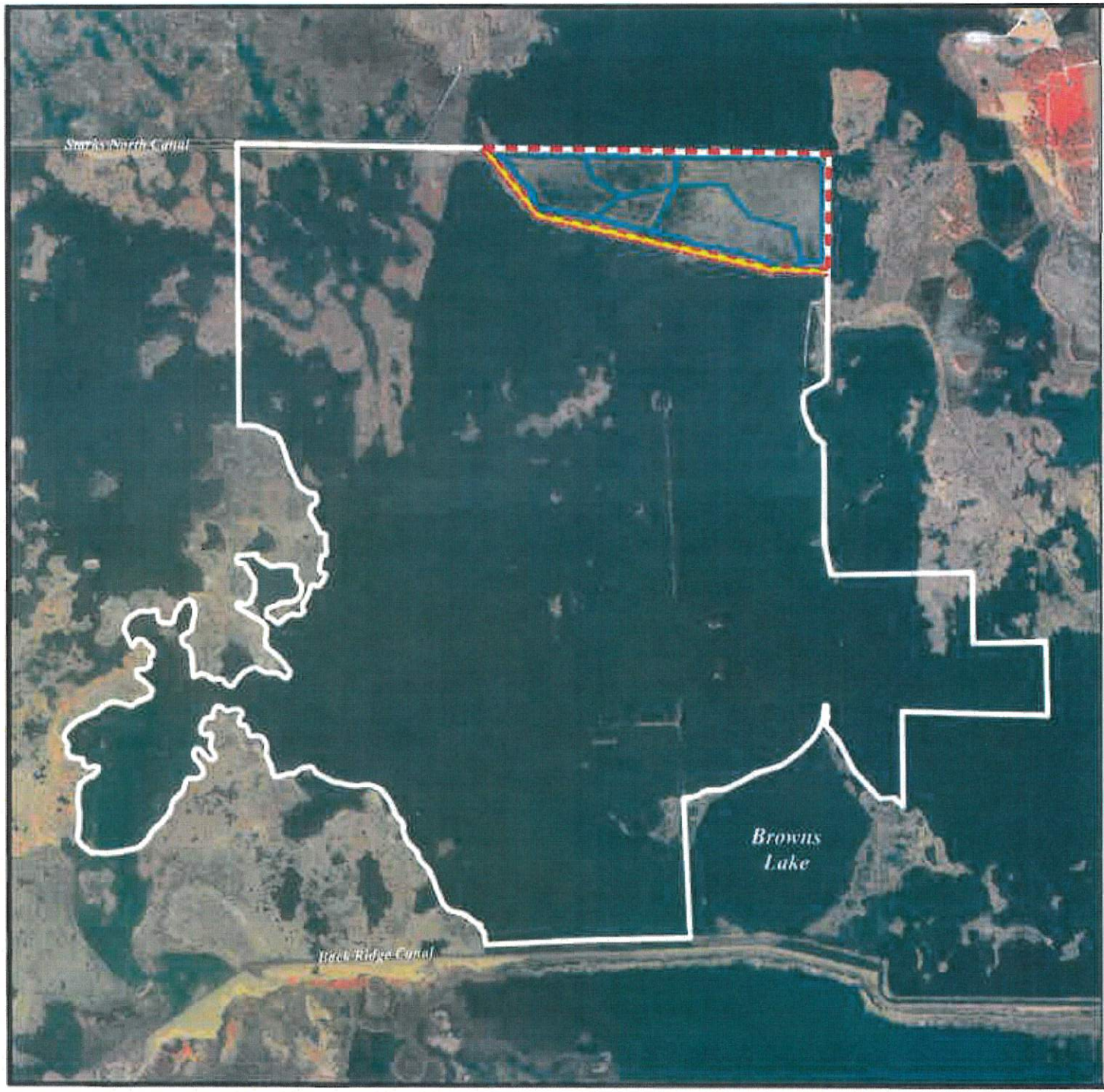
Construction of the Cycle I site was completed on February 26, 2002.

For more project information, please contact:

Federal Sponsors:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-2309

U.S. Fish and Wildlife Service
Lafayette, LA
(337) 291-3100

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, La.
(225) 342-4736



Sabine Refuge Marsh Creation, Cycle 1 (CS-28-1)

- Degraded Dike
- Dike
- Cycle 1
- Trenasses
- Project Boundary

USGS
science for a changing world

Louisiana

Project Location

N

0.3 0 0.3 0.6 Kilometers

0.25 0 0.25 0.5 Miles

Map Produced by:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Baton Rouge, La.

Background Imagery:
2005 Digital Orthophoto Quarter Quadrangle

Map Date: August 13, 2007
Map ID: USGS-NWRC 2007-11-0345
Data accurate as of: August 09, 2007

January 2002
Cost figures as of November 2011

Perry Ridge Shore Protection (CS-24)

Project Status

Approved Date: 1995 **Project Area:** 5,945 acres
Approved Funds: $2.28 M **Total Est. Cost:** $2.28 M
Net Benefit After 20 Years: 1,203 acres
Status: Completed Feb. 1999
Project Type: Shoreline Protection
PPL #: 4

Location

This project is located on the north shore of the Gulf Intracoastal Waterway (GIWW) about 6 miles from Vinton, Louisiana, and 6 miles east of the Sabine River. It is bordered to the east by the Gray Canal, to the west by Big Island and Perry Ridge, and to the south by the GIWW. The project encompasses approximately 5,945 acres of fresh-to-intermediate marsh and open water.

Problems

The severe erosion rate of 3.9 feet per year along the GIWW threatens to breach the spoil bank in this area and cause erosion of fragile, organic soils in the fresh-to-intermediate marshes north of the GIWW.

Restoration Strategy

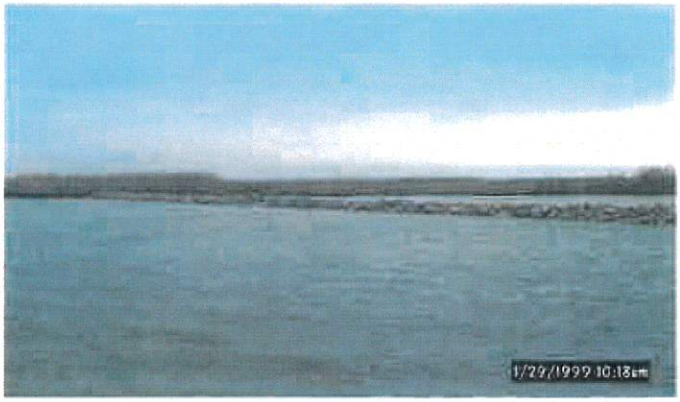
The project will prevent the further erosion of the GIWW shoreline and associated negative impacts to the fragile habitats within the project area.

The project will place limestone riprap to form a dike on critically eroding areas within a 4.3 mile reach along the north bank of the GIWW and the Vinton Drainage Canal.

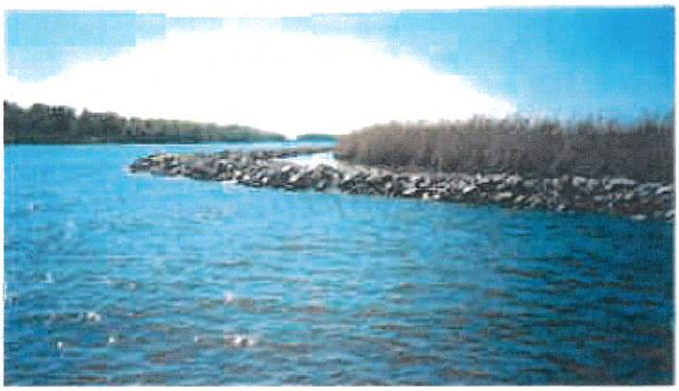
Progress to Date

The project has been completed with the placement of limestone riprap within a 4.3 mile reach along the north bank of the GIWW and the Vinton Drainage Canal.

Monitoring of the project is ongoing.



Rock riprap which can withstand the destructive forces of wave energy helps to maintain the integrity of the shoreline.



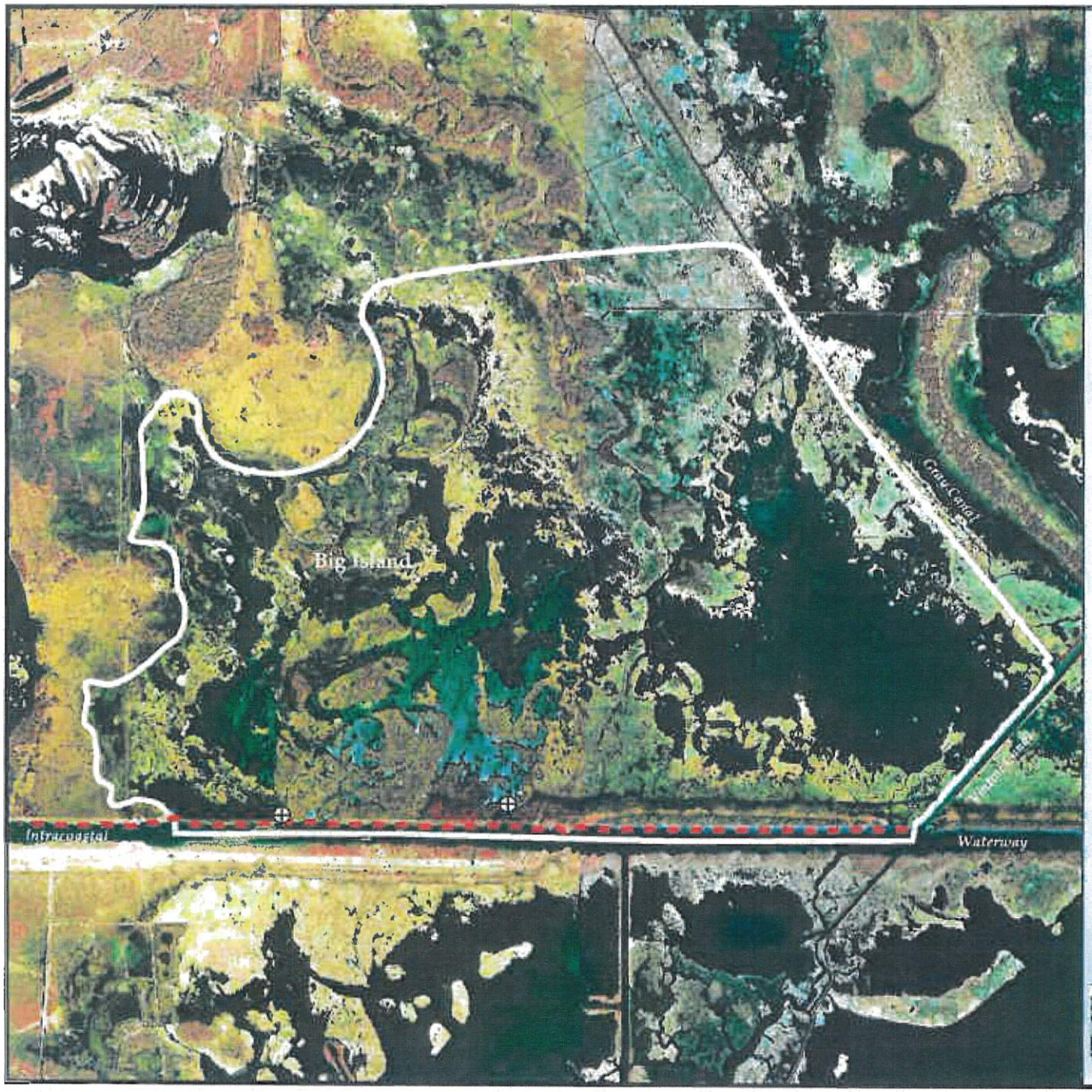
Limestone riprap was placed within a 4.3 mile reach along the north bank of the GIWW between the Vinton Drainage Canal and Perry Ridge.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Perry Ridge Shore Protection (CS-24)

Fish Dip

Rock Dike

Project Boundary

N

0.5 0 0.5 Miles

0.5 0 0.5 1 Kilometers

USGS science for a changing world

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station
Map Date: November 6, 2002
Map ID: 2002-04-127

February 2008 (rev)
Cost figures as of aaaDatePad

Freshwater Bayou Wetland Protection (ME-04)

Project Status

Approved Date: 1992 **Cost:** $3.58 M
Project Area: 14,381 acres **Status** Completed June 1998
Net Benefit After 20 Years: 1,593 acres
Project Type: Hydrologic Restoration and Shoreline Protection

Location

The project is located on the west bank of the Freshwater Bayou Canal, approximately 8 miles northeast of Pecan Island, Louisiana. It encompasses 36,928 acres of intermediate marsh and open water in Vermilion Parish.

Problems

Boat wake-induced shoreline erosion, which averaged 12.5 feet per year along each bank of Freshwater Bayou Canal, has deteriorated the spoil banks along the canal, creating multiple breaches that allow tidal erosion of the organic soils in the adjacent wetlands.

