State of Louisiana

Coastal Protection and Restoration Authority of Louisiana

2021 Monitoring Plan

for

Cameron Creole Maintenance (CS-0004a)

State Project Number CS-0004a
Priority Project List #3

June 2021
Cameron Parish

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MONITORING PLAN
for
CAMERON CREOLE MAINTENANCE CS-0004A

The Coastal Protection and Restoration Authority (CPRA) and the Natural Resources Conservation Service (NRCS) agree to carry out the terms of this Monitoring Plan (hereinafter referred to as the "Plan") of the accepted, completed project features.

The project features covered by this plan are inclusive of and are identified as the Cameron Creole Maintenance Project (CS-0004a). This plan outlines the provisions to monitor the project using standardized data collection techniques and to analyze that data to determine whether the project is achieving the anticipated benefits.

Construction of CS-004a was authorized by Section 303(a) of Title III Public Law 101-646, the Coastal Wetlands Planning and Restoration Act (CWPPRA) enacted on November 29, 1990 as amended. This project was approved on the 3rd Priority Project List.

The construction components associated with this project are located in Cameron Parish between Calcasieu Lake and Louisiana Highway 27

PROJECT DESCRIPTION, PURPOSE, LOCATION, AND GOALS

Description:
The Cameron Creole Maintenance (CS-04a) project area is located in the East Cove Unit of the Sabine National Wildlife Refuge, and on Miami Corporation property, approximately 6 miles northeast of Cameron in Cameron Parish, La (Figure 1). It is bounded by the Gulf Intracoastal Waterway on the north, Calcasieu Lake and Calcasieu Pass on the west, Louisiana Highway 27, Little Chenier Ridge and Little Chenier Canal on the east, and the Gulf of Mexico and Mermentau River on the south. The project encompasses 54,076 acres of fresh-to-saline marsh and open water (LCWCRTF 2008). The project is co-sponsored by the Natural Resource Conservation Service (NRCS) and the Coastal Protection and Restoration Authority (CPRA).

Purpose:
Historically, marshes within the project area consisted primarily of vast, unbroken stands of fresh and low-salinity vegetation with brackish marshes occurring along the border of Calcasieu Lake (USDA 2007). Early accounts of the watershed marshes identify sawgrass (*Cladium jamaicense*) as a dominant vegetation type (Harris 2012). The watershed experienced marsh loss largely due to saltwater intrusion, resulting from construction and enlargement of the Calcasieu Ship Channel in 1941, 1951 and 1968 (Harris 2012), which weakened the fresher plant communities. Natural disturbances, such as drought and Hurricanes Audrey and Carla converted significant areas of the weakened marsh into open water.

The Cameron-Creole Watershed project was constructed to reduce saltwater intrusion and preserve the deteriorating marshes and consisted of two phases. Construction of the first phase began in 1981, consisting of a 19 mile protection levee and interior borrow canal along the eroding shoreline of Calcasieu Lake. The second phase involved the installation of five water control structures and was completed in 1989 (Harris 2012). The United States Fish and Wildlife Service (USFWS) was tasked with operation of the structures under the original Operation and Maintenance Agreement of 1981. In 1997, as part of the CS-17 project, two sheet metal plugs were installed in the borrow area inside of the levee in order to increase control of water flow, isolate management areas, and prevent further saltwater intrusion in the watershed (USFWS 1991).

The watershed operations are overseen by the Cameron Creole Advisory Committee composed of staff from NRCS, USFWS, Louisiana Department of Wildlife and Fisheries (LDWF), United States Army Corps of Engineers (USACOE), Cameron Parish Police Jury, Miami Corporation, National Oceanic and Atmospheric Administration (NOAA) and Cameron Parish Gravity Drainage District 3. Operations are performed in accordance with the project's management plan (Appendix I). Prior to January 1st, 2012, water level and salinity monitoring and subsequent gate operations were performed by Cameron Prairie NWR staff. Thereafter, monitoring and gate operations have been performed by CPRA.

The project reached its 20 year project life in 2017. The CWPPRA Task Force Committee approved funding for a 20 year extension of the project and combined the remaining funds from CS-17 into CS-04a. It also provided funds for CPRA to generate monitoring reports (NRCS was responsible for monitoring reports during the first 20 years of the project).

