LOUISIANA COASTAL WETLANDS RESTORATION PLAN

CALCASIEU/SABINE BASIN
APPENDIX I

PREPARED BY:

LOUISIANA COASTAL WETLANDS CONSERVATION AND RESTORATION TASK FORCE

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LOUISIANA COASTAL WETLANDS

RESTORATION PLAN

CALCASIEU/SABINE BASIN PLAN

APPENDIX I

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INTRODUCTION

STUDY AREA

The Calcasieu/Sabine Basin is located in southwest Louisiana in Cameron and Calcasieu Parishes and consists of approximately 630,000 acres. The approximate northern boundary of the basin is Gulf Intracoastal Waterway (GIWW); the eastern boundary follows the eastern leg of State Highway 27; the western boundary is the Sabine River and Sabine Lake; and the southern boundary is the Gulf of Mexico (Figure 1). About 24 percent (148,600 acres) of the basin wetlands are publicly owned as Federal Refuges.

EXISTING PROJECTS

U.S. ARMY CORPS OF ENGINEERS (USACE)

The USACE has three navigation projects that impact the basin: The Gulf Intracoastal Waterway, the Calcasieu Ship Channel, and the Sabine-Neches Waterway.

Most of the Gulf Intracoastal Waterway (GIWW) was already in place by 1924. The section between the Sabine River and Calcasieu River, constructed by private interests, facilitated deep water navigation (30-foot project depth) between the Gulf of Mexico and the Port of Lake Charles via the Sabine River. The Lake Charles Deepwater Channel (LCDC), is no longer needed for ocean-going access, and was last maintenance dredged to a depth of 30 feet in 1941. Today, the LCDC is an incorporated component of the GIWW and is maintained at the GIWW project dimensions of 12 by 125 feet.The Calcasieu Lock on the GIWW, completed in 1950, prevents saltwater intrusion into the Mermentau Basin to the east. Within the Calcasieu/Sabine Basin, the Calcasieu Lock also protects fresh marshes in the vicinity of Sweet and Willow Lakes.

The Calcasieu Ship Channel was constructed in 1941 to 30 feet deep and 125 feet wide. The average depth of Calcasieu Lake was five to six feet, but the natural river channel in the lake was up to 13 feet deep. In 1951 and 1968 the Calcasieu Ship Channel was deepened and enlarged to the present dimensions of 40 feet deep and 400 feet wide.

DEPARTMENT OF THE INTERIOR, U.S. FISH AND WILDLIFE SERVICE (USFWS)

Two National Wildlife Refuges are located within the basin. Sabine National Wildlife Refuge, established in 1937 and the largest coastal refuge on the Gulf of Mexico, encompasses about 139,000 acres. The Cameron Prairie National Wildlife Refuge, located in portions of the Calcasieu and Mermentau Basins and established in 1989, covers about 9,600 acres.

Actions were taken to reduce adverse impacts to marshes on Sabine National Wildlife Refuge caused by the Calcasieu Ship Channel along the western side of Calcasieu Lake. Water control structures were installed on Hog Island Gully, West Cove and Headquarters Canal, and an earthen plug was placed in the roadside borrow ditch near Long Point Bridge to stop salt water from circumventing the Hog Island Gully structure.

