State of Louisiana
Department of Natural Resources
Coastal Engineering Division

2006/2007 Annual Inspection Report

for

BLACK BAYOU HYDROLOGIC RESTORATION PROJECT (CS-27)

State Project Number CS-27
Priority Project List 6

November 8, 2006
Calcasieu and Cameron Parishes

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I. Introduction

The Black Bayou Hydrologic Restoration Project (C/S-27) is located approximately 18 miles west-northwest of Hackberry, Louisiana in northwest Cameron and southwest Calcasieu Parish. The project is bordered to the north by the Gulf Intracoastal Waterway (GIWW), to the south by Black Bayou, to the east by Gum Cove Ridge, and to the west by the Sabine River (figure 1). Total project area is approximately 25,529 acres and is comprised of approximately 6,516 acres of fresh/intermediate marsh, 7,353 acres of brackish marsh, and 11,660 acres of open water. (See Appendix A).

The Black Bayou Hydrologic Restoration Project was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended and approved on the sixth Priority Project List. The Black Bayou Hydrologic Restoration Project has a twenty year (20 year) economic life, which began in December 2003.

II. Inspection Purpose and Procedures

The purpose of the annual inspection of the Black Bayou Hydrologic Restoration Project (CS-27) is to evaluate the constructed project features to identify any deficiencies and prepare a report detailing the condition of project features and recommended corrective actions needed. Should it be determined that corrective actions are needed, LDNR shall provide, in the report, a detailed cost estimate for engineering, design, supervision, inspection, and construction contingencies, and an assessment of the urgency of such repairs (O&M Plan, 2004). The annual inspection report also contains a summary of maintenance projects, if any, which were completed since completion of constructed project features and an estimated projected budget for the upcoming three (3) years for operation, maintenance and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix C.

An inspection of the Black Bayou Hydrologic Restoration Project (CS-27) was held on November 8, 2006 under clear skies and mild temperatures. In attendance were Stan Aucoin and Herbert Juneau of LDNR. NOAA Fisheries was represented by John Foret. Also on this trip was Bill Hicks of the USACE for an annual inspection of a USACE project. Parties met at the Lafayette Field Office of CED and proceeded to a boat launch in Orange, TX. Darrell Pontiff of LDNR, after launching the boat, traveled to the Ellender Bridge to pick us up after the inspections, cutting travel time in the boat in half. The annual inspection began at the rock weir on Block's Creek.

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

III. Project Description and History

In the early 1900's the marshes in the project area supported vegetation typical of fresh or very low salinity conditions (i.e. *Spartina patens, Typha sp.*, and *Scirpus sp.*). The introduction of water and sedimentation into the project area was influenced mainly by precipitation, local drainage, and wind and tide generated water exchange associated with Sabine Lake through overland flow and small, meandering bayous. Marsh elevation was maintained through vegetative biomass production which compensated for losses due to subsidence and sea level rise (USDA/NRCS 1997). More recently, wetlands in the Black Bayou area have suffered a loss of approximately 10,000 acres, 33% of the project area. Factors contributing to these losses include, but are not limited to, hydrological changes; reduced freshwater inflow from the uplands north of the GIWW; increased magnitude and duration of tidal fluctuations; increased salinities; higher water levels; excessive water exchange; and
Artificial water circulation patterns (NMFS 1996).

Beginning in the late 1800's significant hydrologic changes effecting water level fluctuation and water circulation patterns occurred in the project area. Modifications to Calcasieu Pass such as the removal of the Calcasieu Pass oyster reef in 1876, increased the magnitude and duration of tidal fluctuations in both the lake and the surrounding marshes (LDNR 1993). Construction of the GIWW, North Line Canal, Central Line Canal, and South Line Canal established a hydrological connection between the Calcasieu and Sabine basins, allowing the saline waters of the Calcasieu Basin to encroach on the Sabine Basin. During ebb tide, these canals drain project area marshes simultaneously into both Sabine and Calcasieu Lakes. Water level fluctuations are also influenced by wind. A strong north wind can cause drastic de-watering of the marshes, while a strong sustained southerly wind can result in drastic increases in water levels blown in from the gulf. In addition “blowouts” (direct connections between a channel and an inland water body) often are formed by the water level drawdown effect and the wave wash from wakes created by passing boats and barges. “Blowouts” increase water circulation between the marsh and the GIWW, exposing fragile organic marsh soils to high energy and increased erosion (Good et al. 1995). The extensive system of navigation channels, natural drainage, bayous, oil exploration canals, trenasses, and “blowouts” have created several hydrologic units inside the project area (figure 2) and have allowed increased water fluctuations and salinities to reach the interior of the marsh (USDA, 1991).