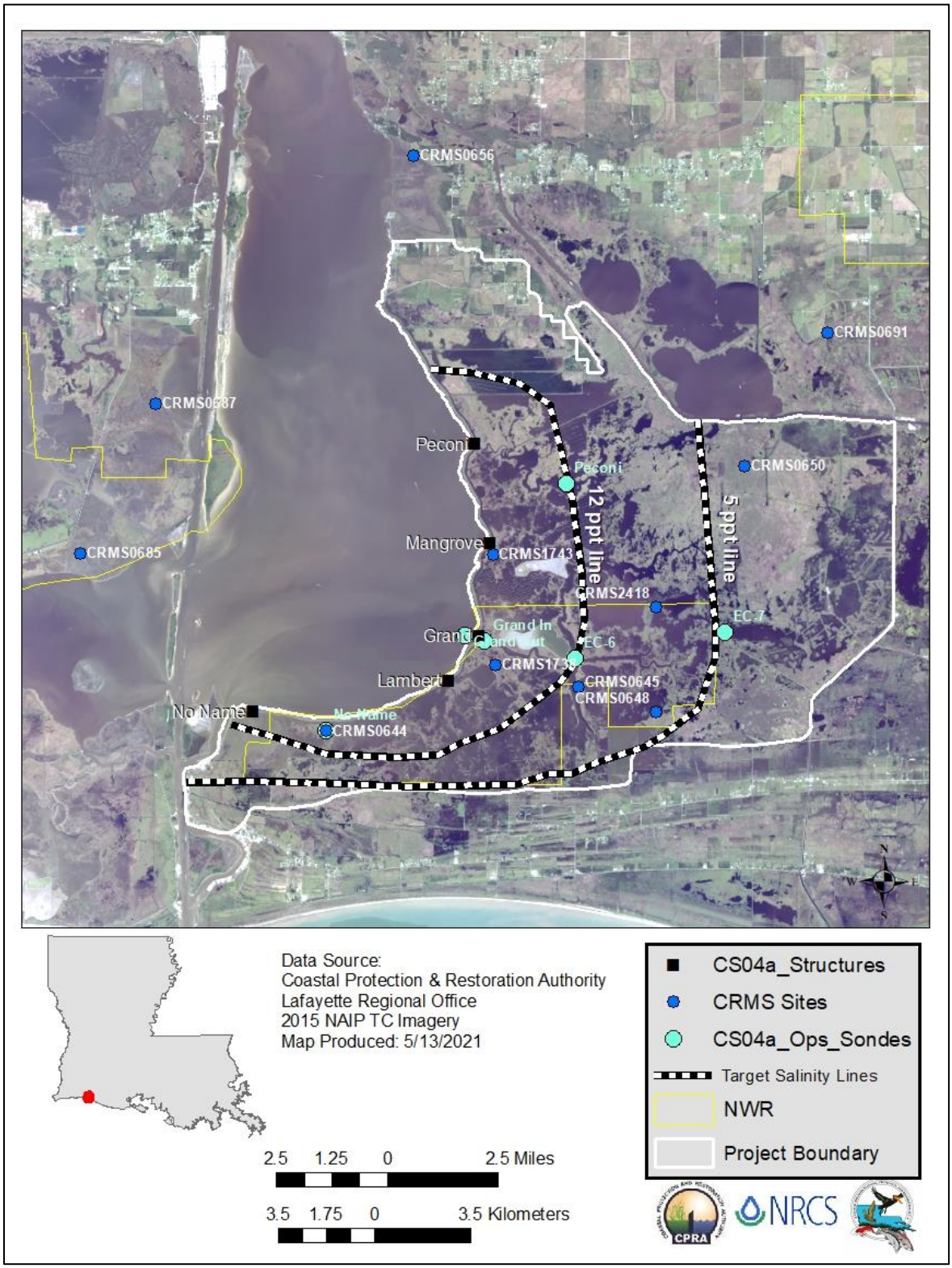

Figure 1. Cameron Creole Maintenance (CS-04a) project features, CRMS sites, and operation sonde locations.

Goals:

The objective of the Cameron Creole Watershed Maintenance project is to restore the project area to approximate the 1972 vegetative communities and salinity regimes.