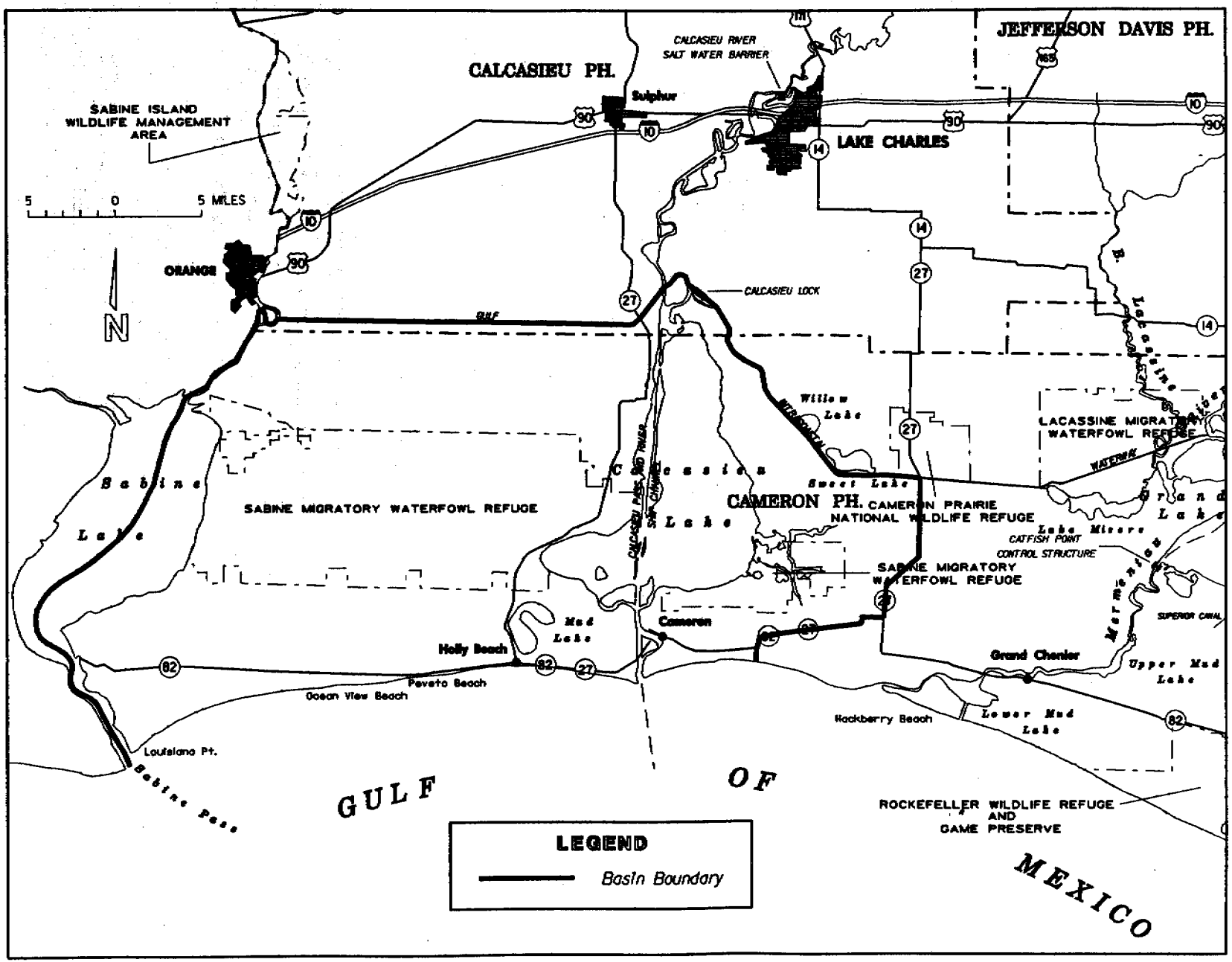

Figure 1. Calcasieu/Sabine Basin, Basin Boundaries.

The USFWS installed continuous data collection platforms at Brown's Lake and at the Hog Island Gully and West Cove structures to improve water management capability. Recently, programmable timers were installed on the tainter gate motors of these structures to provide additional management effectiveness. A data collection platform was installed to improve marsh protection and restoration effectiveness of the five Cameron-Creole Watershed structures along the eastern lakeshore.

DEPARTMENT OF AGRICULTURE, U.S. SOIL CONSERVATION SERVICE (SCS)

The Cameron-Creole Watershed project, constructed by the SCS, encompasses a 113,000-acre area east and northeast of Cameron. The project includes a levee along the eastern shore of Calcasieu Lake, five perimeter structures to protect marshes east of the lake from further saltwater intrusion damage, and vegetative plantings of smooth cordgrass on the southern shore of Calcasieu Lake during 1981 for shoreline erosion control. The SCS is also involved in marsh conservation planning with landowners through the local conservation districts. The agency has been involved in marsh protection with the use of vegetative plantings for protection of levees, lake rims, and shorelines in the basin. The SCS is completing the Calcasieu/Sabine Cooperative River Basin Study which looks at wetland resources, problems, and opportunities for part of the Coastal Wetlands Planning, Protection and Restoration (CWPPRA) study area.

STATE OF LOUISIANA

The State of Louisiana's Department of Natural Resources installed breakwaters in the gulf near Holly Beach (CS-1a and CS-1b) to help protect the gulf shoreline. A successful terracing project near the Sabine National Wildlife Headquarters was installed where interior marshes were destroyed by canal-induced saltwater intrusion. The terracing involved installation of wave-break levees in two open water areas to reduce wind/wave-induced erosion of adjacent marsh shores (State of LA, 1990-93).

PRIVATE

Several large landowners in the basin are involved in marsh conservation planning and implementation. These include Miami Corporation, Amoco Corporation, and Crain Brothers. Many of these landowners have management plans of their own.

EXISTING CONDITIONS

GEOMORPHOLOGY AND HYDROLOGY

Basin marshes and beaches developed over time due to pulses of riverine sediments of the Mississippi and Red Rivers. When the Mississippi River changed courses to a more westerly route, large quantities of reworked riverine sediment deposited along the basin shore and resulted in an outward shift in the shoreline. As the Mississippi River changed to more easterly courses, the shoreline retreated due to reduced sediment supply via littoral transport. These geologic events of beach building and retreating left a wide zone of coastal marshes and beach ridges in the lower basin. This process created the cheniers (oak ridges) associated with the Chenier Plain.

Progradation of the gulf shoreline isolated interior marshes from the nearshore gulf waters by cheniers. Hence, marshes characterized by fresh and low-salinity conditions resulted. As marsh sediments subsided, the accumulating organic matter produced by existing plant communities contributed more to maintaining soil elevation than reworked Mississippi River muds and clays. However, storm tides periodically deposited mineral sediments into interior marshes.