Marsh types and the associated vegetation in and around the project area also indicate that salinities have been increasing for the last 45 years. Prior to man-induced alterations, these marshes supported vegetation typical of fresh or very low salinity conditions. All of the project area was classified as fresh or low salinity (intermediate) marsh in 1949, except for the area adjacent to Sabine Lake and Sabine River just north of Black Bayou where brackish marsh conditions existed (Oneil 1949). Brackish marsh conditions in this area expanded north to the GIWW and eastward along Black Bayou to the Black Bayou Oil Field by 1968 (Chabreck 1968). Further expansion of high salinity marsh north and east of Black Bayou

was documented in 1978 and again in 1988 (Chabreck 1978, 1988). By 1988, the majority of the project area was identified as brackish marsh with fresh marsh found only in the extreme northeast corner of the project area adjacent to the Gum Cove Ridge.

The Black Bayou Hydrologic Restoration Project includes structural and non-structural measures designed to allow freshwater from the GIWW near its confluence with the Vinton Drainage Canal into the wetlands south of the GIWW between the Sabine River, Gum Cove Ridge, and Black Bayou, and to create a hydrologic head that increases freshwater retention time and reduces salt water intrusion and tidal action in the Black Bayou watershed. Constructed structural and non-structural measures and their intended functions are listed below (DNR CS-27 Monitoring Plan).

a. Repair breaches in the GIWW spoil bank west of the Gum Cove Ridge with approximately 24,000 linear ft. of rock foreshore dike to an elevation of +3.0 NAVD88.

b. Construct a weir with a barge bay at the GIWW in the Black Bayou Cut Off Canal with a 70 foot wide sill constructed to -7.0 NAVD88.

c. Construct a rock plug with a 15 ft. boat bay at - 4 ft. NAVD88 bottom elevation in the Burton Canal at the intersection with the Sabine River.

d. Construct a rock weir with a 15 ft. boat bay at - 3 ft. NAVD88 bottom elevation at the intersection of Blocks Creek with Black Bayou.

e. Vegetative plantings of approximately 55,000 linear ft. of bullwhip (*Scirpus californinicus)* or other suitable vegetation in the large open water area within the NO-13 unit. Plants should be in one gallon trade containers with a minimum of 5 stems per container. Planting should be in two staggered rows on 5 ft. centers. An estimated 22,000 plants will be required.

f. Vegetative plantings of approximately 26,000 linear ft. of bullwhip (*Scirpus californinicus)* or other suitable vegetation in the large open water area within the NO-17 unit. Plants should be in one gallon trade containers with a minimum of 5 stems per container. Planting should be in two staggered rows on 5 ft. centers. An estimated 10,400 plants will be required.

g. Vegetative plantings of approximately 26,000 linear ft. of bullwhip (*Scirpus californinicus*) or other suitable vegetation in the large open water area within the NO-18 unit in a similar configuration to the plantings in unit NO-17. An estimated 10,400 plants will be required.

h. Vegetative plantings of approximately 26,000 linear ft. of bullwhip (*Scirpus californinicus*) or other suitable vegetation in the large open water area within the NO-19 unit in a similar configuration to the plantings in unit NO-17. An estimated 10,400 plants will be required.

i. Construct a steel sheet pile weir of 40 foot width with a "self regulating tide gate" (SRT) of 4' x 8' size, with a crest Elevation +0.6 feet NAVD88. Site of the SRT gate/weir structure was located in an abandoned oilfield road. The structure serves as the primary drainage outlet and access for minimal tidal exchange for the marsh area of the project.

j. Construction of a rock plug to Elevation +3.0 NAVD88 across an eroded channel in the vicinity of the SRT Gate.

IV. Summary of Past Operation and Maintenance Projects

General Maintenance: Below is a summary of completed maintenance projects and operation tasks performed since December 2003, the construction completion date of the Black Bayou Hydrologic Restoration Project.

Construction Adjustments: Although construction of the original project components was completed in December 4, 2001, it was determined that leaks along the GIWW rock dike would have detrimental effects on the project. The rock dike along the GIWW was removed at four separate locations and plugs consisting of "C" stone were constructed at "water" connections between the marsh area and the GIWW existing to the north to reduce or eliminate tidal flow through these locations. The original signs installed at the Black Bayou Cut-Off Structure on timber pilings were either leaning or missing. Signage was relocated on concrete bases on top of the rock weir. Also, at the SRT gate, a railing was constructed on the sheet pile cap to reduce the chance of persons falling into the water in the area around the structure. This work was completed in December 2003 and construction was considered to have been complete after these adjustments.