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

1. Curtail marsh erosion
2. Maintain and improve the marsh and open water ponds for high value fisheries nursery and production areas.
3. Reclaim some of the emergent marshes that have been recently converted to open water by saltwater intrusion and subsequent marsh erosion.
4. Improve plant species diversity in emergent marshes which would improve the potential for wildlife habitat.
5. Improve aquatic plant species coverage and diversity.
6. Establish two isohaline lines based on historical vegetative communities and salinities to aid in guiding management procedures (Figure 1).
   a. Isohaline line no.1 will be established at approximately 12 ppt.
   b. Isohaline line no. 2 will be established at approximately 5 ppt.
7. Maintain water levels within a range of 6 inches below marsh elevation up to 2 inches above marsh elevation at the 5 ppt isohaline.

Features:

The project includes a 19 mile protection levee and five water control structures. There are two fixed crest weirs that allow for ingress and egress at Mangrove Bayou and NoName Bayou along with two adjustable crest weirs that allow for additional ingress and egress at Peconi Bayou and Lambert Bayou. The Grand Bayou Boat Bay has flaps that drain into the lake and a boat bay that allows for the passage of small boats into the Cameron Prairie NWR.

ITEMS REQUIRING MONITORING

Data to inform project operations comes from five real-time hydrology stations located inside the Cameron Creole watershed and in Calcasieu Lake near Grand Bayou (Figure 1). CRMS data will be used to assess project performance. CRMS does not include fisheries or SAV data so we will not be able to directly assess items 2 and 5 above.

The Coastwide Reference Monitoring System (CRMS) - Wetlands is a network of 392 monitoring sites distributed throughout the coastal zone of Louisiana. Hydrographic, vertical accretion, elevation change, vegetation, soils, and aerial photography data are collected at each CRMS site. There are seven CRMS monitoring stations within the CS-04a project area: CRMS0650, CRMS1743, CRMS2418, CRMS1738, CRMS0645, CRMS0648, and CRMS0644 (Figure 1). Data from these sites, as well as a reference CRMS site (CRMS0685) outside of the project area, will be used to determine project effectiveness.

The following monitoring strategies will provide the information necessary to evaluate the specific goals listed above.

A. **Aerial Photography**

In order to evaluate land/water ratios in the watershed, land/water data will be obtained from digital imagery with 1-meter resolution. The photography will be georectified using standard operating procedures described in Steyer et al. (1995, revised 2000), and land/water ratios will be determined. Aerial photography will be captured using the nearest CRMS coastwide flights to 2018 and when coastwide imagery becomes available near 2024 and 2030.

In addition, land change of the project area as a whole will be assessed from land/water data interpreted from TM satellite imagery (30 m^2 resolution) which is stored on the CRMS viewer website (http://www.lacoast.gov/crms_viewer/). Linear regressions will be calculated for the period of record. The variability in percent land data points around the slope illustrate the influence of various sources of environmental variance or classification error. Positive slopes indicate increasing percent land or historical land gain and negative slopes indicate decreasing percent land or historical land loss (Couvillion et al., 2017).

B. **Salinity -** Salinity is monitored hourly at the CRMS sites. Continuous data will be used to characterize average annual salinities throughout the project and reference areas. At each servicing, a measurement of interstitial water salinity is collected adjacent to each gauge. Interstitial water salinity is also determined at the 10 vegetation plots, when vegetation is surveyed. Salinity data will be used to determine if project area salinity is being maintained within the target range.

C. **Water Level** - Water level within the marsh is measured at every CRMS site every hour with a water-level gauge installed within an area that is hydrologically connected to the surrounding water body. Water level data will be used to determine if project area water level is being maintained within the target range. The gauge is surveyed relative to the top of the RSET (NAVD 88). Marsh elevations are correlated to the gauges and will be used in determining marsh flooding events.

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

Individual species' cover data will be summarized according to the Floristic Quality Index (FQI) method (Cretini and Steyer 2011). A list of plants occurring in Louisiana's coastal wetlands (~500 species) was provided to all known Louisiana

coastal vegetation experts and their input on scoring was requested. The panel then provided an agreed upon group score (Coefficient of Conservatism or CC score) for each species. CC scores are weighed based on cover in the FQI for Louisiana coastal wetlands. All species known to occur in the coastal zone were given a floristic quality score on a scale of 0 to 10. Species that scored the lowest were considered by the panel to indicate disturbance or unstable marsh environments.