The basin hydrology is dominated by the Calcasieu and Sabine Lakes and Sam Rayburn and Toledo Bend reservoirs, which feed into Sabine Lake. The basin hydrology is influenced by three major navigation projects, which are the Calcasieu Ship channel, the Sabine-Neches Waterway, and the Gulf Intracoastal Waterway. A number of structural measures address some problems associated with channelization. Most of these measures are located along the Calcasieu lakeshore to protect marshes in and around wildlife refuge areas. Water control structures and perimeter levees are maintained to reduce saltwater intrusion and water level fluctuations. Almost 150,000 acres, located along the east and west sides of Calcasieu Lake, are under some form of hydrologic protection.

VEGETATION AND SOILS

Marshes between Sabine and Calcasieu Lake range from saline to fresh. Saline marshes are primarily located adjacent to Calcasieu Lake and Sabine Pass. Brackish marshes are located adjacent to both Sabine and Calcasieu Lakes and extend inland graduating into intermediate marshes.

The distribution of habitat types within the basin is shown in Table 1. The basin habitat data is displayed on Plate 1.

Heavy rainfall during the last several years reduced the frequency and magnitude of saltwater intrusion events. In some interior broken marsh areas cattails, California bulrush, and seashore paspalum expanded into shallow open water areas and began to rebuild deteriorated areas. In some saline areas, smooth cordgrass expanded gradually into shallow open water. These occurrences demonstrated potentially effective wetland restoration techniques.

Table 1. Distribution of Habitat in Calcasieu/Sabine Basin

Habitat Type	Acres
Fresh Marsh	32,800
Intermediate Marsh	112,000
Brackish Marsh	158,200
Saline Marsh	9,500
Marsh Subtotal	312,500
Ag/Pasture/Developed	43,500
Forest/Shrub-Scrub/Spoil	5,000
Open water/canals	269,000
Total	630,000

The soils of the basin are classified into two broad categories; 87 percent are organic and 13 percent are mineral. The organic soils have muck (highly decomposed organic) surface layers 16 to 40 inches thick. The fluid mineral marsh soils generally have muck surface layers that are less than 16 inches thick. These marsh soils are very fragile, held in place by a profuse mat of vegetation. Areas within the basin are forested or covered with prairie, pasture, shrub-scrub, or marsh vegetation.

The marsh soils are further subdivided into three salinity classes fresh, brackish, and saline. The intermediate vegetative class reflects the salinity of the soil surface layer, not the salinity of the whole soil profile. Approximately 70 percent of the intermediate vegetative community in the basin occurs on brackish soils, and 30 percent of this community occurs on fresh soils.

FISH AND WILDLIFE RESOURCES

The Chenier Plain basins differ in their fish and wildlife resources compared to Deltaic Plain basins in the quantity and species of migratory birds that visit these areas. The Calcasieu/Sabine and Mermentau Basins have more geese and whistling-ducks that concentrate during the year. These basins also receive species that traditionally are restricted to western states. This improves species diversity of birds that visit or reside in the Chenier Plain basins. The Calcasieu/Sabine basin has the longest running marsh inventory of birds in the state. The Sabine Christmas Bird Count has been compiled almost annually since 1942.

The basin is part of the Lower Mississippi River Delta-Gulf Coast portion of the North American Waterfowl Management Plan's priority habitat which protects mallard and pintail migration and wintering habitat. Several marsh areas in the basin provide wintering habitat for waterfowl. The Gum Cove area (74,100 acres) has wintering habitat for 150,000 waterfowl. It also has nesting habitat for mottled ducks and fall concentrations of blue-winged teal in excess of 20,000.

The Big Burn area (59,280 acres) supports 130,000 waterfowl and also has fall concentrations of blue-winged teal in excess of 20,000. The Johnson Bayou marshes

(54,340 acres) contain habitat for 93,000 waterfowl plus blue-winged teal and also breeding and wintering habitat for mottled duck.

Calcasieu/Sabine wetlands provide extensive nursery habitat for estuarine-dependent species such as brown shrimp, white shrimp, blue crab, seatrout, and many other species of fish and shellfish. Low-salinity marshes support both freshwater and estuarine-dependent fish and shellfish. Such areas also provide high quality habitat for furbearers, white-tailed deer, American alligator, and numerous species of reptiles and amphibians. Brackish marshes, having abundant wigeongrass and three-cornered grass, also provide high quality habitat for furbearers. Wetlands throughout the basin provide habitat for wading birds. Saline and brackish marshes also provide habitat for numerous species of shorebirds.Impoundments in the basin may reduce utilization of those arèas as nursery habitat for estuarine-dependent fish and shellfish. Water control structures used to reduce saltwater intrusion and restore deteriorated marshes could reduce the numbers of juvenile estuarine fish and shellfish found in such areas. Productivity of estuarine fish and shellfish is considered in restoration efforts.

ECONOMIC RESOURCES

Navigation through the basin is a source of revenue for many residents. Ports in the area include Lake Charles, Cameron, and Port Arthur. The Calcasieu Ship Channel, Sabine-Neches Waterway, and GIWW provide employment opportunities to many basin residents in the form of shipping and navigation services. The area also acts as a service center for the offshore industries.