Between 1968 and 1990, the bank width of this navigation canal increased threefold (from 172 feet to 583 feet), resulting in the loss of 1,124 acres of coastal wetlands.

Restoration Strategy

Approximately 28,000 linear feet of freestanding, continuous rock dike were built along the west bank of Freshwater Bayou Canal. The USDA Natural Resources Conservation Service and Louisiana Department of Natural Resources worked with the landowner to develop other preservation features in the area. The landowner installed several other structures that were not funded by CWPPRA but will complement CWPPRA project features.

Project effectiveness is being determined by monitoring vegetation, water quality, and changes in vegetated and non-vegetated areas in the project area with aerial photography taken before and after construction. In addition, shoreline change is being measured by comparing pre-construction and post-construction shoreline surveys.

This continuous rock dike will drastically reduce boat wake-induced shoreline erosion.

Progress to Date

Shoreline surveys taken 1 year after construction show that while reference area sites *eroded* at a rate of 9.00 feet per year, the project area *built* land at an average rate of 1.53 feet per year. These data indicate that the rock dike has successfully prevented or significantly reduced erosion of the protected segment of canal bank for the year following construction.

In both the project area and the reference area, monthly mean post-construction salinities were higher at all stations than pre-construction salinities, but project area salinities generally remained within the target range of zero to five parts per thousand. Higher salinities in the post-construction period could be a result of drought and tropical storm activity.

Control of the water level within the project area is being compromised by breeches in the spoil banks along the Freshwater Bayou Canal adjacent to the rock dike. The first post-construction survey of emergent vegetation took place in October 2001, and the data are still under analysis.

Maintenance surveys of the rock dike were completed in February 1998 and May 2001. Maintenance of the rock dike is currently being implemented.

The 2003 OM&M report concluded that the ME-04 rock dike along the Freshwater Bayou Canal adjacent to CTU1 has worked quite will to reduce erosion along this shoreline, but since the structure is water permeable, it does very little to prevent tidal exchange during high tides and storm surges. This project is on Priority Project List 2.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

Local Sponsor:
Louisiana Department of Natural Resources
Baton Rouge, LA
(225) 342-7308

Freshwater Bayou Wetland Protection (ME-04)

Water Control Stucture (landowner constructed)

Rock Dike

Project Boundary

USGS science for a changing world

Louisiana

Project Location

N

1 0 1 2 3 Miles

1 0 1 2 3 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
Thematic Mapper Satellite Imagery 2000

Map Date: August 23, 2002
Map ID: 2002-11-712
Data accurate as of: August 23, 2002

September 2010 (rev.)
Cost figures as of November 2011

Grand-White Lakes Landbridge Protection (ME-19)

Project Status

Approved Date: 2001
Cost: $8.58 M
Project Area: 1,530 acres
Status: Completed October 2004
Net Benefit After 20 Years: 213 acres
Project Type: Shoreline Protection

Location

The project is located on the southeastern shore of Grand Lake just north of the Old Gulf Intracoastal Waterway and extends eastward to include Collicon Lake in Cameron Parish, Louisiana.

Problems

Erosion of the southeastern shoreline of Grand Lake and the western shoreline of Collicon Lake has removed the lake rims and is endangering the narrow landbridge between the two lakes and the entire Grand-White Lakes Landbridge. Without the project, the size of Grand Lake could increase by over 4,800 acres, and the width of the landbridge could be reduced by 2 miles. Shoreline erosion would accelerate in the remaining marshes of the landbridge.

Restoration Strategy

One objective of the project includes stabilizing the shoreline by installing a 2 mile-long limestone rock breakwater along the southeastern shore of Grand Lake. The rock was placed about 100 to 200 feet lakeward from shore in water 1 to 2 feet deep with dredged material placed between the rock and the shore to restore marsh.

Two 9,000 foot-long rows of vegetated earthen terraces were constructed along the northern and western shores of Collicon Lake and 4,000 feet of plantings were installed on the southern shoreline of Round Lake.

Progress to Date

Engineering and design began with a project implementation orientation interagency meeting held on February 14, 2001. Construction funding was approved in August 2002. Project construction was completed in October 2004.

This project is on Priority Project List 10.

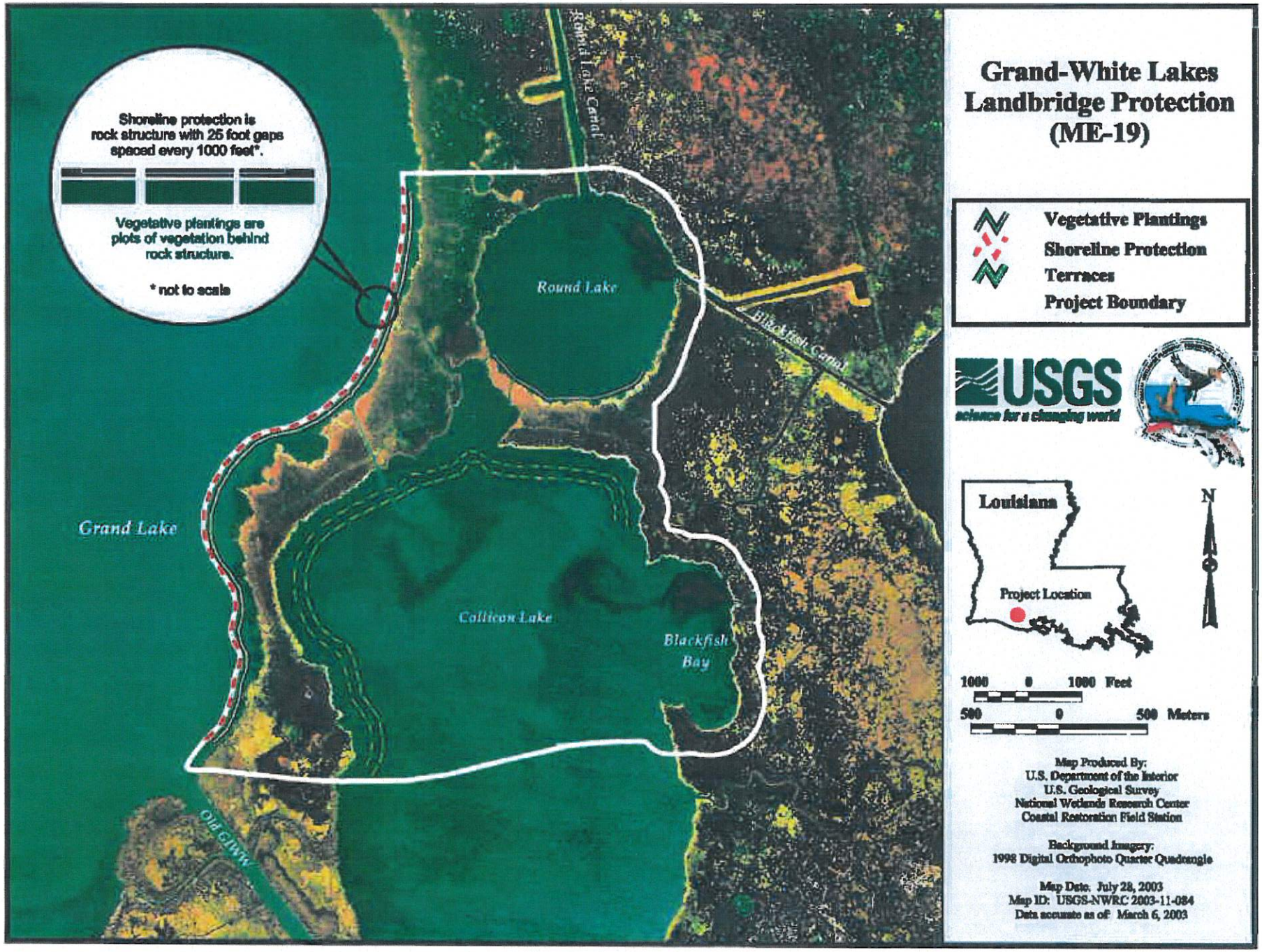
View of Collicon Lake vegetated terraces immediately after construction.

View of the rock breakwater with gaps at the southeastern Grand Lake shoreline.

For more project information, please contact:

Federal Sponsor:
U.S. Fish and Wildlife Service
Lafayette, LA
(337) 291-3100

Local Sponsor:
Office of Coastal Protection and Restoration
Baton Rouge, LA
(225) 342-4122



Grand-White Lakes Landbridge Protection (ME-19)

- Vegetative Plantings
- Shoreline Protection
- Terraces
- Project Boundary

USGS
science for a changing world

Louisiana

Project Location

N

1000 0 1000 Feet

500 0 500 Meters

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: July 28, 2003
Map ID: USGS-NWRC 2003-11-084
Data accurate as of: March 6, 2003

March 2010 (rev)
Cost figures as of November 2011

Bayou LaBranche Wetland Creation (PO-17)

Project Status

Approved Date: 1991 **Project Area:** 487 acres
Approved Funds: $3.81 M **Total Est. Cost:** $3.81 M
Net Benefit After 20 Years: 203 acres
Status: Completed Oct. 2000
Project Type: Marsh Creation
PPL #: 1

Location

The project is bounded by U.S. Interstate 10 to the south and Lake Pontchartrain to the north. It is approximately 3 miles northeast of Norco, Louisiana, in St. Charles Parish.

Problems

Construction of Interstate 10 (with its associated construction access canals), the Illinois Central Railroad, and an abandoned agricultural development resulted in altered hydrology and increased salinity.

The primary cause of wetland loss in the area was the failure of agricultural impoundments and subsequent flooding.

An unnamed hurricane in 1915 and Hurricane Betsy (1965) caused salt water to overflow the banks of Lake Pontchartrain and flow unchecked through canals. This overflow resulted in excessive salt water in the project area marsh and a subsequent loss of intermediate marsh vegetation.

Restoration Strategy

The project's goal was to create an area of 70% land and 30% water within 5 years of construction. Depositing 2.7 million cubic yards of sediments dredged from Lake Pontchartrain within an earthen containment berm created new, emergent marsh in what had formerly been an open water area.

Project effectiveness was evaluated by monitoring emerging wetland vegetation growth, water quality, and both the elevation and compaction rates of the deposited sediment.

Aerial view looking north depicting the marsh created within the Bayou LaBranche project area. Lake Pontchartrain is in the foreground, U.S. Interstate 10 can be seen running east to west near the top, and the emergent marsh (open water prior to 1994) is the large, vegetated area in the center.

Progress to Date

Land and water analysis in 1997 showed 300 acres of open water had been converted to land 3 years after construction was completed in 1994. The project had created 80% land and 20% percent water in 3 years, which was well within the target schedule. As of January 1999, sediment elevation was within target range at all monitoring stations.

The goal of creating a shallow water habitat conducive to the natural establishment of wetland vegetation seems to have been partially met. As sediment continues to consolidate and water is maintained in the area, upland vegetation is expected to be supplanted by more oblilgate wetland species. The project goal of creating a minimum of 70% marsh and 30% open water in the project area may still be attained as sediment elevation continues to decline. The project will be monitored for 20 years.

This project is on Priority Project List 1.