E. **Elevation Change -** Soil surface elevation change utilizing a combination of sediment elevation tables (RSET) and vertical accretion from feldspar horizon markers are being measured twice per year at each site. This data will be used to describe general components of elevation change and establish accretion/subsidence rates. The RSET was surveyed to a known elevation datum (ft, NAVD88) so it can be directly compared to other elevation variables such as water level. Data collected over at least 5 years will be used to calculate rates for the project and reference areas; therefore the displayed elevation change rates are an estimation of that temporal trend.

MONITORING BUDGET

The cost associated with the Operations of the structures and Monitoring of the features outlined above in this plan for the life of the project is $2,644,844 agreed upon by CPRA and NRCS.

RESPONSIBILITIES – MONITORING

A: CPRA will:

1. Conduct joint site inspections with NRCS after major storm events if determined to be necessary by CPRA and/or NRCS. CPRA will submit to NRCS, a report detailing the condition of the project features.

2. Provide a total contribution equal to the amount outlined in the Cost Sharing Agreement for the life of the project.

3. Coordinate and oversee all monitoring data collection.

4. Ensure that all data goes through quality control procedures.

5. Analyze the data and report on the status of the project.

6. The federal and state representatives appointed above shall meet as necessary to review the reports and discuss the project status.

B. NRCS will:

1. Conduct joint site inspections with CPRA after major storm events if determined to be necessary by CPRA or NRCS.

2. Provide a total contribution equal to the amount outlined in the Cost Sharing Agreement for the life of the project.

3. Review reports submitted by CPRA and provide comments.

NOTES

A.	Implementation	Begin Project Life: Begin 20 Yr Extension:	September 1997 September 2017
B.	NRCS Project Manager	Ron Boustany	337-291-3067
E.	CPRA Monitoring Manager	Mark Mouledous	337-482-0661
F.	CPRA Operations Manager	Dion Broussard	337-482-0686
G.	Landowners	Cameron Prairie National Wildlife Refuge Miami Corporation	337-598-2216 337-264-1695

REFERENCES

Coastal Protection and Restoration Authority of Louisiana. 2012. *Louisiana's Comprehensive Master Plan for a Sustainable Coast*. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA.

Couvillion, B.R., Beck, Holly, Schoolmaster, Donald, and Fischer, Michelle, 2017, Land area change in coastal Louisiana 1932 to 2016: U.S. Geological Survey Scientific Investigations Map 3381, 16 p. pamphlet, https://doi.org/10.3133/sim3381.

Cretini, K.F., and Steyer, G.D. 2011, Floristic Quality Index-An assessment tool for restoration project and monitoring sites in coastal Louisiana: U.S. Geological Survey Fact Sheet 2011-3044, 4p.

Harris, G. 2012. Special Report: Management of the Cameron-Creole Watershed Project 1980-2011. U.S. Fish and Wildlife Service. 96 pp.

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Steyer, G.D., R.C. Raynie, D.L. Steller, D. Fuller, and E. Swenson. 1995 (revised 2000). Quality management plan for the Coastal Wetlands Planning, Protection, and Restoration Act monitoring program. Open-file series no. 95-01 (Revised June 2000). Baton Rouge: Louisiana Department of Natural Resources, Coastal Restoration Division. 97 pp.

Todd M. Folse, Thomas E. McGinnis, Leigh A. Sharp, Jonathan L. West, MelissaK. Hymel, John P. Troutman, Dona Weifenbach, William M. Boshart, Laurie B. Rodrigue, Danielle C. Richardi, W. Bernard Wood, C. Mike Miller, Elizabeth M. Robinson, Angelina M. Freeman, Camille L. Stagg, Brady R. Couvillion, and Holly J. Beck. 2020. A Standard Operating Procedures Manual for the Coastwide Reference Monitoring System-Wetlands and the System-Wide Assessment and Monitoring Program: Methods for Site Establishment, Data Collection, and Quality Assurance/Quality Control. Louisiana Coastal Protection and Restoration Authority. Baton Rouge, LA. 252 pp.