Industry in the basin includes major oil and gas fields at Cameron Meadows, Black Bayou, East Hackberry, West Hackberry, Black Lake, Second Bayou, and near Broussard Lake. Numerous access canals and board roads, that support these industries, negatively impact wetland resources.

Much of the basin population earns part of its income directly or indirectly from the commercial and recreational use of vegetated wetland habitat. Profits are associated with fisheries and fur harvest, and the purchase of goods by recreational hunters, fishermen, and wildlife observers. The loss of wetland habitat results in a loss of income related to the sale of goods and services, and, thus, taxes. Cameron's port receives the third highest tonnage in the nation for fishery landings, and the annual catch is valued in excess of $20 million (NMFS 1993).

COASTAL WETLAND PROBLEMS

Figure 2 displays wetland loss in the basin between 1956 and 1984. Table 2 shows the average annual land loss acreages and percentages by subbasin for the listed time periods. The subbasins were broken out for examination of wetland losses. The problems affecting each subbasin are the same; therefore, the problems and selected plan projects are not on a subbasin basis. A total of 122,000 acres of wetlands have converted to open water since 1933 (Dunbar, Britsch, and Kemp 1992) (Table 2). The loss is 28 percent of the historical wetlands, but most of the loss occurred in the 1955-74 period.

Table 2. Average Annual Land Loss.

Time Period	Calcasieu Subbasin Measured Loss		Sabine Subbasin Measured Loss	
	(acres)	(percent/year)	(acres)	(percent/year)
1933-1955	2,188	0.07	1,498	0.03
1955-1974	27,565	1.09	73,260	1.66
1974-1983	5,078	0.53	7,780	0.54
1983-1990	2,407	0.34	2,206	0.21

1USACE GIS data base (February 1993).

Historic delta-building processes associated with the Mississippi River resulted in periodic marsh building along the gulf coast of the Mermentau and Calcasieu/Sabine Basins. Implementation of flood control and navigation projects on the Mississippi and Atchafalaya Rivers interrupted those natural processes. Consequently, mineral marsh building along the gulf coast occurs on only the eastern-most portion of the Mermentau Basin's coastline, with the remaining coastline presently experiencing net shoreline erosion and marsh loss. Given the need to maintain the existing flood control and navigation projects along the Mississippi and Atchafalaya Rivers, this condition is not expected to improve substantially.

Natural processes, such as subsidence and sea level rise, also contributed to wetland deterioration and loss. Under pristine conditions, natural marsh building and maintenance processes of organic accumulation were effective in maintaining coastal marshes despite the process of reduction. However, human alterations disrupted the hydrologic processes contributing to wetland building and maintenance, while subsidence and sea level rise continued. In the Calcasieu/Sabine Basin, subsidence and sea level rise resulted in an average water level rise of 0.25 inches per year (Penland et al. 1988).

Man-made hydrologic alterations first affected basin marshes prior to the turn of the century, when channels were dredged through the shallow bars of Sabine Pass and Calcasieu Pass. By the mid 1920's, a series of small access canals were dredged through the marshes connecting Sabine and Calcasieu Lakes. Those canals connected formerly separate watersheds, and in some cases established boat access between Sabine and Calcasieu Lake. Salt domes and associated deposits of oil and gas were discovered at Hackberry, Cameron Meadows, and Black Bayou, and canals were dredged for access and other extraction activities.

Between 1927 and 1941 deep-draft navigation channels were constructed along the west side of Sabine Lake (Sabine-Neches Waterway), and through Calcasieu Lake to the gulf (Calcasieu Ship Channel). The Sabine-Neches Waterway was deepened and widened during the late 1930's and again in the early 1970's. And similarly, the Calcasieu Ship Channel was deepened and enlarged in 1951 and 1968. Today these deep water channels are maintained at a 400-foot bottom width and a 40-foot depth. The channels were connected by construction of the Lake Charles Deepwater Channel (now the GIWW).