Navigational Aid Light Repairs: A letter was received from the US Coast Guard in July 2003 reporting problems with the navigational lights at the Black Bayou Cut-Off Canal weir. The problem was investigated and repaired in October 2003 by Wet-Tech Energy, Inc. at a total cost of $1,250.00.

During October 2005 DNR made an inspection to determine any damages to the project from Hurricane Rita and in March 2006, DNR/CED/LFE, via a Purchase Order employed WET TECH Energy, Inc. to inspect and report thereon on damages caused by Hurricane RITA to any of the Navigation Lights and support structures of the Black Bayou Project that were in place as appurtenant parts of the various structure features of the Project. The cost of the inspection/report was $2,000.00.

The damages reported were as follows:
(1)The Black Bayou CutOff Channel west Light needed a new battery box and the replacement of two batteries. The east Light of this site was o'k and needed no repair.

(2)The Block's Creek Structure Lights and supports needed no repair work.
(3)The Burton Canal Structure Light experienced major damage and the entire Light Assembly, Solar Cell, and battery system needed to be replaced.

Later, during May 2006, the damages reported above were all corrected on each respective Structure of the Project by WET TECH Energy, Inc. by a separate Purchase Order for Hurricane RITA Repairs for a total of $3,842.00. The sum of the costs for the Inspection/Report and thence the repair efforts was $5,842.00. All of this sum was reimbursed by FEMA for reason of the storm damage.

SRT Gate modification and culvert installation: In the spring of 2005, it was determined that water was "stacking up" on the southeast corner of the project area. In order to correct the situation, it was decided to decrease the cross sectional area of the SRT Gate by attaching a flap to the railing. Also, two 30" flapgated culverts on the southern boundary of the project will relieve excess waters. A Notice to Proceed dated July 20, 2005 was issued to Duphil, Inc. of Orange, Tx. Construction was accepted as complete on January 4, 2006 at a total construction cost of $84,976.87. Engineering & design, construction oversight, and as-built drawings were provided by C. H. Fenstermaker & Associates at a total cost of $39,856.77. The overall cost for the entire SRT Modification was $124,833.64.

2006/2007 Navigational Light Maintenance:

Automatic Power, Inc. performed the following navigational light maintenance:

Burton Canal (1/30/07)	$525.00
Burton Canal (2/12/07)	$1,550.00
Black Bayou Cutoff (1/30/07)	$525.00
Blocks Creek (1/30/07)	$525.00

Structure Operations: There are no active operations associated with this project.

V. Inspection Results

Blocks Creek
The rock weir is in excellent condition. Signage is stable. There is some slight erosion on the SE bank that will need to be monitored. No immediate need for maintenance at this structure. Conditions of the Navigational Aid Lights were inspected in March '06 and determined to be functioning properly. (Photos: Appendix B, Photos 1-3)

Burton Canal

The weir is in good condition. There is some minor scouring along the canal banks inside of the weir at the end of the dike that will be monitored. Severe current through the weir has caused problems for boaters in the area. Although the pilings with the arrow signs have been repositioned, they are still fairly close together and pose a collision hazard. As a result of this, and previous inspections, it is recommended that these pilings be removed and warning signs similar to the ones on the Black Bayou Cut-Off canal be used. The Navigational Aid Lights were inspected and repaired in March, '06. (Photos: Appendix B, Photos 4-5)

Self Regulating Tide Gate (SRT)

The structure is in very good condition. Signage, railings, wingwalls, etc. in as-built condition. Pillow blocks on new flap have begun to show signs of rust and will need to be monitored. Timber piles need to be re-coated. No need for maintenance other than that which is underway at this time. (Photos: Appendix B, Photos 6-10)

Rock Plug

Rock has either been moved or has settled slightly to an approximate elevation of +2.5 feet NAVD '88 in spots. This will need to be addressed, possibly with sacks of QuickCrete placed on the crown of the plug. (Photos: Appendix B, Photo 11)

Black Bayou Cut-Off Canal

This component is in immediate post construction condition. No need for maintenance at this time. Conditions of the Navigational Aid Lights were inspected in March, '06. (Photos: Appendix B, Photo 12)

GIWW rock dike

Tie-ins on both the east and west end of the dike are stable. Several random spots along the dike were checked and no apparent toe scour is occurring. As mentioned in previous inspections, the warning signs at both the Vinton and Black Bayou closures have been stolen. The spoil placed behind the rock dike at the Black Bayou Canal has washed away on the western end. Spoil is also gone on the eastern end of the closure at Vinton Canal. There is also a gap in the rock at this location. The second gap from the east has a large gap on the eastern end of the C-stone closure. Rapid water exchange is occurring here, therefore, this area will need to be addressed. The alligator crossing, mentioned in previous inspections, on the 3rd closure from the east has not gotten any worse. (Photos: Appendix B, Photos 13-17)

Culvert 1/Culvert 2:

While these culverts were not directly inspected on this trip, they were assumed to be, after conversations with the landowners, in very good, post construction condition and in no need of repair.