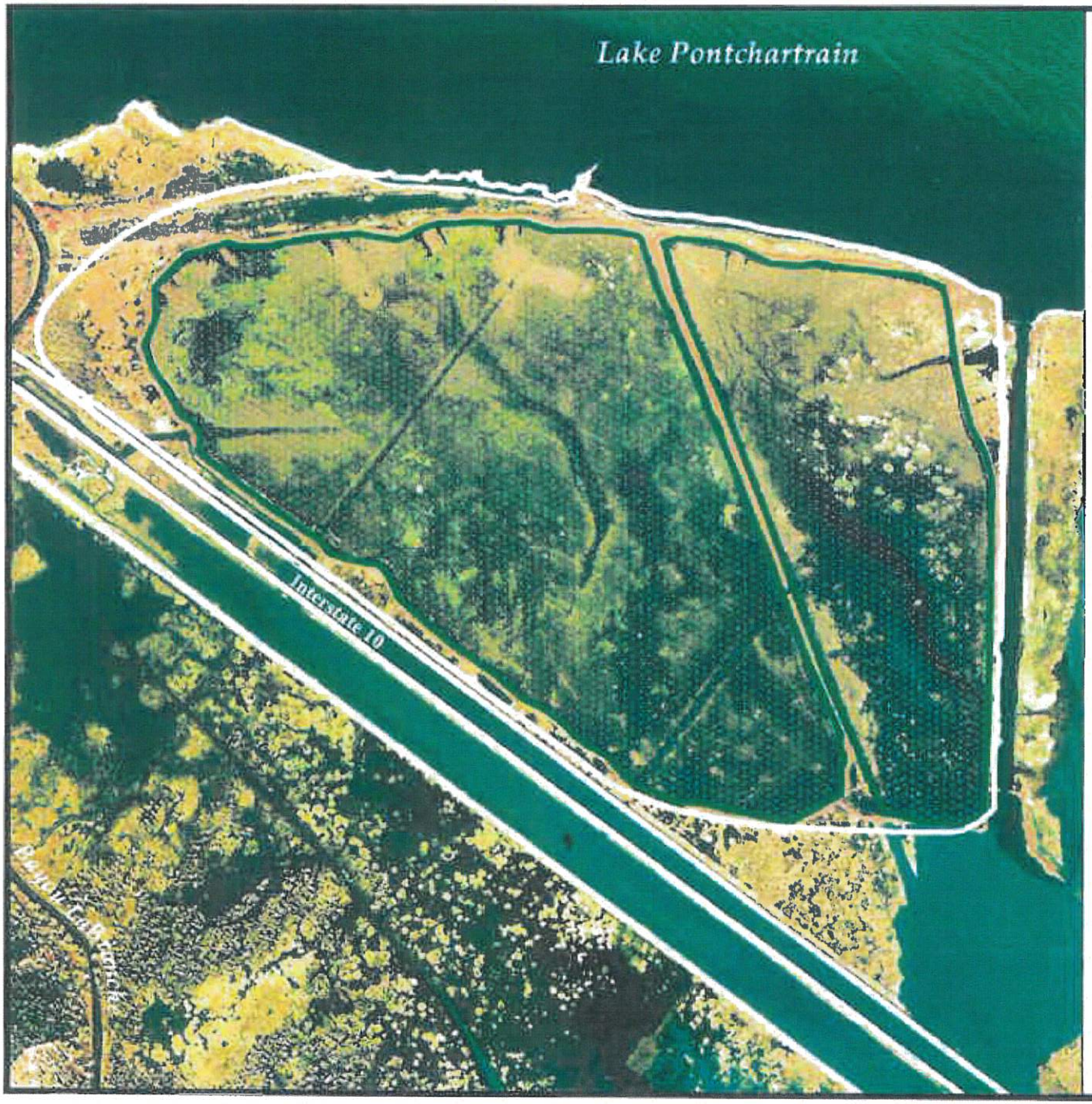
For more project information, please contact:

US Army Corps of Engineers
New Orleans District

Federal Sponsor:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-1597

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Bayou LaBranche Wetland Creation (PO-17)

Marsh Creation Area

Project Boundary

USGS
science for a changing world

200 0 200 400 600 Feet

200 0 200 Meters

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: August 13, 2002
Map ID: 2002-11-670
Data accurate as of: August 13, 2002

Louisiana Coastal Wetlands Conservation and Restoration Task Force

October 2003
Cost figures as of November 2011

Bayou Chevee Shoreline Protection (PO-22)

Project Status

Approved Date: 1996 **Project Area:** 212 acres
Approved Funds: $2.58 M **Total Est. Cost:** $2.58 M
Net Benefit After 20 Years: 75 acres
Status: Completed
Project Type: Shoreline Protection
PPL#: 5

Location

The project is located in the Bayou Chevee marsh area, approximately 2 miles west of Chef Menteur Pass, in the Bayou Sauvage National Wildlife Refuge in Orleans Parish, Louisiana.

Problems

This area is suffering marsh loss caused by subsidence and shoreline erosion from high wave energies associated with Lake Pontchartrain and Chef Menteur Pass.

Restoration Strategy

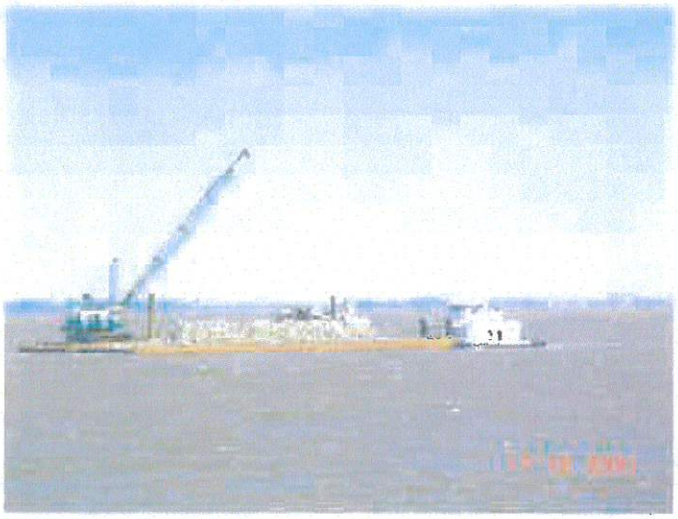
The project consists of constructing approximately 4,790 feet of rock dike across the mouth of the north cove and 4,020 feet of rock dike across the south cove. The newly constructed rock dikes tie into an existing U.S. Fish and Wildlife Service rock dike.

Progress to Date

Construction of the project was completed in December 2001.

This project is on Priority Project List 5.

Rock dike at Bayou Chevee with fish dip.



Fully-loaded barge of rock waiting to be unloaded at Bayou Chevee construction site.

Rock being placed at Bayou Chevee.

For more project information, please contact:

US Army Corps of Engineers
New Orleans District

Federal Sponsor:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-1597

CPRA

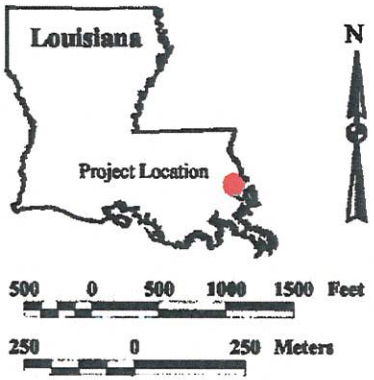
Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Bayou Chevee Shoreline Protection (PO-22)

Shoreline Protection

Project Boundary

USGS
science for a changing world



Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: August 25, 2003
Map ID: 2002-11-796
Data accurate as of: March 12, 2003

October 2002
Cost figures as of November 2011

Point Au Fer Canal Plugs (TE-22)

Project Status

Approved Date: 1992 **Project Area:** 5,230 acres
Approved Funds: $5.49 M **Total Est. Cost:** $5.54 M
Net Benefit After 20 Years: 375 acres
Status: Completed May 2000
Project Type: Shoreline Stabilization and Hydrologic Restoration
PPL #: 2

Location

The project is located on Point Au Fer Island, approximately 30 miles south of Morgan City, Louisiana, in Terrebonne Parish. The project is divided into two areas. Area 1 consists of saline and brackish marshes on the southeastern portion of the island between Mosquito Bay and the Gulf of Mexico. Area 2 consists of brackish marsh on the southwestern portion of Point Au Fer.

Problems

Pipeline canals and access channels on Point Au Fer Island are conduits for saltwater intrusion into the island's interior marshes. During periods of low river flow in which the input of fresh water declines, the elevated salinity levels cause the breakup of the island's marshes. In addition, storm-induced breaches along sections of the gulf shoreline immediately adjacent to oilfield canals also allow salt water to penetrate the island's interior.

Restoration Strategy

Under Phase 1, a series of wooden plugs reinforced with oyster shells was constructed in two major natural gas/oil pipeline canals on the eastern half of the island. Under Phase 2, a rock shoreline stabilization structure was built along a thin stretch of beach separating the Gulf of Mexico from a minerals access canal. The project has reestablished the natural hydrology of the island, preventing saltwater intrusion into the island's interior brackish marshes and protecting over 4,000 acres of wetlands habitat.

Progress to Date

The shoreline erosion rate along the plugged canals (Phase/Area 1) has not been reduced. Visual observations indicate that the shoreline stabilization project (Phase/Area 2) has halted erosion, but monitoring data is still under analysis. This project is on Priority Project List 2.

The beach where a pipeline canal meets the Gulf of Mexico has been stabilized with concrete mats thus preventing saltwater intrusion into the interior wetlands of Point au Fer Island.

This section of Mobil Canal was backfilled and armored with rock to reestablish the separation between the canal and the gulf so that salt water would be prevented from damaging the intermediate marshes in the interior of the island.

For more project information, please contact:

Federal Sponsor:
National Marine Fisheries Service
Baton Rouge, LA
(225) 389-0508

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Point Au Fer Canal Plugs (TE-22)

Plug
Shoreline Protection
Project Boundary

USGS science for a changing world

1 0 1 Miles

1 0 1 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
Thematic Mapper Satellite Imagery 2000

Map Date: June 10, 2002
Map ID: 2002-11-449
Data accurate as of :June 10, 2002

Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island (TE-26)

October 2002
Cost figures as of November 2011

Project Status

Approved Date: 1993 **Project Area:** 13,024 acres
Approved Funds: $5.93 M **Total Est. Cost:** $6.84 M
Net Benefit After 20 Years: 509 acres
Status: Completed May 1999
Project Type: Hydrologic Restoration and Marsh Creation
PPL #: 3

Location

The project encompasses approximately 13,000 acres of intermediate marsh, brackish marsh, and open water near Lake Chapeau on Point Au Fer Island, some 30 miles south of Morgan City, Louisiana in Terrebonne Parish. It is bounded by Fourleague Bay to the north, Atchafalaya Bay to the West, Locust Bayou's network of canals to the south, and by Wildcat Bayou and a single oilfield canal to the east.

Problems

Existing canal networks that extend into the center of Point Au Fer Island have considerably altered its hydrology. Specifically, excessive tidal water exchange has increased erosion, creating a 30% loss of the island's interior marsh over the past 60-70 years.

An aerial close-up view of the created wetlands with a prominent lobe in the foreground.

Restoration Strategy

The project reestablishes hydrologic control points, reducing the tidal fluctuations that cause the erosion and scouring of the island's interior marsh. It also promotes conditions that will sustain communities of aquatic vegetation.

The project's first component, sediment input, restored marshes west of Lake Chapeau and reestablished a land bridge between two existing bayous. An estimated 850,000 cubic yards of material were hydraulically dredged from Atchafalaya Bay and spread to a thickness of approximately 2 feet to create 160 acres of marsh.

The project's second component, hydrologic restoration, included the construction of seven weirs in man-made channels around the perimeter of the project area. In addition, existing spoil banks were gapped in one channel, and a 6,700-foot section of natural bayou was dredged. One rock plug was also installed at the dredge pipeline access corridor to address damage which occurred during construction and two additional weirs were installed in an existing canal to address spoil bank breaches that occurred after installation of the seven weirs. The weirs, gapping, and dredging restored the natural circulation and drainage patterns within the central portion of Point Au Fer Island.

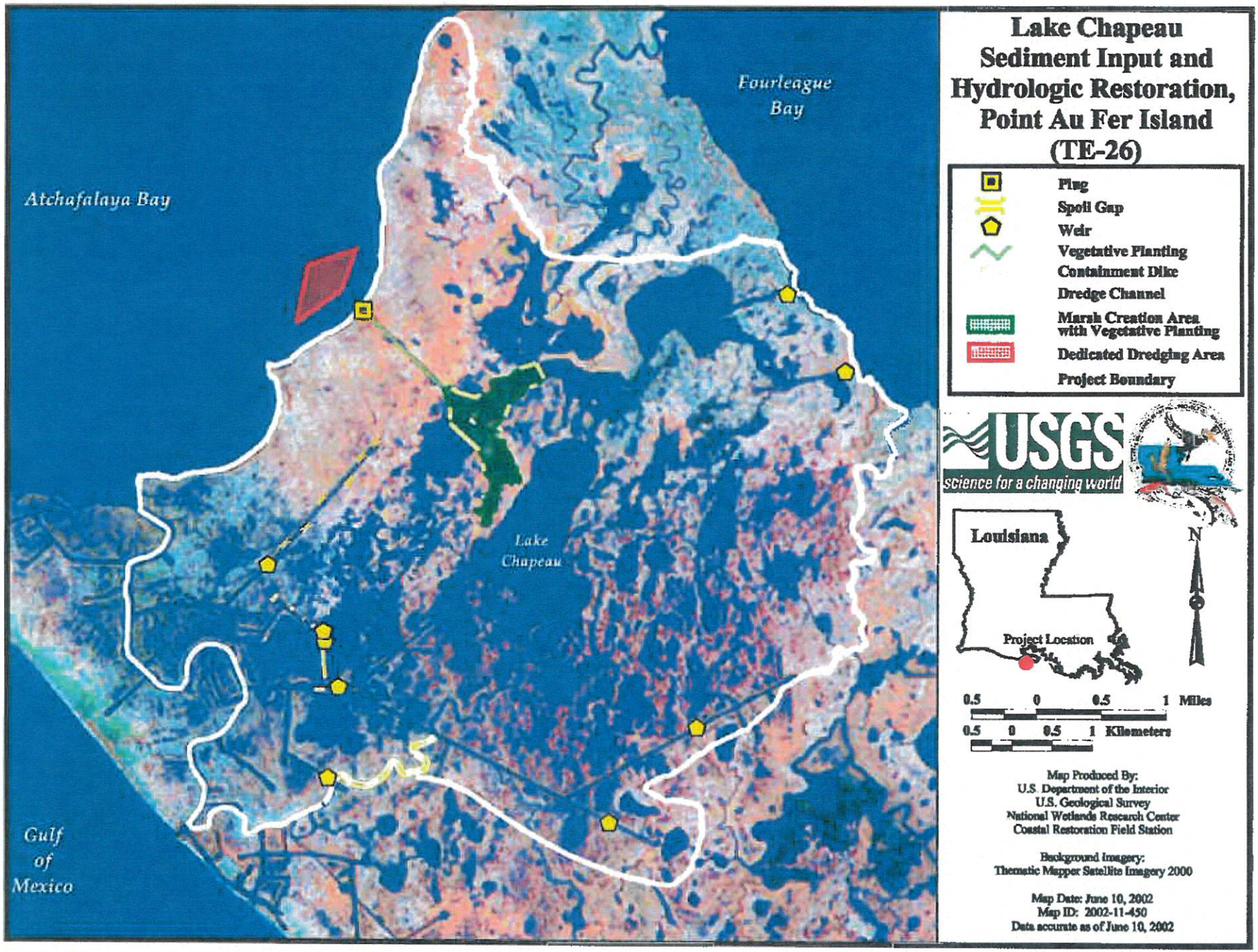
Progress to Date

In the spring of 2000, 40,000 plugs of smooth cordgrass (*Spartina alterniflora*) were planted in the area where the dredged sediments had been placed. Monitoring indicates that the plants are vigorously growing and spreading. Additional monitoring of water flows and salinities is underway. This project is on Priority Project List 3.