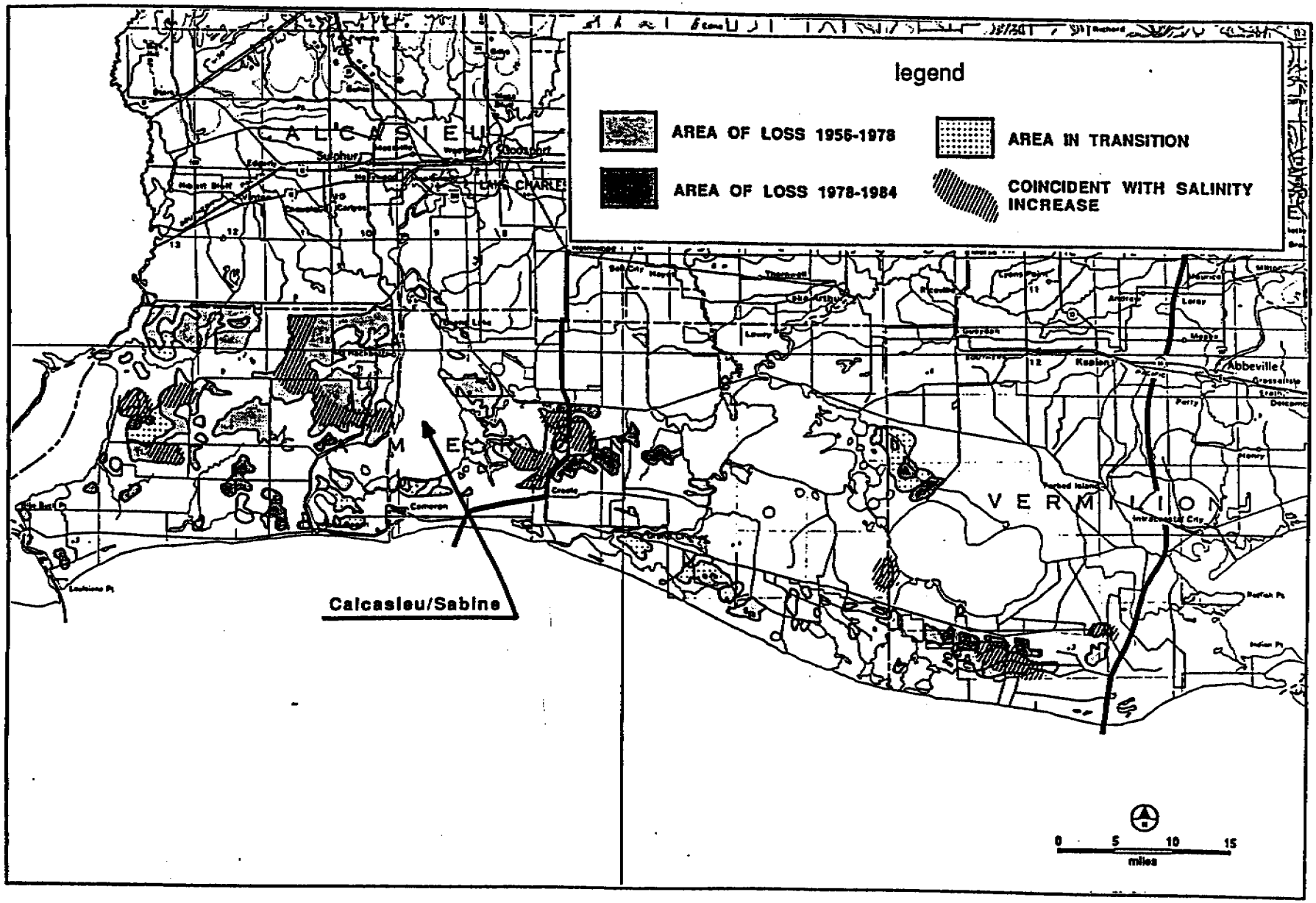

Figure 2. Wetland loss in the Calcasieu/Sabine Basin

Extensive channelization caused much of the marsh loss in the basin. During the 1930's, fresh and low-salinity vegetation dominated the area, but by the mid 1950's these marshes deteriorated between Calcasieu and Sabine Lakes. More saline habitat types resulted throughout the basin. High rates of marsh loss occurred through the 1960's and most of the 1970's. Almost all fresh marsh was converted to intermediate and brackish by the late 1970's, except marsh within freshwater impoundments that was preserved by the Calcasieu Locks in the northeast corner of the basin (adjacent to Sweet and Willow Lakes). As indicated by habitat maps of the basin, conversion to more saline habitat types continued through the 1980's at a slower rate.

Vast interior fresh marshes south of the Gulf Intracoastal Waterway deteriorated to three fresh marsh impoundments and a few very small remnants located elsewhere. Because of this severe marsh deterioration and loss during the 1960's and 1970's, large areas of turbid shallow open water and broken marsh exist. The most extensive loss areas are adjacent to Black Lake, Brown's Lake, south and southeast of Hackberry, and in the vicinity of Black Bayou, Green's Lake, Willow Bayou, and Broussard/Boudreaux Lake. Marshes adjacent to these large open water areas experience erosion due to wave action. Wind actions across these areas produce wind tides that may exacerbate the export of eroded soils.

Another cause of marsh deterioration and loss is the network of interior canals which increase the saltwater flow into vulnerable interior marshes. Canals, dredged through natural ridges, greatly increase the area of tidally influenced marsh and increase the degree of tidal/marine influence experienced by affected marshes. Historically, marshes drained to natural bayous within the basin that carried the excess water to the Calcasieu and Sabine Lakes. Increased channelization reduced the freshwater retention of interior marshes by connecting these bayous with man-made canals. Drainage capacity and discharge rates increased from the marshes to the lakes. Controlled water releases at Toledo Bend Dam and Sam Rayburn Dam also altered flows into Calcasieu and Sabine Lakes. Lower salinities resulted in the Sabine Lake during the summer months.

Operation of the Toledo Bend and Sam Rayburn Reservoirs also affects salinities in the basin. Sabine Lake salinities are lower now due to increased water discharges associated with seasonal demands for electrical power. These discharges likely reduce the adverse impacts associated with the Sabine-Neches Waterway, but excessive salinities may still occur during drought conditions.