United States Department of Agriculture, Natural Resources Conservation Service (NRCS). 2007. Cameron-Creole Watershed 2003 Vegetative Monitoring Report. Alexandria, LA. 19 pp and appendices.

United States Fish and Wildlife Service, Sabine National Wildlife Refuge. 1991. Cameron-Creole Watershed borrow canal plug project. [Proposed project information sheet for wetland value assessment.] Hackberry, Louisiana: Sabine National Wildlife Refuge.

Appendix I
Resource Management Plan

RESOURCE MANAGEMENT PLAN FOR CAMERON CREOLE
February 1987

BASIC OBJECTIVE:

Restore the project area to approximate the 1972 vegetative communities and salinity regimes.

SPECIFIC OBJECTIVES:

WEST OF 5 PPT ISOHALINE LINE

1. Curtail marsh erosion.

2. Maintain and improve the marsh and open water ponds for high value fisheries nursery and production areas.

3. Operate the water control structures to minimize reductions in access by estuarine organisms to nursery areas. Recruitment of estuarine dependent organisms will be accommodated to the greatest extent practicable to meet the overall basic objective.

4. Improve plant species diversity in emergent marshes which would improve the potential for wildlife habitat improvement.

5. Improve the aquatic vegetative component in the open water ponds.

EAST OF THE 5 PPT ISOHALINE LINE

1. Curtail marsh erosion.

2. Reclaim some of the emergent marshes that have benn recently converted to open water by saltwater intrusion and subsequent marsh erosion.

3. Improve plant species diversity in the emergent marshes which would improve the potential for wildlife habitat improvement.

4. Improve aquatic plant species diversity.

5. Improve the marshes and open water ponds for freshwater fisheries.

SALINITY AND WATER LEVEL MANAGEMENT CRITERIA

1. Establish two isohaline lines based on historical vegetative communities and salinities to aid in guiding management procedures.

   A. Isohaline line no. 1will be established at approximately 12 ppt (see attachment #1)

   B. Isohaline line no. 2 will be established at approximately 5 ppt (see attachment #1)

   C. Necessary salinity stations will be established and data gathered to monitor the salinity along these isohaline lines.

2. Water levels will be maintained in a range of 6 inches below normal marsh elevation up to 2 inches above normal marsh elevation based on water levels readings taken along the 5 ppt isohaline line monitoring stations.

3. Deviation from the normal planned operation of these structures will be allowed in the event of unusual weather conditions (hurricanes, abnormal rainfall, etc.) This would include utilizing the structures on Creole canal.

PHASE ONE - TWO YEAR PERIOD

GENERAL: Phase I of the management plan will place primary emphasis on curtailing marsh erosion and reclaiming some of the emergent marshes that have been converted to open water ponds east of the 5 ppt isohaline line. These shallow, open water ponds are a result or recent deteriorating marsh and offer the greatest potential for re-vegetation to emergent marshes. If not re-vegetated in the near future, these shallow open water ponds will become too deep to practically re-vegetate.

FEBRUARY 15 - JULY 15

1. Implement a partial drawdown of 6 inches below normal marsh elevation for the area east of the 5 ppt isohaline line. The open water ponds west of the 5 ppt isohaline line are mush deeper and would maintain shallow water during the drawdown period. The drawdown would be accomplished by manipulation fo the water control structures during winter and spring frontal passages. At least one of the vertical slots in each structure will remain open this entire time period.

JULY 15 - FEBRUARY 15

1. The partial drawdown will end on July 15 and water levels would be allowed to increase. On July 15 the crest of the variable structures will be set at 6 inches below normal marsh elevation and the vertical slots in all structures will be opened.