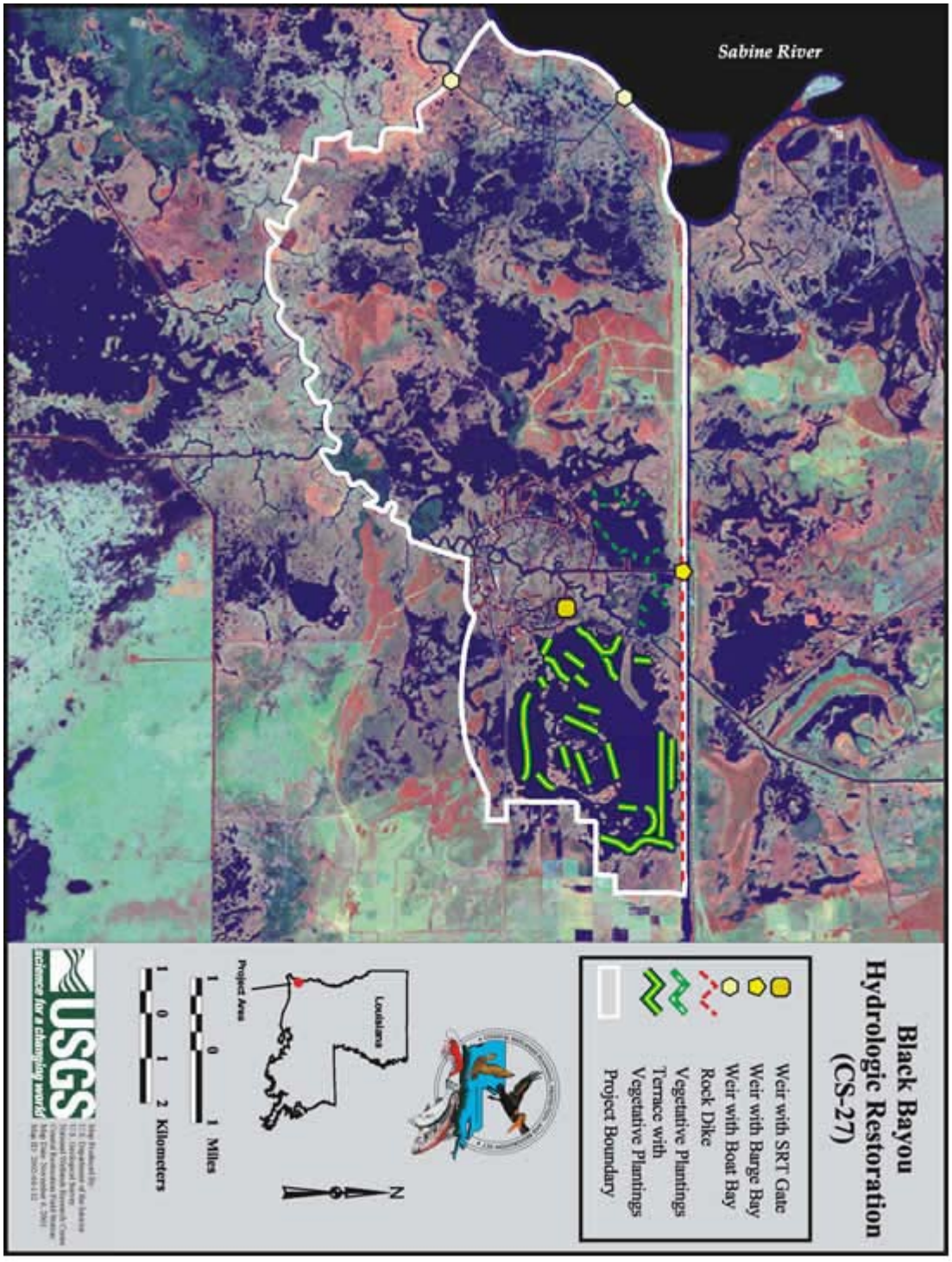
VI. Conclusions and Recommendations

The Black Bayou Hydrologic Restoration Project constructed components are in relatively good condition. The functionality of these components, however, has been affected by damages sustained during Hurricane Rita to a levee that runs from the SRT Gate northward to the GIWW. This levee serves as a hydrologic boundary but is not a feature to be maintained. Methods, other than CWPPRA, are being investigated by the local landowners, to repair this levee. Installation of staff gauges in convenient locations within the project area is still recommended. Warning signs in areas of severe current caused by installation of rock or sheet pile weirs should always include warning signs. These signs should be installed in concrete blocks out of the way of traffic since this has proven to be very effective. Also, railings or fences around water control structures should be considered. Plans and specifications will be prepared to address these issues in 2007.