For more project information, please contact:

Federal Sponsor:
National Marine Fisheries Service
Baton Rouge, LA
(225) 389-0508

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island (TE-26)

- Ping
- Spoil Gap
- Weir
- Vegetative Planting
- Containment Dike
- Dredge Channel
- Marsh Creation Area with Vegetative Planting
- Dedicated Dredging Area
- Project Boundary

USGS science for a changing world

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0.5 0 0.5 1 Miles

0.5 0 0.5 1 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
Thematic Mapper Satellite Imagery 2000

Map Date: June 10, 2002
Map ID: 2002-11-450
Data accurate as of June 10, 2002

Brady Canal Hydrologic Restoration (TE-28)

October 2002
Cost figures as of November 2011

Project Status

Approved Date: 1993 **Project Area:** 7,653 acres
Approved Funds: $6.40 M **Total Est. Cost:** $7.12 M
Net Benefit After 20 Years: 297 acres
Status: Completed May 2000
Project Type: Hydrologic Restoration
PPL #: 3

Location

The project is located 21 miles southwest of Houma, Louisiana, in Terrebonne Parish. The project is bounded by Turtle Bayou to the east, Bayou DeCade to the south, and Bayou Penchant to the north.

Problems

The intermediate marshes in the area are highly fragmented and are the transitional areas between the fresh and brackish zones. These marshes are extremely susceptible to erosion and wetland loss. Land loss in the area has been caused by saltwater intrusion, subsidence, and increased tidal energies.

Restoration Strategy

The project measures include replacing and maintaining weirs, constructing a rock plug, stabilizing channel cross-sections, and restoring and maintaining channel banks. These measures will maintain and enhance existing marshes in the project area by reducing the rate of tidal exchange. They will also increase the utilization of sediment and fresh water introduced from the water control structures and overbank flow along the north, east, and west sides of the project area. Along the southern boundary, bank restoration and water control structures are used to reduce tidal flow rate from channels into interior ponds, helping to improve the retention of sediment and fresh water.

Progress to Date

Fina Oil Company and Burlington Resources helped fund the project. Construction was completed in July 2000. A monitoring plan has been developed, and the Louisiana Department of Natural Resources is currently collecting data so that the project's effectiveness can be evaluated. This project is on Priority Project List 3.

The narrow, eroding shoreline of Bayou DeCade was reinforced with rock in order to help restore the hydrology of the Brady Canal area.

Much time and effort were spent coordinating with petrochemical and electrical power suppliers to ensure that existing systems were not damaged and that customer supply was not interrupted as various project features were installed.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7816

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Brady Canal Hydrologic Restoration (TE-28)

- Plug
- Weir
- Containment Dike
- Shoreline Protection
- Vegetative Plantings
- Project Boundary

USGS
science for a changing world

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: July 1, 2002
Map ID: 2002-11-544
Data accurate as of: July 1, 2002

Timbalier Island Dune and Marsh Restoration (TE-40)

June 2006 (rev.)
Cost figures as of November 2011

Project Status

Approved Date: 2000 **Project Area:** 663 acres
Approved Funds: $16.6 M **Total Est. Cost:** $17.4 M
Net Benefit After 20 Years: 273 acres
Status: Construction
Project Type: Barrier Island Restoration
PPL #: 9

Location

Timbalier Island is located south of Terrebonne Bay and west of East Timbalier Island in Terrebonne Parish, Louisiana.

Problems

Timbalier Island is migrating rapidly to the west/northwest, which is a clear indication of the dominant influence of longshore sediment transport processes (the movement of beach material by waves and currents) along the island. Thus, the western end of Timbalier Island is undergoing lateral migration by spit-building processes, at the expense of erosion along the eastern end, while the island overall is shortening and narrowing. This loss can be attributed to an inadequate sediment supply, relative sea-level rise, and the passage of storms. Without mitigating efforts, Timbalier Island was projected to disappear by the year 2050.

Restoration Strategy

The objective of this project is to restore the eastern end of Timbalier Island through the direct creation of dune and marsh habitat. The project boundary is divided into Areas A and B. Area A was restored through direct creation of dune and marsh on the east end of Timbalier Island. Area B will be enhanced through addition of sediment into the nearshore system, maintaining the west/northwest migration of the island and attenuation of wave energy.

Specifically, the project introduced sediment from the Gulf of Mexico to restore 2.2 miles of the beach rim and dune system and create a marsh platform on the bay side of the island. The marsh platform was built around existing marsh with minimal impact. Approximately 4.6 million cubic yards of material was dredged from the Little Pass borrow area about 14,000 feet away from the project and 22,750 linear feet of sand fencing was placed. Over 110,000 container grown plants consisting of eight species were initially planted. This is the most diverse plantings to date for a CWPPRA barrier island project. The sand fencing and vegetative plants help capture and retain wind-blown sand.

The plants and sand fencing shown above will help to maintain the integrity of Timbalier Island by capturing and retaining wind-blown sand.

Progress to Date

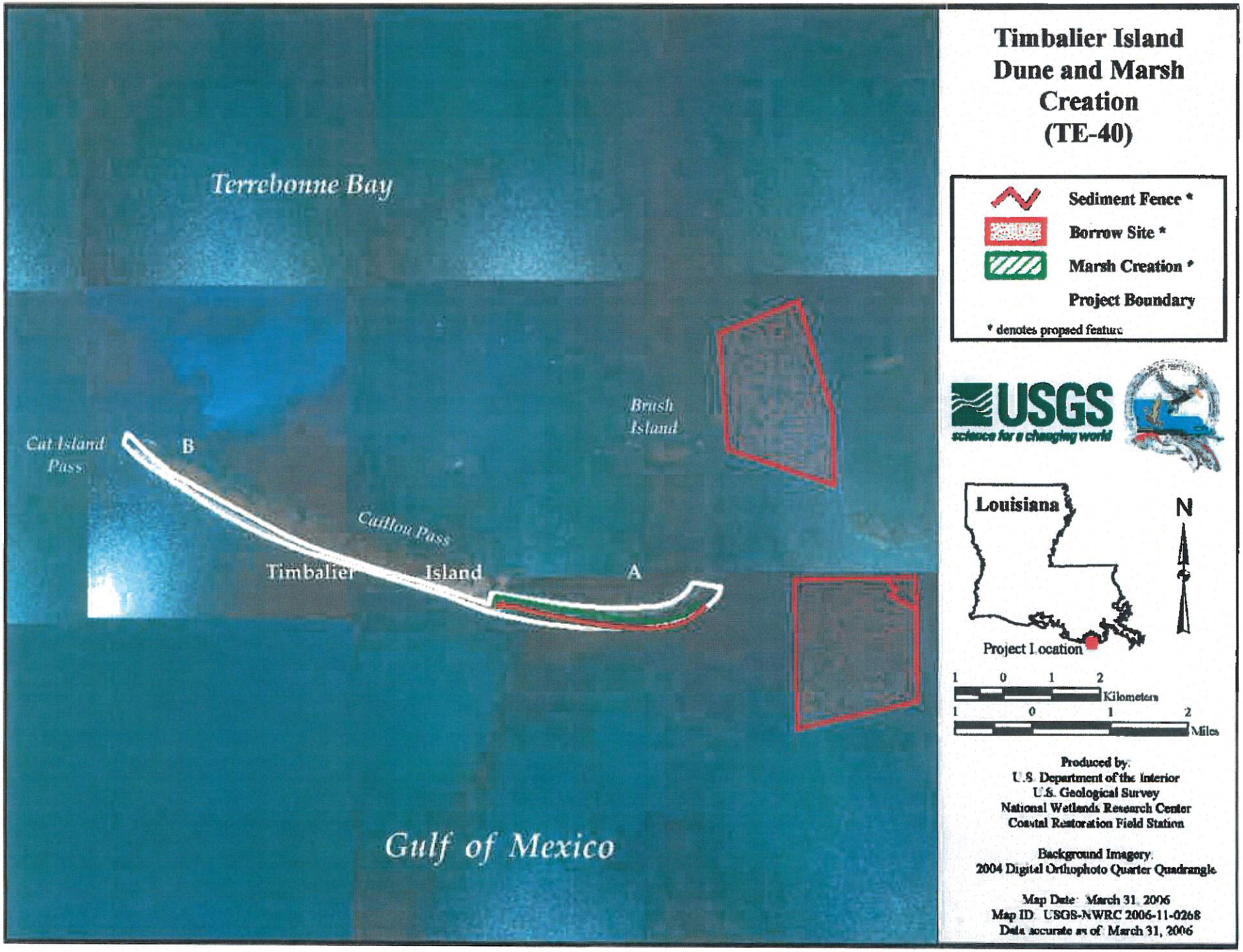
Construction funding was approved by the Louisiana Coastal Wetlands Conservation and Restoration Task Force in January 2003. Construction began June 2004 and dredging from the borrow site was completed in December 2004. This portion of the project was accepted in January 2005. The initial vegetative planting component began March 2005 and was completed in June 2005. The total cost of construction was $13,761,336. An additional row of sand fencing will be installed in spring 2006 along with an additional 40,000 plugs of smooth cord grass and 2,000 bitter panicum container plants.

This project is on Priority Project List 9.

For more project information, please contact:

Federal Sponsor:
U.S. Environmental Protection Agency
Dallas, TX
(214) 665-7255

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Timbalier Island Dune and Marsh Creation (TE-40)

Sediment Fence *

Borrow Site *

Marsh Creation *

Project Boundary

* denotes propsed feature

USGS science for a changing world

Produced by:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
2004 Digital Orthophoto Quarter Quadrangle

Map Date: March 31, 2006
Map ID: USGS-NWRC 2006-11-0268
Data accurate as of March 31, 2006

October 2009
Cost figures as of November 2011

Mandalay Bank Protection Demonstration (TE-41)

Project Status

Approved Date: 2000 **Project Area:** N/A
Approved Funds: $1.73 M **Total Est. Cost:** $1.73 M
Net Benefit After 20 Years: N/A
Status: Completed Sept. 2003
Project Type: Demonstration: Shoreline Protection
PPL #: 9

Location

The project is located on the Gulf Intracoastal Waterway (GIWW), just west of Houma, in Terrebonne Parish Louisiana, in the vicinity of Minors Canal. The project features will be installed in the Mandalay National Wildlife Refuge.

Problems

Erosion of canal banks is caused by the wakes of passing vessels on the GIWW. Wake action erodes the spoil banks and exposes the underlying organic soils. Once breakthrough occurs, bay-like areas form in adjacent areas through continued erosion.

Restoration Strategy

This project is intended to develop new techniques for protecting and restoring easily erodable organic soils. Intact banks and breakthroughs will be treated to determine the cost effectiveness of demonstrated approaches.

Progress to Date

The project was approved for engineering and design in January 2000 and construction in October 2001.

Construction was completed September 2003.

This project is on Priority Project List 9.