PHASE TWO

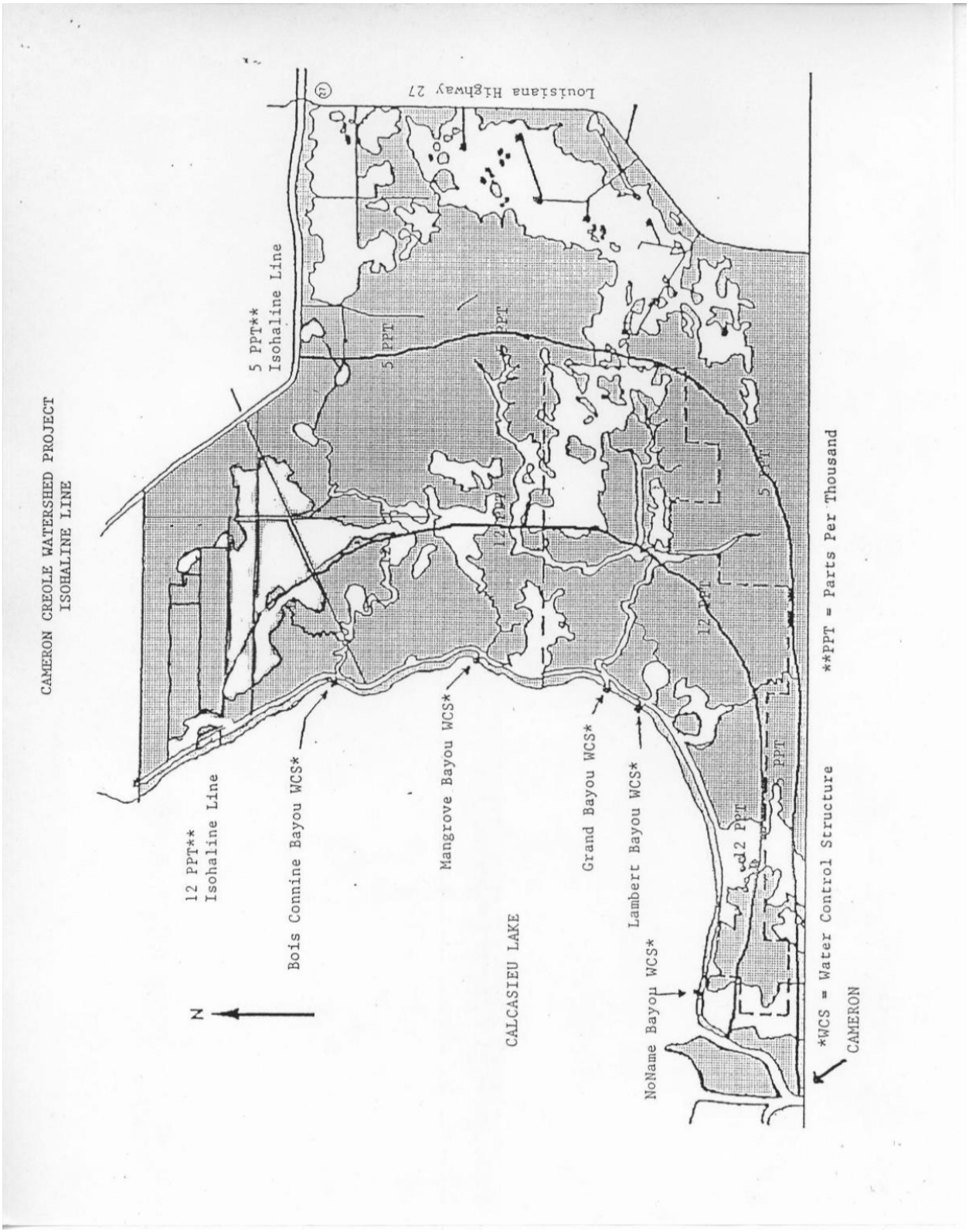
GENERAL: Phase II of the management plant will place primary emphasis on curtailing marsh erosion. Secondary emphases on Phase II will be (1) maintain and improve fisheries habitat, (2) maintain and improve wildlife habitat, (3) increase plant diversity in emergent marshes that have been converted to open water ponds east of 5 ppt isohaline line.

1. The Phase II basic management plan involves a "semi-static" water management scheme. The crests of all structures will be set at 6 inches below normal marsh elevations. The three, 6 inch slots in the structures will be left open. The boat bay on the Grand Bayou structure will be left open. (Boat Bay is serving same function as the slots for the Grand Bayou Structure). Additionally, another flapgate on the Grand Bayou structure can be opened for fisheries purposes in (a) late winter and spring, (b) late summer and fall, (c) night, (d) in the winter with the approach of weather fronts expected to cause significant decrease in temperature, or (e) other special circumstances when conditions favor recruitment of young into the nursery areas.