- Add bags of concrete to raise the elevation of the rock plug
- Install a new warning sign at Burton Canal
- Address low elevations and gaps in GIWW rock dike and canal closures
- Install staff gauges

Appendix A

Project Features Map


Sabine River
Black Bayou
Hydrologic Restoration
(CS-27)
Weir with SRT Gate
Weir with Barge Bay
Weir with Boat Bay
Rock Dike
Vegetative Plantings
Terrace with
Vegetative Plantings
Project Boundary
Louisiana
Project Area
N
1 0 1 Miles
1 0 1 2 Kilometers
USGS
science for a changing world

Appendix B

Photographs

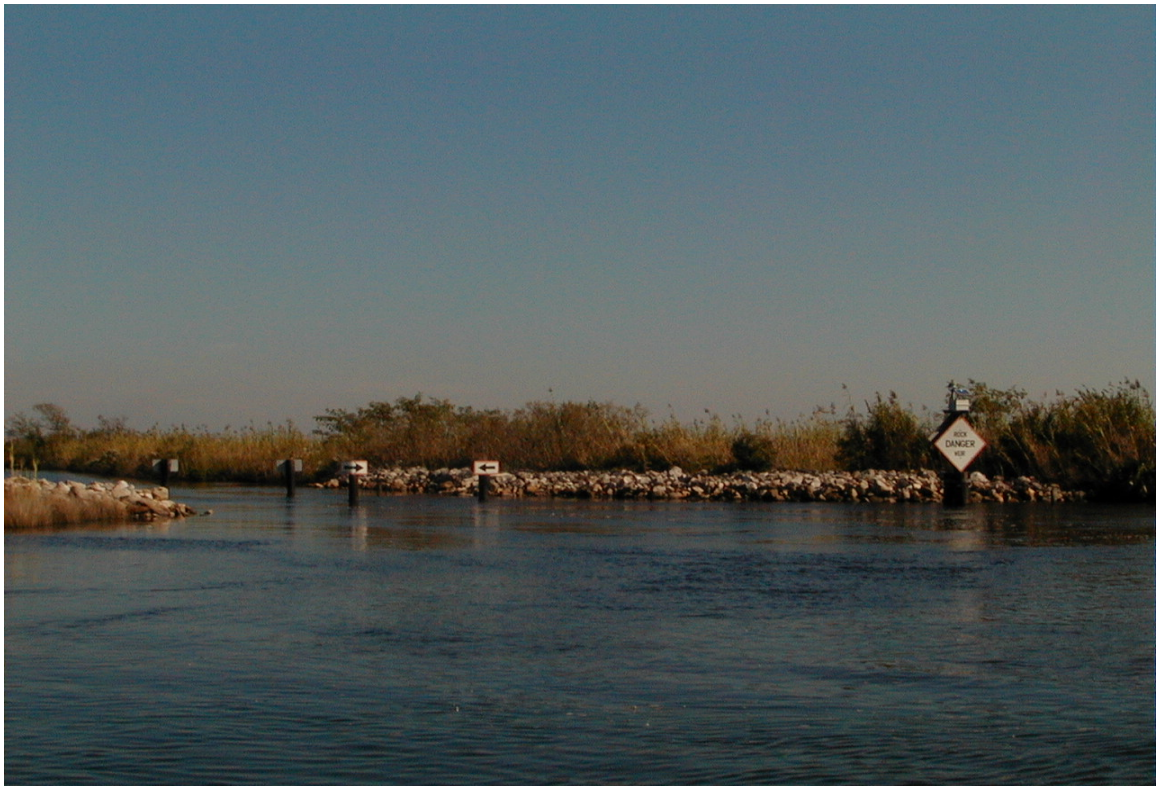


Photo 1—Navigational Aids and signage at Block's Creek

Photo 2—western side of Block's Creek Structure

Photo 3—erosion on SE end of Block's Creek Structure

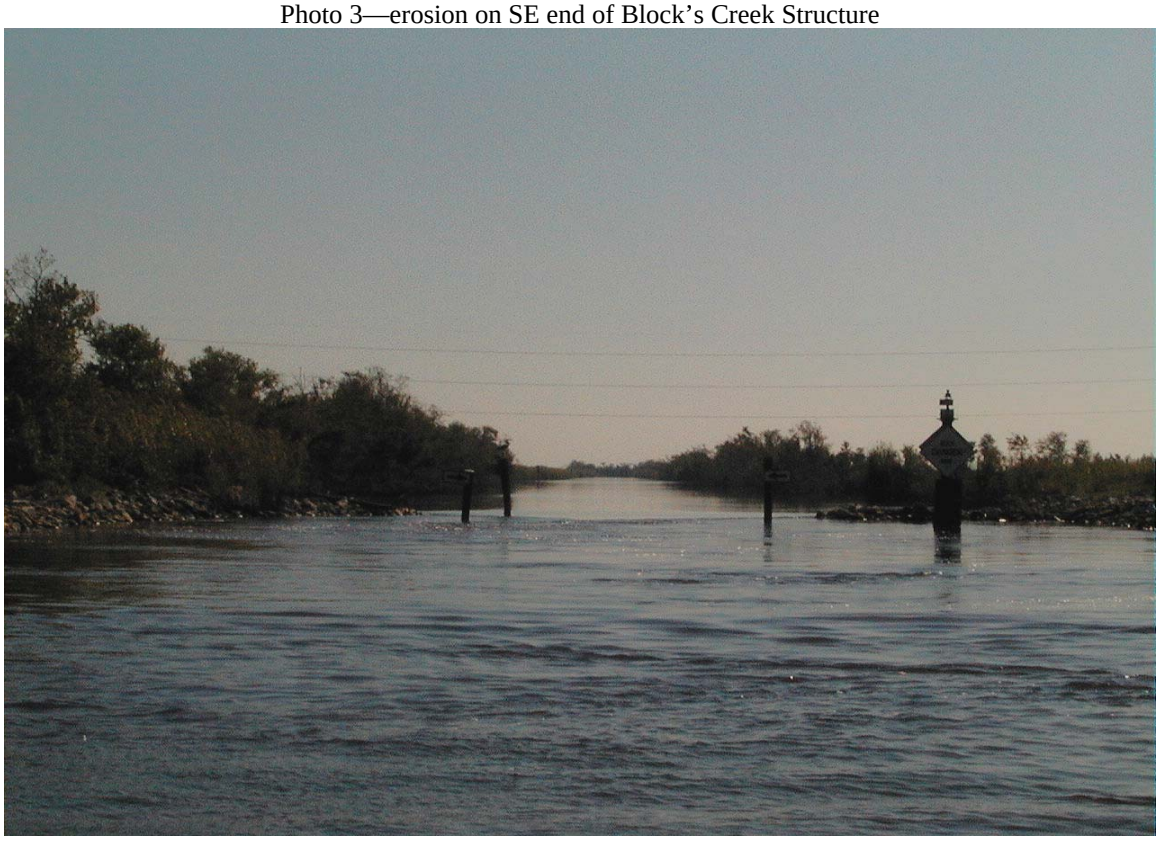


Photo 4—Burton Canal Structure

Photo 5—Burton Canal Structure

Photo 6—SRT Gate

Photo 7—SRT Gate railings, etc.

Photo 8—SRT Gate S end

Photo 9—SRT Gate N end

Photo 10—SRT Gate pillow block on new flap

Photo 11—Rock plug near SRT Gate

Photo 12—Black Bayou Cut-Off Canal Structure; Navigational aids, signs, etc.