Hydrologic alterations within the basin also impact sediment introduction into affected marshes. Flood control projects on the Mississippi and Atchafalaya Rivers, and construction of jetties on the Mermentau River, Calcasieu Ship Channel, and at Sabine Pass, affect long shore sediment transport and sediment availability. Navigation channels and associated spoil banks retard the flow of riverine freshwater, nutrients, and suspended sediments into coastal marshes. Deep-draft channels and upstream structures capture suspended riverine sediments that might otherwise resuspend and deposit in adjacent marshes. Spoil banks of the numerous access canals dredged through the marsh may also reduce sediment availability to some areas.

Salt water contributes to severe alteration of the plant community and disperses soil materials. As salt-intolerant species become stressed and die, they lose their root-binding effect on the organic soil layers. These dispersed organic soil particles

are transported from the marsh area via tidal outflow. The result of prolonged erosion of these soils is open water areas from a few inches to 40 inches deep. Hurricanes drive salt water into fresh marshes which also increases the loss.

In areas where saltwater intrusion destroyed fresh and low-salinity vegetation, large areas of shallow open water now exist. Wind-induced wave action continues to erode exposed marsh edges. Additionally, strong winds create tides which often create flow patterns conducive to exporting eroded soils, and discharging interior fresh water and/or introducing salt water. Unless this erosive cycle is interrupted, erosion of exposed marsh edges will likely continue.

Shoreline erosion is a problem along the banks of Calcasieu Lake, Sabine Lake, and the Gulf Intracoastal Waterway. Erosion-related breaching of the shores threatens adjacent marshes, due to the vulnerability of their typically weaker soils to increased water exchange and saltwater intrusion. Along the Gulf of Mexico, shoreline retreat causes loss of back-beach marshes and also threatens to alter the hydrology of interior marshes.

In summary, wetland loss within the basin is largely the result of extensive hydrologic alterations to wetland building and maintenance functions. Recent observations regarding marsh recovery indicate that reduced salinities may protect and restore wetlands in some areas.

FUTURE WITHOUT-PROJECT CONDITIONS

WETLAND LOSS

Given the existing conditions of the marsh, the future loss rate may increase to that of the an average 1974 to 1990 loss rate, with future losses averaging about 1,100 acres per year. Table 3 presents the projected losses by subbasin for 20 and 50-year time periods. The percentage of acres lost is based on a comparison of the acres lost to those existing in 1988.

Table 3. Projected Land Loss in Calcasieu/Sabine Basin

	Projected Loss in 20 Years		Projected Loss in 50 Years	
Subbasin	Acres	Percent	Acres	Percent
Calcasieu	9,400	9.5	23,400	23.7
Sabine	12,500	8.4	31,200	20.9

Despite attempts to reduce saltwater intrusion into marshes west of Calcasieu Lake, some areas of broken brackish and intermediate marsh continue to deteriorate, while other areas experience minimal loss. Gradual evolution of the landscape toward a system dominated by large bodies of open relatively turbid water will occur.

Physical erosion of marshes around the perimeters of Willow Lake and Sweet Lake will eventually result in one large open water body between the Gulf Intracoastal Waterway and the coastal prairie to the north. This large water body could exacerbate shoreline erosion of Cameron-Creole marshes south of the Gulf

Intracoastal Waterway and compromise the effectiveness of the Cameron-Creole Watershed Project.

The Cameron-Creole Watershed Project is intended to help stabilize deteriorated marshes east of Calcasieu Lake. The project was initiated under the SCS Small Watershed Program and has the potential to improve the habitat diversity and productivity of the wetlands east of Calcasieu Lake. Automation of watershed water control structures will improve water management capability, further reducing wetland losses and minimizing adverse impacts on estuarine-dependent fish and shellfish. Erosion of marshes adjacent to large water bodies will continue; and some brackish marshes may also deteriorate. Small open water areas within fresh and low-salinity marshes will likely close in with emergent vegetation. Over time, the landscape may evolve into a relatively solid marsh which includes a greater number of medium and large ponds.

Marshes in the vicinity of Oyster Lake, south of West Cove, will also deteriorate and become a relatively large body of shallow open water. Marshes north of Black Bayou will gradually open up resulting in the establishment of a large open water area.

Continuing shoreline retreat combined with gulf overwash due to storms will allow the effects of salt burns following storms to reach further into the non-saline marshes. This will occur even though saline marshes immediately adjacent to the gulf benefit from sediment introduction.

FISH AND WILDLIFE RESOURCES

The basin is losing nesting, roosting, and feeding habitat for many migratory species. The loss of vegetated emergent and submerged aquatics affects the quantity and quality of available habitat. Loss of perimeter marshes around Willow and Sweet Lakes will result in a substantial loss of fresh marsh fish and wildlife habitat and habitat quality. Production of estuarine-dependent fish and shellfish will decrease in proportion to the remaining acreage and interface of nursery wetlands.