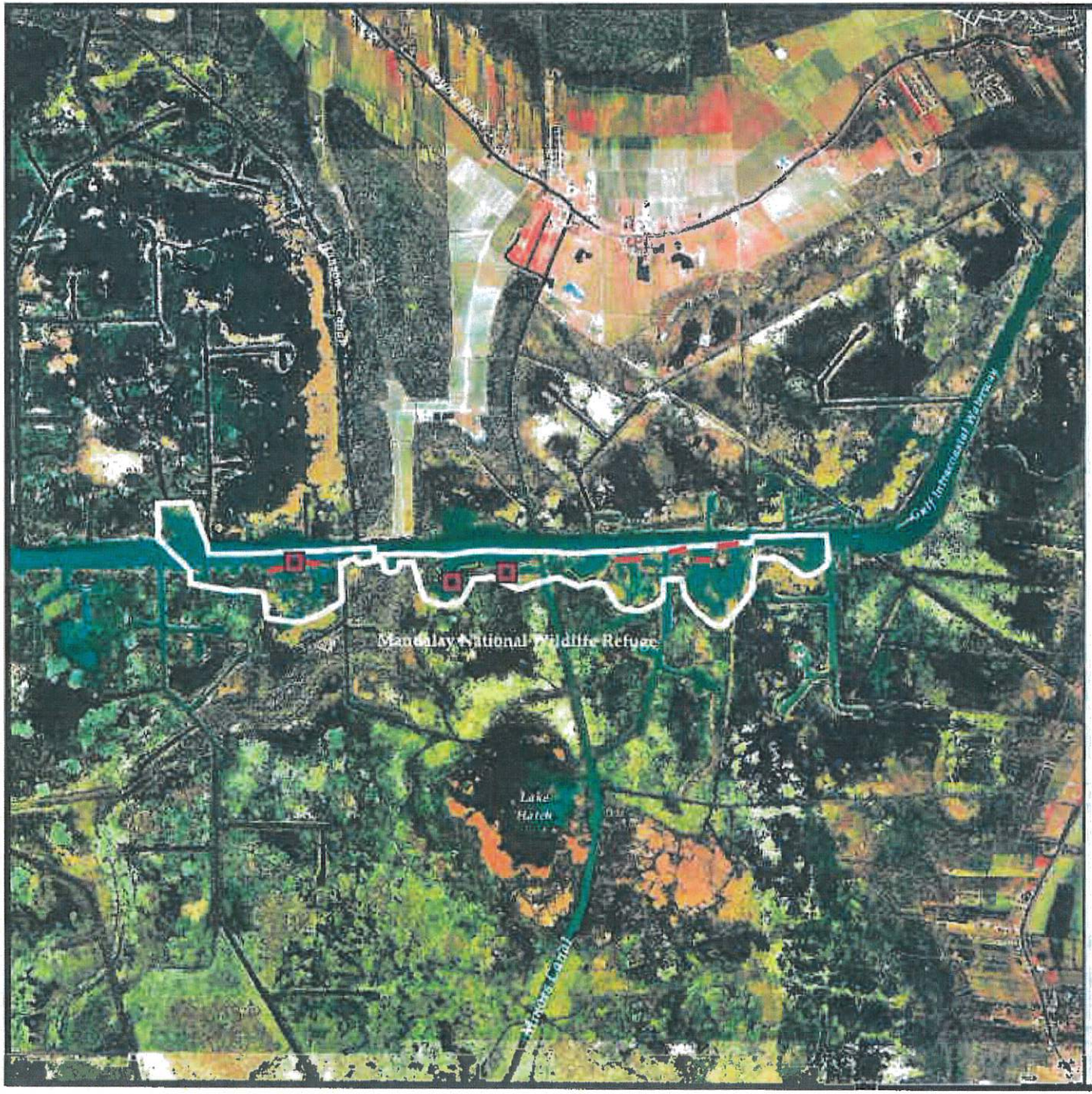
Breach along the southern bank of the GIWW in Mandalay NWR.

The project is located within the boundaries of Mandalay National Wildlife Refuge.

For more project information, please contact:

Federal Sponsor:
U.S. Fish and Wildlife Service
Lafayette, LA
(337) 291-3100

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Mandalay Bank Protection Demonstration (TE-41)

- Plugs*
- Shoreline Protection*
- Vegetative Plantings*
- Project Boundary

* denotes proposed features

USGS science for a changing world

0.5 0 0.5 1 Miles

0.5 0 0.5 1 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: August 25, 2003
Map ID: 2002-11-546
Data accurate as of: March 11, 2003

October 2002
Cost figures as of November 2011

Cote Blanche Hydrologic Restoration (TV-04)

Project Status

Approved Date: 1993 **Project Area:** 30,000 acres
Approved Funds: $8.53 M **Total Est. Cost:** $10.0 M
Net Benefit After 20 Years: 2,223 acres
Status: Completed Jan. 1999
Project Type: Hydrologic Restoration
PPL #: 3

Location

The 30,000-acre project in the marshes surrounding Marone Point is located approximately 10 miles southwest of Franklin, Louisiana, in St. Mary Parish.

Problems

Construction of several oilfield canals altered the hydrologic regime of Cote Blanche project area marshes. The result has been an increase in water exchange between interior marsh areas and East and West Cote Blanche Bays that directly contributed to marsh deterioration and loss. In addition, shoreline erosion has been a major problem, and breaches along the shoreline have begun to provide additional exchange points between interior marshes and the bays.

Restoration Strategy

Low-level weirs were constructed across seven major water exchange avenues in the Cote Blanche system. These passive weirs reduce the water exchange between the system's interior marsh and the outer bays, thereby preventing continued scouring of the marsh substrate and conversion to open water. The lower-energy hydrologic regime also encourages accretion of available sediment.

In addition, a PVC sheet-pile wall was constructed along 4,140 linear feet of shoreline between Jackson Bayou and the British American Canal to minimize wave-induced erosion.

Progress to Date

The project construction was completed in January 1999. Monitoring is ongoing, and preliminary field data has been gathered.

The most notable effect of the project was a reduction in the range of water level fluctuation. Since the project was completed, preliminarily analysis of monitoring data indicates the range in water level fluctuation increased or showed no change in the reference area, but decreased in the project area. This project is on Priority Project List 3.

A low-level weir constructed across the British American Canal within the project area.

This sheet-pile structure provides protection to the eroding shoreline. Metal caps were placed on the pilings to prevent the rotting of the wood.

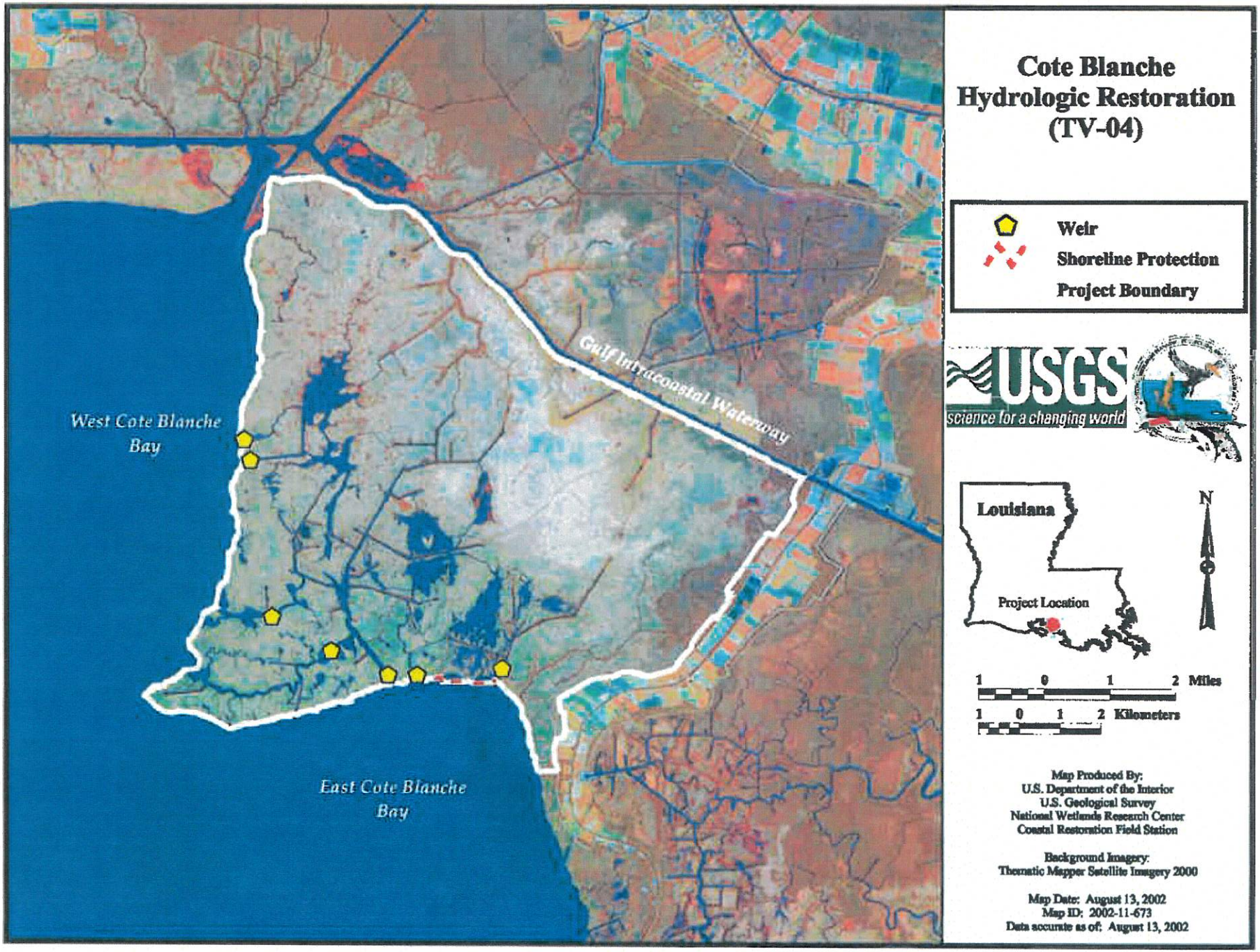
For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7816

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736



Cote Blanche Hydrologic Restoration (TV-04)

Weir
Shoreline Protection
Project Boundary

USGS
science for a changing world

Louisiana
Project Location

N

1 0 1 2 Miles
1 0 1 2 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
Thematic Mapper Satellite Imagery 2000

Map Date: August 13, 2002
Map ID: 2002-11-673
Data accurate as of: August 13, 2002

September 2010 (rev)
Cost figures as of November 2011

Oaks/Avery Canal Hydrologic Restoration, Increment 1 (TV-13a)

Project Status

Approved Date: 1997 **Project Area:** 3,348 acres
Approved Funds: $2.92 M **Total Est. Cost:** $2.92 M
Net Benefit After 20 Years: 160 acres
Status: Completed Oct. 2002
Project Type: Hydrologic Restoration
PPL #: 6

Location

This project is located in northeast Vermilion Bay in the vicinity of the Oaks and Avery canals and Tigre Lagoon, and in both Vermilion and Iberia Parishes, Louisiana.

Problems

Marsh loss is caused by increased tidal action and altered hydrology. The north shoreline of Vermilion Bay is eroding at a rate of 13 feet/year, and marine traffic is causing shoreline erosion along the Gulf Intracoastal Waterway (GIWW).

Restoration Strategy

This project will improve hydrology and reduce tidal fluctuation to minimize marsh loss and provide protection to critically eroding shoreline areas.

Project components include shoreline stabilization at the mouth of Oaks Canal; shoreline protection along the GIWW; a low sill rock weir at Cow Path Channel east of Oaks Canal; an armored plug in the breached opening along the Union Oil Canal; spoil bank maintenance on the western side of the Union Oil Canal; and vegetative plantings along the northern shoreline of Vermilion Bay from Oaks Canal eastward to Avery Canal.

The low sill rock weir east of the Oaks Canal and the armored plug at the Union Oil Canal will restore historic hydrologic conditions and reduce the surge effect of large marine traffic within interior marshes. The project will increase marsh, fish, and wildlife productivity by reducing shoreline erosion and improving altered hydrology.

By planting vegetation which is well suited to an intertidal environment, erosion along the shoreline of Vermilion Bay from Oaks Canal to Avery Canal will be reduced. The plantings will also result in creating diverse habitat for wading birds and other wildlife species.

Progress to Date

This project was approved by the Louisiana Coastal Wetlands Conservation and Restoration Task Force on April 24, 1997 and has both vegetative and structural components. The Natural Resources Conservation Service implemented the vegetative component and Louisiana Department of Natural Resources implemented the structural components. Approximately 34,000 smooth cordgrass plants were planted along 5.1 miles of the Vermilion Bay shoreline in the summer of 2000.

The monitoring plan was finalized in March 1999 and data collection has been ongoing since that time. Pre-construction aerial photography was collected in November 2000 and the first post-construction photography was collected in the fall of 2002. Monitoring elements to evaluate project effectiveness include submerged aquatic vegetation, emergent vegetation, shoreline movement, bathymetry, and water level.

This project is on Priority Project List 6.