Photo 13—Typical section of rock dike

Photo 14—Missing sign at Black Bayou

Photo 15—Missing spoil on W. end of Black Bayou Closure

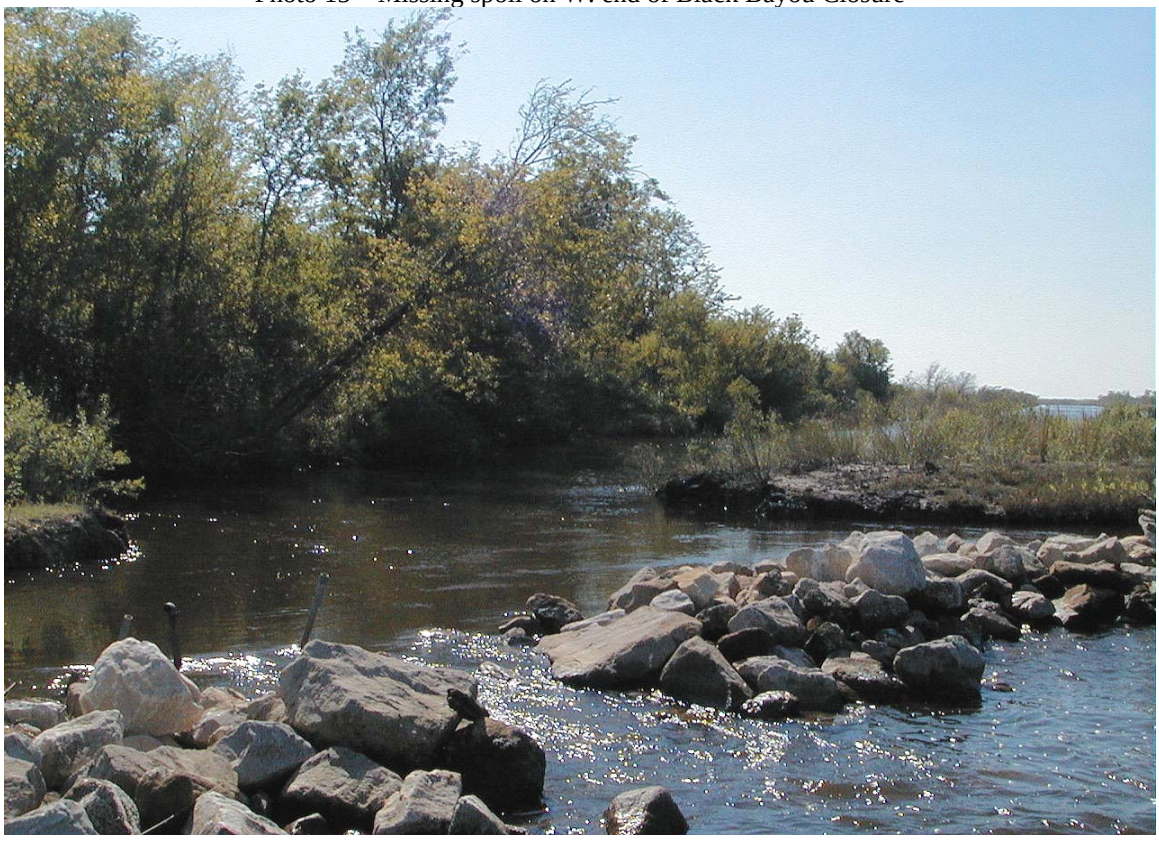


Photo 16—Missing spoil and gap in rock dike at E. end of Vinton Canal Closure

Photo 17—Gap in E. end of C-stone closure at second gap from the east

Appendix C

Three Year Budget Projection

BLACK BAYOU HYDROLOGIC RESTORATION/ CS27 / PPL 6

Three-Year Operations & Maintenance Budgets 07/01/2007 - 06/30/10

Project Manager	O & M Manager	Federal Sponsor	Prepared By
Herb Juneau	*Herb Juneau*	*NMFS*	*Stan Aucoin*

	2007/2008	2008/2009	2009/2010
Maintenance Inspection	$ 4,981.00	$ 5,053.00	$ 5,120.00
Structure Operation			
Administration	$ 12,330.00	$ -	$ -
Maintenance/Rehabilitation			

07/08 Description: Repairs to levee & rock dike

E&D	$ 24,000.00
Construction	$ 131,875.00
Construction Oversight	$ 14,000.00
Sub Total - Maint. And Rehab.	$ 169,875.00

08/09 Description

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

09/10 Description:

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

	2007/2008	2008/2009	2009/2010
Total O&M Budgets	**$ 187,186.00**	**$ 5,053.00**	**$ 5,120.00**

O &M Budget (3 yr Total)	**$ 197,359.00**
Unexpended O & M Budget	**$ 143,851.00**
Remaining O & M Budget (Projected)	**$ (53,508.00)**

OPERATION AND MAINTENANCE BUDGET WORKSHEET

BLACK BAYOU HYDROLOGIC RESTORATION/CS-27/PPL 6

DESCRIPTION	UNIT	EST. QTY.	UNIT PRICE	ESTIMATED TOTAL
O&M Inspection and Report	EACH	1	$4,981.00	**$4,981.00**
General Structure Maintenance	LUMP	1	$0.00	**$0.00**
Engineering and Design (12% of construction)	LUMP	1	$24,000.00	**$24,000.00**
Operations Contract	LUMP	1	$0.00	**$0.00**
Construction Oversight (12% of construction)	LUMP	1	$14,000.00	**$14,000.00**