NOTE: Temporary closures of the boat bay and other bays will be allowed if salinities exceed the 5 ppt limit at isohaline line no. 2.

2. Periodic partial drawdowns, as outlined in Phase One, can be carried out dependent on the success of the drawdowns in Phase One and recommendations of the advisory committee.

NOTE: The advisory committee will meet annually to review the progress of the management plan, and make recommendation regarding any needed changes. More frequent meeting can be held if the need arises.


CAMERON CREOLE WATERSHED PROJECT
ISOHALINE LINE
Louisiana Highway 27
5 PPT**
Isohaline Line
5 PPT
5 PPT
12 PPT**
Isohaline Line
Bois Connine Bayou WCS*
Mangrove Bayou WCS*
Grand Bayou WCS*
Lambert Bayou WCS*
NoName Bayou WCS*
CALCASIEU LAKE
12 PPT
12 PPT
12 PPT
5 PPT
5 PPT
N
*WCS = Water Control Structure
**PPT = Parts Per Thousand
CAMERON

Appendix II
Project Monitoring Budget

CS-04a Cameron Creole Project 20 year Extension

Operation & Maintenance and Monitoring

Project Priority List 25 (ver.022615) 5-Aug-20

O&M Cost Considerations:

	Federal	State	TOTAL	Years for Annual Inspection
Annual Inspections	$3,400	$9,600	**$13,000**	*21-40*
Annual Cost for Operations	$0	$79,200	**$79,200**	
Preventive Maintenance	$0	$0	**$0**	

NOTE: Items shown below are an example, actual project features and years should be used.

State Costs

State O&M / Construction Items	Unit	Quantity	Unit Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20
Maintenance Event* (see tab)	1	1	$900,000.00							$900,000							$900,000						
Subtotal				**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$900,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$900,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**
Subtotal (1) w/ 25% contingency				***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$1,125,000***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$1,125,000***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***
Eng Survey																							
5 days @ $3,755 per day										$18,775							$18,775						
days @ $3,755 per day																							
Inspection (10 hrs/day)																							
20 days @ $1,952 per day										$39,040							$39,040						
days @ $1,952 per day																							
Subtotal (2)				***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$57,815***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***	***$57,815***	***$0***	***$0***	***$0***	***$0***	***$0***	***$0***
Monitoring Items (State costs placed in separate "monitoring" acct)																							
Land:Water Classification (CPRA based cost due to size)		1	$72,000	$72,000									$72,000								$72,000		
Aerial Photography				included									included								included		
Vegetative Analysis				included									included								included		
Data analysis and report (CPRA costs due to size)		1	$58,425		$58,425									$58,425								$58,425	
Monitoring Management* (yearly CPRA)		1	$90,134	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$94,940	$90,134
*Due to intesive monitoring (6 wks needed/yr)																							
Subtotal (3)				***$166,940***	***$153,365***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$166,940***	***$153,365***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$94,940***	***$166,940***	***$153,365***	***$90,134***
State Costs - Misc																							
Landrights				$100,000																			
Engineering and Design Cost (on Subtotal 1,2)				$0	$0	$0	$0	$0	$0	$84,669	$0	$0	$0	$0	$0	$0	$84,669	$0	$0	$0	$0	$0	$0
Administrative Cost (on Subtotal 1,2,3,Engr Montr)				$8,320	$4,320	$2,160	$2,160	$2,160	$2,160	$48,753	$2,160	$2,160	$4,320	$4,320	$2,160	$2,160	$48,753	$2,160	$2,160	$2,160	$4,320	$4,320	$2,160
Subtotal (4)				***$108,320***	***$4,320***	***$2,160***	***$2,160***	***$2,160***	***$2,160***	***$133,422***	***$2,160***	***$2,160***	***$4,320***	***$4,320***	***$2,160***	***$2,160***	***$133,422***	***$2,160***	***$2,160***	***$2,160***	***$4,320***	***$4,320***	***$2,160***
Total State Cost				**$216,320**	**$76,320**	**$38,160**	**$38,160**	**$38,160**	**$38,160**	**$1,352,237**	**$38,160**	**$38,160**	**$112,320**	**$76,320**	**$38,160**	**$38,160**	**$1,352,237**	**$38,160**	**$38,160**	**$38,160**	**$112,320**	**$76,320**	**$38,160**