For more project information, please contact:

NRCS Natural Resources Conservation Service

Federal Sponsor:
Natural Resources Conservation Service
Alexandria, LA
(318) 473-7756

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Oaks/Avery Canal Hydrologic Restoration, Increment 1 (TV-13a)

- Weir
- Plug
- Shoreline Stabilization
- Spoil Bank Maintenance
- Shoreline Protection
- Vegetative Plantings
- Project Boundary

USGS science for a changing world

Louisiana

Project Location

N

0.5 0 0.5 1 Miles

0.5 0 0.5 1 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: October 8, 2002
Map ID: USGS-NWRC 2003-11-003
Data accurate as of: October 8, 2002

Marsh Island Hydrologic Restoration (TV-14)

October 2002
Cost figures as of November 2011

Project Status

Approved Date: 1997 **Project Area:** 6,697 acres
Approved Funds: $5.14 M **Total Est. Cost:** $5.14 M
Net Benefit After 20 Years: 408 acres
Status: Completed Dec. 2001
Project Type: Hydrologic Restoration
PPL #: 6

Location

This project is located in Iberia Parish, Louisiana, on the eastern portion of the Marsh Island State Wildlife Refuge, also known as Russell Sage Refuge, and surrounds Lake Sand.

Problems

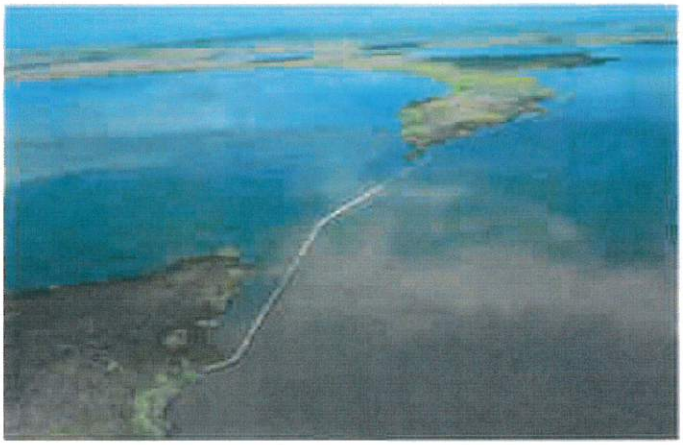
Natural erosion and subsidence, as well as the construction of navigation canals along the northeast shoreline of Marsh Island, have led to the deterioration of the north rim of Lake Sand and the interior marshes.

Restoration Strategy

This project stabilizes the northeastern shoreline of Marsh Island, including the northern shoreline of Lake Sand, and helps restore the historic hydrology. Project components include the construction of 7 closures for oil and gas canals at the northeast end of Marsh Island and the protection of the northeast shoreline with rock including the isolation of Lake Sand from Vermilion Bay.

The dams in the existing oil and gas canals do not reduce estuarine fisheries access to area marshes because there are other fisheries access points into the project area through natural bayous.

The project increases marsh, fish, and wildlife productivity by reducing shoreline erosion and correcting altered hydrology.



Project features include shoreline protection, canal closures, and isolation of Lake Sand from Vermilion Bay with a rock dike on the northeastern edge of Marsh Island. View is looking west.

Progress to Date

Construction was completed in December 2001.

The monitoring plan was finalized in January 2000 and data collection has been ongoing since that time. Pre-construction aerial photography was collected in November 2000 and the first post-construction photography is scheduled for fall of 2004. Water level, submerged aquatic vegetation, and shoreline movement data are also being collected to evaluate project effectiveness.

This project is on Priority Project List 6.

For more project information, please contact:

US Army Corps of Engineers
New Orleans District

Federal Sponsor:
U.S. Army Corps of Engineers
New Orleans, LA
(504) 862-1597

CPRA

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

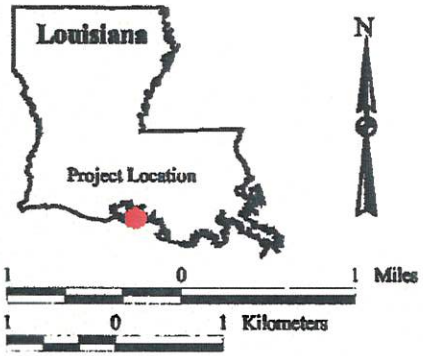
Marsh Island Hydrologic Restoration (TV-14)

Closure

Shoreline Protection

Project Boundary

USGS science for a changing world



Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: July 26, 2002
Map ID: 2002-11-717
Data accurate as of: July 26, 2002

Four Mile Canal Terracing and Sediment Trapping (TV-18)

October 2007
Cost figures as of November 2011

Project Status

Approved Date: 2000 **Project Area:** 1,214 acres
Approved Funds: $2.08 M **Total Est. Cost:** $3.79 M
Net Benefit After 20 Years: 167 acres
Status: Construction
Project Type: Sediment and Nutrient Trapping
PPL #: 9

Location

The project is located approximately 4 miles south of Intracoastal City in Vermilion Parish, Louisiana. The project area includes all of Little White Lake and part of the northeastern embayment of Little Vermilion Bay.

Problems

The main cause of current marsh loss is a shoreline erosion rate of approximately 8 feet/year. A combination of wind and wake energy prevents sediments introduced by the Gulf Intracoastal Waterway (GIWW) via the Vermilion River and Four Mile Canal from allowing subaerial marsh development in the area.

Restoration Strategy

Reduction of shoreline erosion will be achieved by the buffering capacity of the constructed terraces. The proposed terrace layout is very different for each area of the project. The "fish net" design for Little Vermilion Bay is designed to allow sediment deposition and the terraces in Little White Lake are aligned to reduce the wind-generated waves, thus reducing shoreline erosion. Thus, marsh habitat will be created in two ways within the Four Mile Canal Terracing Project area. First, marsh will immediately be built by creating approximately 90 terraces from dredged material and planting them with smooth cordgrass. This action alone will create 70 acres of subaerial land. Second, by reducing fetch and wave energy, terraces will promote the deposition of suspended sediments in the shallow water adjacent to the terrace edges in Little Vermilion Bay and Little White Lake. This will slowly build marsh over the life of the project as subaerial land is built and plants naturally become established.

The proposed terraces at Four Mile Canal will be constructed in a similar fashion as shown above. The above photo is of the *Captain Buford Berry* constructing terraces at the project at Little Vermilion Bay (TV-12).

Progress to Date

The cooperative agreement was awarded September 25, 2000. As a result of mitigation agreements between the Louisiana Department of Natural Resources and an energy company, an original construction feature for the Onion Lake area of the project has been removed. However, project goals and objectives will be maintained by enhancing the remaining features.

This project is on Priority Project List 9.

For more project information, please contact:

Federal Sponsor:
National Marine Fisheries Service
Baton Rouge, LA
(225) 389-0508

Local Sponsor:
Coastal Protection and Restoration Authority
Baton Rouge, LA
(225) 342-4736

Four Mile Canal Terracing and Sediment Trapping (TV-18)

Terrace*

Project Boundary

* denotes proposed features

USGS science for a changing world

Louisiana

Project Location

N

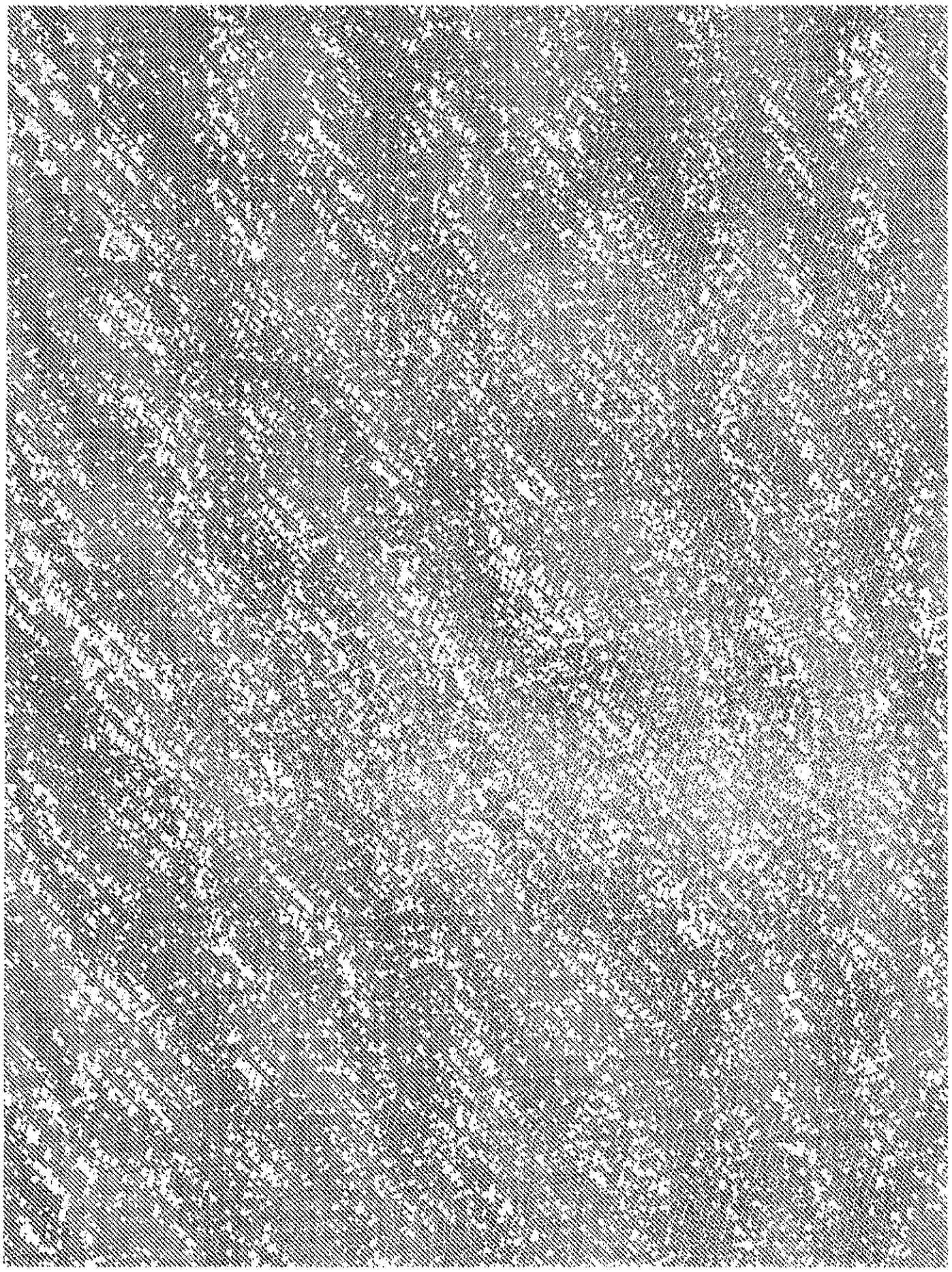
0.5 0 0.5 Miles

0.5 0 0.5 Kilometers

Map Produced By:
U.S. Department of the Interior
U.S. Geological Survey
National Wetlands Research Center
Coastal Restoration Field Station

Background Imagery:
1998 Digital Orthophoto Quarter Quadrangle

Map Date: November 13, 2002
Map ID: 2002-11-535
Data accurate as of: November 13, 2002



OM&M Report Summary
2011 Projects

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2011 Projects

Project #	Project Name	Type	Parish	Goals	Achieved	If not, why?	Lessons Learned
BA-03c/BA-26	Naomi Outfall Management/Barataria Bay Waterway East Side Shoreline Protection	SP	Jeff &Plaq	Manage the diverted freshwater from the Naomi siphons in the project area via the installation of two water control structures designed to reduce freshwater loss and saltwater intrusion; rebuild the east bank of the BBW to protect the adjacent marsh from erosion due to boat wakes, and saltwater intrusion. 1. Reduce the mean salinity in the project area. 2. Improve the growing conditions and increase the relative abundance of freshwater-to -intermediate marsh species 3. Reduce the rate of conversion of marsh to open water in project area.	1. partial 2. ND 3. yes	The siphons need to be run more frequently and at a greater flow rate. More efficient water retention structures are needed. A redesign of the siphons to allow them to flow during low river stages would allow for fresh water to enter the project area when it is most needed. The influence of the siphons rapidly decreased with distance.	The freshening potential of the siphons is not being fully-realized due to limited usage and flow. The two boat-bay weirs are not sufficient deterrents to water exchange between the project area and the Barataria Bay Waterway, likely, in part, due to their setting.
BA-20	Jonathan Davis Wetland Protection	WP	Orleans	Use structural measures to restore hydrologic conditions that reduce water level and salinity fluctuations (variabililty) and allow freshwater retention to increase the quantity and quality of emergent vegetation, and to reduce wetland loss through hydrologic restoration and reduce erosion through shoreline protection.	yes/ND	The effect of the weir and plug features on salinity is inconclusive. They do not appear to be reducing variation in salinity and water level as stated in project goals. Erosion was reduced and shoreline acreage was increased.	A staggered long-term construction regime can have an adverse effect on data interpretation. Monitoring of a project should be scheduled from 1-3 years pre-construction and 3-5 years post-construction, as determined by the final date of construction, not the start of construction. The rock dike was successful in reducing shoreline erosion, however, a zero crown width should not be used.
BA-23	Barataria Bay Waterway West Side Shoreline Protection	SP	Jeff &Plaq	Re-establishment of a hydrologic barrier to protect marsh and open water from wave action, water level flux, and saltwater intrusion.	yes	N/A	Future projects should be carefully classified according to the monitoring needs of the entire project and care should be taken as to what funding classification is used to ensure monitoring needs are met (not just the integrity of constructed features).
BA-37	Little Lake Shoreline Protection/Dedicated Dredging Near Round Lake	SP	Lafourche	1. Reduce marsh edge erosion rates along the Little Lake and Round Lake shorelines. 2&3. Create and nourish intermediate or brackish marshes. 4. Maintain emergent marsh at the end of the 20 year period.	1. Partial 2&3 Yes 4. Yes	The shoreline fronting the marsh creation area incurred minimal shoreline erosion while the lake rim shoreline showed considerable erosion. Increased erosion in the lake rim areas occurred and then massive erosion occurred during the 2005 hurricane season.	The area around BA-37 consists of large acreages of broken and subsided marsh. These areas have low contours that are conducive to marsh creation and nourishment. Nourishing the lake rim shoreline with mineral sediments may have been a viable alternative to lowering the shoreline erosion rates in the lake rim area. The marsh creation and nourishment area was in agreement with its consolidation curve. Pre-construction geotechnical data underestimated the primary settlement in the foreshore rock dike. Accurate and detailed geotechnical data is important particularly along shoreline with poor load-bearing soils. Habitat mapping or land/water classification data should have been collected to monitor habitat over time. The constructed marsh created several diverse plant communities that are only being assessed through elevation data.