ECONOMIC RESOURCES

As wetland loss continues, the economies of local and state government will be adversely affected by increased maintenance costs and loss of infrastructure and tax base. Revenues from commercial and recreational use of the basin's fishery and wildlife resources will decline as wetlands are lost. The loss of fish and wildlife associated income will primarily affect residents in the lower basin reducing their quality of life and ability to maintain households.

PLANNING OBJECTIVES FOR THE BASIN

Due to the problems discussed above, the potential for natural large-scale wetland creation is virtually nonexistent. The natural riverine sediment deposition processes that built wetlands along the gulf coast of the Calcasieu/Sabine basin have been eliminated by flood control and navigation projects on the Mississippi and Atchafalaya Rivers. Additionally, natural processes that historically helped to maintain basin wetlands have been disrupted to varying degrees by man-made hydrologic alterations for navigation and mineral extraction access. These man-made hydrologic alterations have further affected the basin by causing detrimental circulation patterns of saltwater throughout the basin. Therefore, the basin plan must be designed to utilize features that will protect and preserve the marsh.

The key planning objectives in the Calcasieu/Sabine Basin are: 1) Preserve marshes by restoring hydrology (which reduces saltwater intrusion and tidal scour); and 2) Maintain the geologic framework of basin by protecting shorelines from further erosion.

STRATEGIES CONSIDERED

These objectives lead us to strategies that will help to approach the stated objectives. The key strategies include: 1) preserve marshes by decreasing saltwater intrusion and detrimental water circulation patterns with locks in the major waterways; 2) preserve marshes by decreasing saltwater intrusion and detrimental water circulation patterns at the basin perimeter; and 3) maintain the geologic framework of the basin. A fourth strategy is to use small scale measures in areas of critical need and opportunity.

Strategy 1, Lock Strategy (Figure 3), would address basin-wide hydrologic alterations caused by the Calcasieu Ship Channel, the Sabine-Neches Waterway, and the Gulf Intracoastal Waterway. Locks would be constructed at Sabine Pass and Calcasieu Pass to control water flow and reduce saltwater intrusion. A lock would also be constructed on the Gulf Intracoastal Waterway, approximately midway between the Calcasieu and Sabine Rivers, which would re-establish the historic separation of the upper Sabine and Calcasieu estuaries. In combination, these three structures would act to restore historic hydrologic conditions throughout most of the basin, thus reducing stress on vegetation and wetlands. Adverse impacts of saltwater intrusion and increased water exchange associated with these man-made navigation channels would be addressed by this strategy.

Strategy 2, Perimeter Control Restoration (Figure 4), would treat adverse effects of basin-wide hydrologic alterations at the perimeters of Calcasieu and Sabine Lakes, Gulf of Mexico, and major waterways. Structural and vegetative measures would be installed at critical areas around the perimeter of the basin to provide shoreline protection, decrease saltwater intrusion, provide freshwater introduction, and help stabilize interior areas. Because the Sabine-Neches Waterway and Calcasieu Ship Channel also affect hydrology of marshes adjacent to the GIWW, structures would be installed where needed along the GIWW to protect wetlands and reduce erosion.

Strategy 3, Maintain Geologic Framework (Figure 4), will provide the protection of marshes from increased saltwater intrusion and tidal exchange due to shorelines eroding into fragile marsh areas. Also, protection of interior marsh shorelines and