ADMINISTRATION

LDNR / CRD Admin. (6% of construction)	LUMP	1	$6,330.00	$6,330.00
FEDERAL SPONSER Admin.	LUMP	1	$6,000.00	$6,000.00
SURVEY Admin.	LUMP	0	$0.00	$0.00
OTHER				$0.00
			TOTAL ADMINISTRATION COSTS:	**$12,330.00**

MAINTENANCE / CONSTRUCTION

SURVEY

SURVEY DESCRIPTION:	INSTALL ONE STAFF GAUGE NEAR THE ROCK ON THE GIWW AND ONE AT BURTON CANAL				
	Secondary Monument	EACH	0	$0.00	$0.00
	Staff Gauge / Recorders	EACH	4	$5,000.00	$20,000.00
	Marsh Elevation / Topography	LUMP	0	$0.00	$0.00
	TBM Installation	EACH	0	$0.00	$0.00
	OTHER				$0.00
				TOTAL SURVEY COSTS:	**$20,000.00**

GEOTECHNICAL

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

CONSTRUCTION

CONSTRUCTION DESCRIPTION:	REPAIR BREACHES/LOW SPOTS ON GIWW AND ROCK PLUG; INSTALL SIGN AT BURTON CANAL					
	Rip Rap	LIN FT	TON / FT	TONS	UNIT PRICE	
	Graded Stone- Bankline	150	1.0	0	$70.00	$10,500.00
	610 Limestone-Compacted Fill		1.0	0		$0.00
		0	0.0	0	$0.00	$0.00
	Filter Cloth / Geogrid Fabric		SQ YD	0	$0.00	$0.00
	Navagation Aid		EACH	0	$0.00	$0.00
	Signage		EACH	1	$3,000.00	$3,000.00
	General Excavation / Fill		LUMP	1	$10,000.00	$10,000.00
	Dredging		CU YD	0	$0.00	$0.00
	Sheet Piles (Lin Ft or Sq Yds)			0	$0.00	$0.00
	Corrugated Alum. Pipe (30")		LF	0	$0.00	$0.00
	Aluminum Flap Gate		EACH	0	$0.00	$0.00
	Fabricate & Install 2 SS Flap Gates		LUMP	0	$0.00	$0.00
	Materials		LUMP	0	$0.00	$0.00
	Mob / Demob		LUMP	1	$50,000.00	$50,000.00
	Contingency		LUMP	1	$26,375.00	$26,375.00
	General Structure Maintenance		LUMP	1	$0.00	$0.00
	900 BAGS OF CONCRETE AT LARGE GAP		900		$10.00	$9,000.00
	200 BAGS AT PLUG		200		$10.00	$2,000.00
	100 BAGS AT ALLIGATOR CROSSING		100		$10.00	$1,000.00
					TOTAL CONSTRUCTION COSTS:	**$111,875.00**

TOTAL OPERATIONS AND MAINTENANCE BUDGET: **$187,186.00**

Appendix D

Field Inspection Form

Annual Inspection Report
BLACK BAYOU HYDROLOGIC RESTORATION PROJECT
State Project No. CS-27

MAINTENANCE INSPECTION REPORT CHECK SHEET

Project No. / Name:CS-27 Black Bayou Hydrologic Restoration

Date of Inspection: November 8, 2006 Time:

Structure No. ___ N/A

Inspector(s):Stan Aucoin, Herb Juneau (LDNR)
John Foret (NMFS)

Structure Description: Rock Dike, SRT Gate, Rock Plug, Boat Bay

Water Level Inside:_____ Outside: _____

Type of Inspection: Annual

Weather Conditions:partly cloudy and mild

Item	Condition	Physical Damage	Corrosion	Photo #	Observations and Remarks
Steel Bulkhead / Caps					
Steel Grating					
Stop Logs					
Hardware					Staff gauges will have to be re-established at selected locations.
Timber Piles Burton Canal	Good				These piling pose a collision hazard with swift current.
Timber Wales					
Galv. Pile Caps					
SRT Gate	Good				
Signage /Supports Vinton Canal					Signs missing at Vinton Canal and Black Bayou closures along GIWW.
Rip Rap (fill) Rock Dike at GIWW	Fair				Gap in spoil and rock at Vinton Canal Alligator crossing at 3rd closure from east and breach in 2nd closure from east need to be repaired. Several low areas on dike where rock was apparently pushed back by a barge.
Block's Creek Rock Plug	Good Fair				Plug has settled to ~+2.5' and will need to be lifted slightly.

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

Appendix E

Locations to be Monitored