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BS-03a	Caernarvon Diversion Outfall Management	Div	Plaquemines	1. Reduce marsh loss 2. Reduce salinity variation in interior marshes 3. Increase the occurrence and abundance of fresh/intermediate marsh type plant species 4. Increase the occurrence of submerged aquatic vegetation (SAV) in shallow open-water area.	1. NA 2. mixed result 3. NA 4. no	1. Land loss was not assessed due to lack of aerial photography to compare pre-and post- construction gains/loss and Katrina damage. 2. Some areas showed a positive effect, however, mean salinity overall was higher, while rearrangement of topography and hydrology by Katrina increased salinity variance in other areas. 3. Percent cover of vegetation increased, but intermediate species response varied. There was significant damage to marsh and project structural features. 4. SAV is no longer monitored due to effects of Katrina	Properly consider the structural integrity of existing topographic features that project structures will depend on to function. Costs of maintenance due to subsidence, increased water velocity or erosion should be included in the selection criteria. Potential impacts of emergent invasive species, such as water hyacinth promulgated by a lower salinity environment, should be evaluated and resources incorporated into the budget for the control of these occurrences. The majority of the marsh that remained post-Katrina was adjacent to spoil banks that had woody vegetation. Ridges with trees may be a highly beneficial restoration technique in freshwater marshes to hold the adjacent marsh.The distribution and retention of diversion waters is more effective at lower flow rates.
CS-11B	Sweet Lake/Willow Lake Hydrologic Restoration	HR	Cameron	Protect emergent marsh by reducing shoreline erosion and increase the acreage of emergent and submerged aquatic vegetation (SAV) within the project area. Specifically, 1. Reduce the erosion rate along the lake shorelines adjacent to the terraces with vegetative plantings of *Zizaniopsis miliaceo* 2. Decrease the rate of marsh loss in the project area. 3. Increase the coverage of emergent wetland vegetation and submerged aquatic vegetation (SAV) in the shallow open water areas in the terracing/vegetative planting section of the project.	yes/no	Rock dike was very effective at restraining the water and suspended sediments; open water and shoreline terraces were ineffective at reducing wave energy.	Vegetative plantings should be installed as early as possible within the growing season to allow time for the plantings to become established. Terraces were spaced too far apart and the crown and side slopes were not large enough. Sacrificial terraces built in front of the proposed terraces could be beneficial in decreasing wave erosion and allowing ample time for plantings to become established.
CS-24	Perry Ridge Shore Protection	SP	Calcasieu	Protect the existing emergent wetlands along the north bank of the GIWW and prevent their further deterioration from shoreline erosion and tidal scour. Prevent the widening of the GIWW into the project area wetlands. Reduce the occurrence of salinity spikes within the project area. Decrease the rate of shoreline erosion along the north bank of the GIWW using a rock dike.	yes	The project has been effective at preventing shoreline erosion. Project stations was prograded while the shoreline in the reference area stations continued to retreat. Visual observation indicates vertical accretion of the wetland area at 23 of 25 monitoring stations between the foreshore rock dike and the shoreline.	No improvements are currently being recommended.
CS-28	Sabine Refuge Marsh Creation , Increment 1	MC	Cameron	Create new vegetated marsh and enhance and protect existing marsh vegetation. Place dredge spoil slurry to a maximum height of 4.5 ft. (1.4 m) MLG to settle to a height of 2.5 ft (0.8 m) MLG, after five years, for each of five dredging cycles. Create 125 acres of vegetated wetlands in the first dredge placement cycle and 230 acres in each cycle for Cycles 2 through 5. Reduce loss of existing surrounding marshes within the project area.	yes	The acreage created will help protect interior marshes from saltwater intrusion. Specific goals of creating marsh that settles to 2.5 ft MLG, creating land in the dredge cycles, and reducing land loss appear to have been achieved.	Dredge cells will vegetate without the addition of plantings on the edge. The seed bank alone was sufficient. It is not necessary to pre-dig trenasses for tidal ingress and egress. The track hoe/marsh buggy can be driven over the area where tidal channels are desired approximately one year after pumping to create channels. Pre-digging trenasses is costly and can interfere with the placement of the dredged material.

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ME-04	Freshwater Bayou Wetland (Phases 1 &2)	WP	Vermilion	Protect the existing emergent wetlands along the west bank of Freshwater Bayou Canal and prevent their further deterioration from shoreline erosion and tidal scour. Reduce ponding and marsh loss in the project area wetlands. Increase vegetation cover in shallow open water areas within the project area wetlands. 1. Decrease the rate of soil bank erosion along the west bank of the canal using a rock breakwater. 2. Reduce water levels to within the target range of fresh to intermediate marsh vegetation, which is 6 in (15 cm) below to 2 in (5 cm) above marsh level. 3. Maintain salinity levels within the target range for fresh to intermediate marsh vegetation which is 0-5 ppt. 4. Decrease the duration and frequency of flooding over the marsh. 5. Decrease the rate of marsh loss. 6. Increase the coverage of emergent vegetation in shallow open water areas within the project area.	mixed	Shoreline along the west bank of of the project significantly reduced erosion. The project does not appear to be effective in keeping water levels within he desired range (less than half the time). Salinity stayed within the target range in project area most years, but this is not a project effect. Vegetation is not benefitting and is not filling open spaces. Vegetation was severely impacted by Hurricane Rita and Hurricane Ike. Marsh loss was lower, but land gain did not occur.	The water control structures that were constructed, operated and maintained by the land owner are not included in the Operation and Maintenance Plan. Projects where the landowner has total control over the operation of existing water control structures and over the installation and operation of additional structures has been discontinued. In order to prevent further wetland degradation along the FBC, especially in the project area, and adjacent marshes, and to prevent increased saltwater intrusion into the part of the Chicot Aquifer, any deepening and widening of the Freshwater Bayou Canal to Port of Iberia Canal shipping lane must be mitigated by the installation and maintenance of canal embankments, preferably armored with rock or protected by rock dikes.
ME-19	Grand-White Lakes Landbridge Protection	SP	Cameron	The goal is to prevent coalescence of Grand, Collicon, and Round Lakes. Stop erosion along the southeastern shoreline of Grand Lake and the northern and western shorelines of Collicon Lake. Create a total of 17 acres of emergent marsh along the southeastern shoreline of Grand Lake and 10 acres of emergent marsh along the northern and western shorelines of Collicon Lake. Reduce erosion along the southern shoreline of Round Lake by 50 %.	yes	The width of the land bridge has broadened. The rock dike has reversed erosion along the southeastern shoreline of Grand Lake; earthen terraces have significantly reduced erosion on the northern and western shoreline of Collicon Lake. Land has been gained, but not as much as targeted. Erosion reduction along the sourthern shoreline of Round Lake by 50% has not been monitored. But vegetation on the remaining terraces is beginning to resemble the marsh on the land bridge.	Although the lakeside terraces were intitally effective at buffering the marshside terraces, the high rate of lakeside terrace loss has made the marshside terraces vulnerable. Sizeable wave generation has degraded the earthen terraces. Roseau cane has been effective in maintaining terraces thus far; high water-levels will not allow for a successful planting event. Armoring the lakeside slope of terraces should be considered.
PO-17	Bayou LaBranche Wetland Creation	MC	St. Charles	Create new vegetated wetlands in the Bayou LaBranche area utilizing dredged sediments: 1. Create approx. 305 acres of shallow-water habitat conducive to the natural establishment of emergent wetland vegetation. 2. Increase the marsh:open-water ratio in the project area to a minimum of 70% emergent marsh to 30% open water after 5 years following project completion.	yes	N/A	Gaps should be created in the containment dikes to increase tidal exchange for increased productivity of the project. A greater degree of coordination between biologists and engineers should occur. Data gathered for calculating and maintaining the correct elevation of the dredged material and its placement were the most important aspects of project. Adjacent borrow area filled and was not a constraint towards the success of this project.

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PO-22	Bayou Chevee Shoreline Protection	SP	Orleans	The objective of the Bayou Chevee Shoreline Protection project is to provide shore protection for the north cove and south cove areas of the Bayou Sauvage National Wildlife Refuge and enhance the establishment of submerged aquatic vegetation in the south cove are while maintaining or enhancing their establishment in the north cove area. Decrease the mean rate of shoreline erosion in both the north and south cove areas. Maintain (north cove) or maintain/increase (south cove) mean abundance of submerged aquatic vegetation in the ponds behind the rock dikes.	yes	N/A	Efforts should be taken in the future to minimize construction delays. Rock structures should terminate on land to prevent the "erosional shadow" created by having the rocks end in open water. Heavy erosion along north facing shorelines shows the need to consider prevailing wind direction and wave angles in project design.
TE-22	Point Au Fer Canal Plugs	HR	Terrebonne	Reduce marsh loss and the potential for saltwater intrusion from storm surges and high tides, and restore hydrologic circulation to conditions present before the dredging of the pipeline canals. In Phases II and III, the objective is to reduce the chance of breaching between the Gulf of Mexico and the Mobil pipeline canal during overwash events, thereby reducing the potential for interior marsh loss. Reduce the rate of marsh loss (Phase I), Reduce the rate of canal widening (Phase I). Maintain or decrease local shoreline erosion rate within the project area (Phase II and III).	yes/no	Goal to maintain or decrease shoreline erosion rate within Phase II and II project areas was accomplished. Reduced rate of marsh loss in Phase I was not achieved. It was not possible to determine affect of plugs.	The experimental design of the project was not able to adequately measure the attainment of reducing marsh loss. Canal plugs and petraflex mats enhanced the rate of interior marsh loss. Analysis of hydrological and vegetation data would have aided in determining water movement and vegetation structure within the Phase I project and reference areas over time. Although the CRMS sites did provide this type of data, there is no project specific data to compare. As a result, there was no mechanism in place to test the effectiveness of the structures in attaining this project goal.
TE-26	Lake Chapeau Sediment Input and Hydrologic Restoration, Point Au Fer Island	MC/HR		To convert approximately 168 acres of open water to marsh at a mean elevation of 0.5 ft. west of Lake Chapeau between the Locust Bayou and Alligator Bayou watersheds using sediment mined from Atchafalaya Bay, and to restore natural sediment and hydrologic pathways by plugging canals in the project area.			
TE-41	Mandalay Bank Protection Demonstration	DEMO	Terrebonne	Stop shoreline erosion in specified segments along the GIWW.	mixed	The geometry, orientation, distance from the GIWW, and the size of some of the treatment areas contributed to the success of the replicates within the treatment area. The highest positive shoreline change rate occurred along the blowout reference shoreline segments while the off-bank reference segments experienced the only negative change.	The treatments placed in blowout areas and shallow off-bank embayments seem to be more efficient at capturing sediments and raising shoreline contours than the treatments placed along the linear segments of the shoreline. Mean vegetation cover increased; bare ground decreased; species diversity increased 1. The sedimentation patterns along the GIWW shorelines seem to be governed by the shoreline geometry. Blowout and embayment segments of the shoreline tend to aggrade while linear shoreline eraches tend to have reduced sedimentation. 2. As-built drawings and associated GPS files for the plantings should be provided for projects like this as they are important tools for monitoring percent survival. 3. Pre-construction survey data should be available for comparison with as-built and post-construction survey data to aid in the assessment of elevation and shoreline position changes. 4. The structures in this demo project were relatively durable with small amounts of differential settlement. The treated lumber fencing and fiberglass sheet pile treatments did not display any secondary settlement.

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TV-04	Cote Blanche Hydrologic Restoration	HR	St. Mary	1. Decrease water level variability within the project area 2. Reduce erosion rate of shoreline along southern project boundary. 3. Decreae the rate of marsh loss.	yes to all	Cote Blanche Hydrologic Restoration project has been successful at decreasing water level variability within the project area, reducing shoreline erosion, and decreasing the rate of marsh loss, from 1999-2010.	Protect structures from breaches by hardening the bank at each wingwall with rock. Rock should be placed at aan elevation that allow extrememtly high tidal events to pass around the structure without scouring the banks.
TV-14	Marsh Island Hydrologic Restoration	HR	Iberia	1. Reduce water level variability. 2. Decrease the rate of marsh loss. 3. Reduce erosion of the northeast shoreline of Marsh Island. 4. Increase the occurrrence of submerged aqautic vegetation in Lake Sand and in shallow open water.	yes/partly	The project has been effective at reducing water level variability. SAV was beginning to improve in the project area prior to Hurricanes Rita and Ike but it has been virtually absent since the storms. The goal to reduce the erosion rate of the northeast shoreline waws partially met. Protected areas showed signs of accretion prior to Hurricane Katrina.	The stone bank paving installed at each end of Closure No. 5 after Hurricane Lili proved to be successful in preventing erosion during the Hurricane Rita storm surge event. This application will be applied to other closures sites for bank stabilization and protection.
TE-40	Timbalier Island Dune/Marsh Restoration	BS/MC	Terrebonne	To restore the eastern end of Timbalier Island and to maintain the lateral migration of Timbalier Island. 1. Determine the area, average width, length, and position of Timbalier Island and the project area over time. 2. Determine the effectiveness of project features in reducing the rate of erosion as compared to historical rates of erosion and maintaining the littoral transport of the shoreline. 3. Determine sediment characteristics and their change over time. 4. Determine the evolution of tidal channel development. 5. Determine elevation and habitat classes in the project area.	1. No 2. Yes 3. ND 4. No 5. No	1. Cross-shore transport induced by the 2005 and 2008 hurricanes are the primary reason why this goal is not being realized. Width and area have been expanded but elevation and habitat data are not being collected. 3. Not monitored. 4. No depressions fitting the sinusoidal pattern of tidal creeks were found within the three tidal creek areas. 5. Elevation and subaerial habitats area declining due to the magnitude and frequency of tropical storm activity. Elevation and habitat data are not being collected.	1. Elevation surveys should extend beyond the fill area boundary. There was no mechanism in place to estimate the volume of sediment that was transported and relocated outside of the fill area. 2. Data collection efforts should be more cohesive. Sampling efforts after the first post-construction elevation surveys and habitat mapping events were fragmented (not done at similar times) and limiting. 3. Only summary statistics and shoreline change data can be used to describe the impacts of the 2008 hurricanes because no surveys of the fill area or habitat maps have been created after the 2008 hurricane. 4. The passage of four 100 year storms within a three year period (Katrina, Rita, Gustav, and Ike) is highly unusual and has substantially altered the geomorphology of the fill area. Portions of the fill area did recover and expand after the 2005 hurricanes, but large scale recovery of subaerial habitat within the fill area probably will not occur following the 2008 hurricanes.

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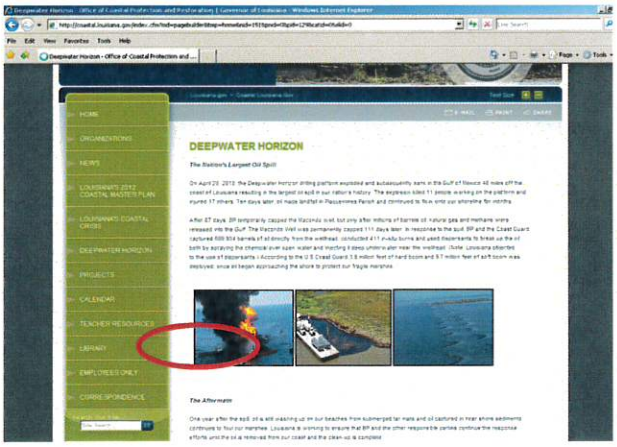
TV-18	Four Mile Canal Terracing and Sediment Trapping	Terracing		1. Create 70 acres (28.3 ha) of earthen terraces within the project area immediately after construction. 2. Reduce shoreline erosion rates by 50% (reduce from 8 ft/yr to 4 t/yr) over the 20 year project life. 3. As a result of goals 1 and 2, achieve a 9% (approximately 17 acres [6.9 ha]) net increase in marsh habitat by the end of the 20 year project. 4. Increase submerged aquatic vegetation (SAV) coverage from 0% to 25% of the project area by the end of the 20 year project life. 5. Increase fisheries utilization of the project area.	yes partial yes N/A N/A	The outer row of terraces have eroded in the highest energy environments but the shorelines have been protected for the most part.The terraces effectively protected the shoreline in Little Vermilion Bay where the protected southern shoreline gained land behind the terraces and the unprotected northern shoreline continued to erode. Parts of the western shore of Little White Lake continued to erode despite being protected while the northern shoreline gained land. The new land became vegetated by Spartina alterniflora. Land to water ratios has increased over time in both areas.	Terraces created in high energy environments such as the ones located adjacent to the Four-Mile Canal may benefit from a hard structure, fence, or breakwater to minimize the erosive effects from boat wake traffic. In order to evaluate earthen terrace settlement and any vertical accretion between the terraces, a structural assessment survey performed by a licensed engineering/ land surveying firm is recommended within the first 5 years of construction.
TE-28	Brady Canal Hydrologic Restoration	HR					Awaiting comments from federal sponsor.
TV-13a	Oaks/Avery Canal Hydrologic Restoration , Increment 1	HR					Awaiting comments from federal sponsor.

Document Reference System and
CRMS Data Access Instructions

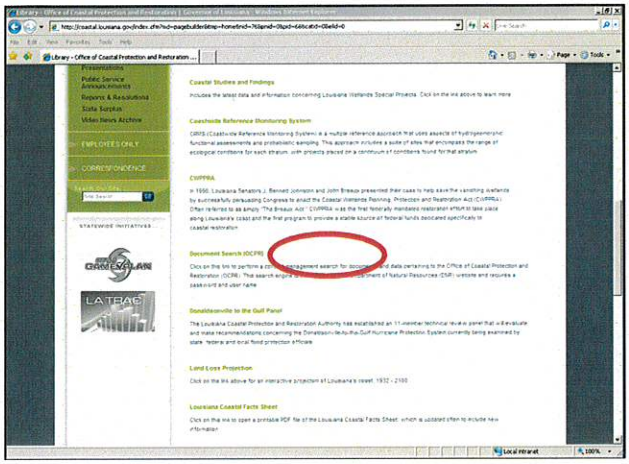
Accessing CPRA's Online Document System

1. Start at www.Coastal.Louisiana.gov

2. Expand the "LIBRARY" tab.

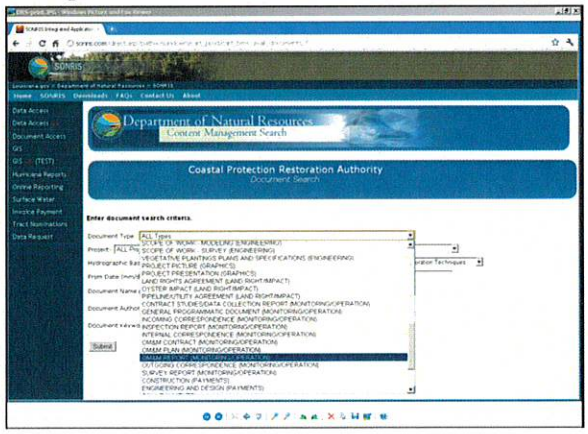


3. Scroll down and select the "Document Search (OCPR)" link. This will open up the Document Search screen.



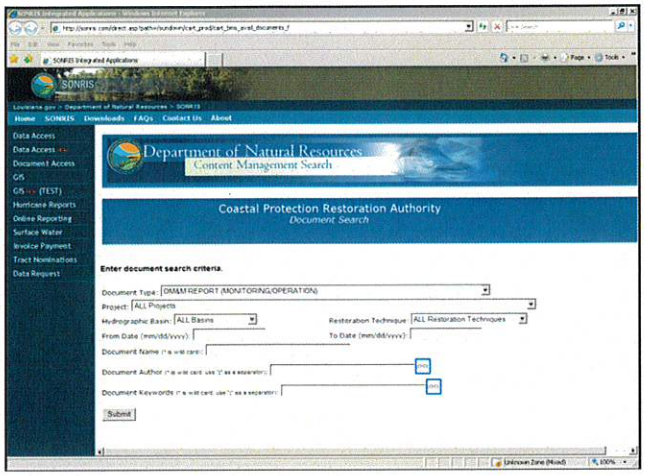
Use pull-down pick lists to specify your preferred combination of search criteria:

a. Document Type
b. Project
c. Hydrographic Basin
d. Restoration Technique



4. Use optional custom search fields to add further criteria to refine your search:

a. Date Range
b. Document Name
c. Document Author
d. Document Keywords

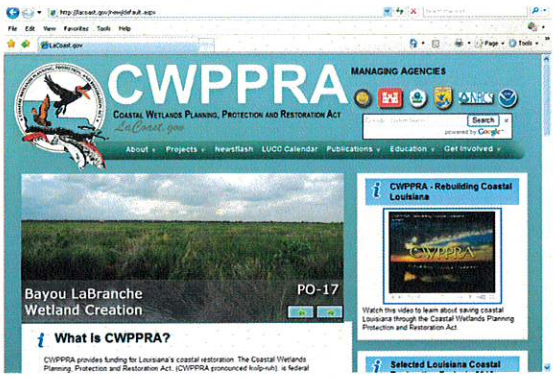


5. Note "eyeglass" icons will open windows showing you complete lists of all available Authors and Keywords

6. Hit "SUBMIT" button to initiate search.

Accessing Coastwide Reference Monitoring System (CRMS) Data Online

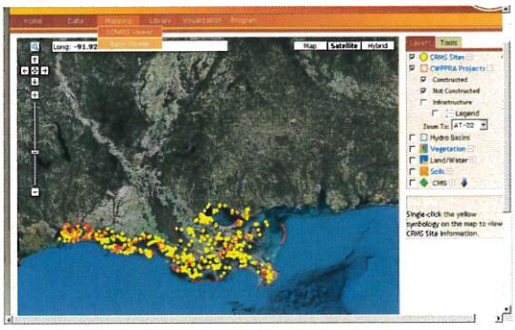
1. Navigate to the CWPPRA website: www.lacoast.gov



2. Scroll to the bottom of the page and click on the CRMS logo in the lower right corner.

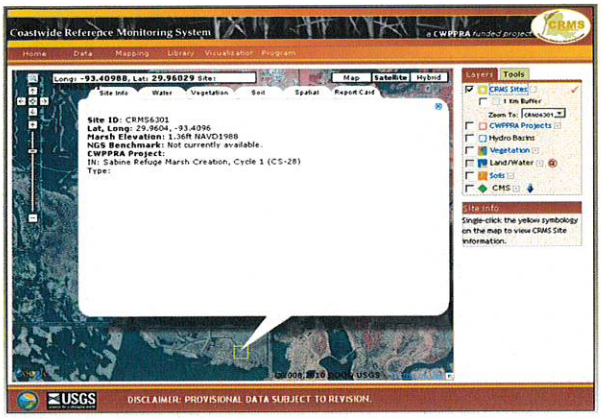
3. Under the Mapping Tab, click on basic viewer (Mapping/Basic Viewer). You should now be on the following web address: http://www.lacoast.gov/crms_viewer/

4. Make sure that the CRMS Sites layer is checked. Then click on the "+" to expand that layer. You can now zoom to a specific CRMS site. Select a CRMS site from the drop-down list.

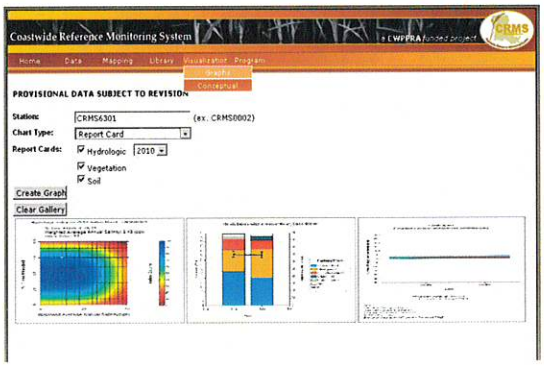


5. The map will zoom to that site. If you click on the dot, the data tabs will appear.

6. You can browse the site data by selecting the various tabs.



7. You can also get larger data sets and more options by using the Visualization/Graphs screen. You will need to type in the CRMS site number and then select the parameter (chart type) from the drop down menu. Select a start date or use the default date and then click on create graph.



8. More detailed information can be found on the CRMS website.