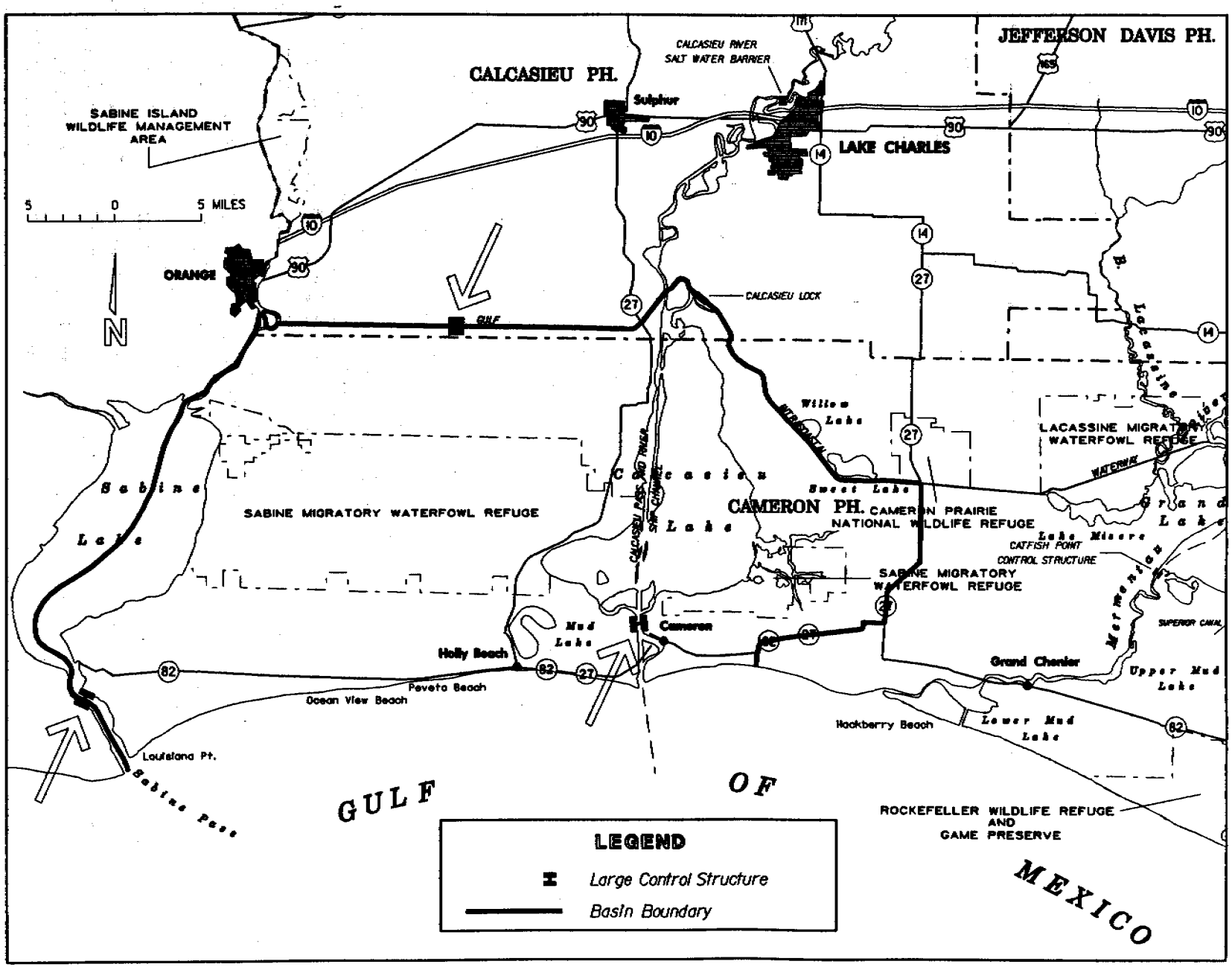

Figure 3. Calcasieu/Sabine Basin, Strategy I - Lock Alternative.

levees will reduce wave fetch and thus, erosion of interior wetlands. Shoreline protection can be accomplished with the use of hard structures such as rip rap, gabions, etc. in areas of high energy waves. Shoreline protection can also be accomplished with soft and semi-soft structures such as vegetative plantings, levees, terraces, and wave stilling devices.

The feature is used in Sweet and Willow Lake-GIWW Bank Stabilization (CS-11b), Constance Beach to Ocean View Shore Protection (CS-1c), and six others projects. The sediment/nutrient trapping feature is used in the Deep Lake Bayou Unit (XCS-48 (SA-6)) and Browns Lake-Starks Canal Area (XCS-48 (SA-1)) projects. The terracing feature is utilized in the Boudreaux-Broussard Marsh Protection (CS-15) project.

Strategy 4, Use Small Scale Measures in Areas of Need or Opportunity (Figure 5), will protect interior marshes from interior marsh erosion by reducing saltwater intrusion, water level fluctuations, and wave fetch. These problems can be addressed with marsh management and hydrologic restoration structures and operation schemes, freshwater introduction, and beneficial use of dredge material.

The hydrologic restoration feature is used by North Black Lake Freshwater Impoundment (XCS-48 (NO-3)), Rycade Canal Structure (CS-2), Oyster Bayou and Mud Bayou Structures (PCS-12/18), Greens Lake Unit (XCS-48 (SA-5)), and other projects. The marsh management feature is used by Cameron-Creole Operation and Maintenance (XCS-47, 48i,j,&p) Brown Lake Hydrologic Restoration (CS-9), Tripod Bayou (CS-14), East Mud Lake (PCS-24), and Black Lake North East Area (XCS-48 (NO-2)) projects. The marsh creation feature is used by Calcasieu Ship Channel Spoil Mining and West Cove Canal Plug (XCS-51/44) project, Hog Island Gully Area (XCS-48 (SA-9)), and other projects. The freshwater introduction feature is utilized the Toledo Bend Water Management (XCS-33), Back Ridge Freshwater Introduction (CS-13), Freshwater Introduction from the GIWW (XCS-48b), and two other projects.

RATIONALE FOR SELECTED PLAN

In order to best achieve the basin objectives, strategies 2, 3, and 4 were used for choosing projects in the selected plan. Strategy 2 was chosen due to the shorter time and lower cost of implementation of the perimeter alternatives versus the lock alternative. Strategy 1 would require $750 million dollars to construct, operate, and maintain. The locks in this alternative would also require a detailed feasibility study by the USACE, a Congressional authorization for funding, and time for design and construction of each lock. The locks would also have indirect costs due to increased cost to shipping because of the time it would take for boats to go through each lock system. Strategy 2 would cost $136.5 million to construct and maintain and many of the projects could be funded under the present CWPPRA authorization and be implemented within five years of selection.

This combination addresses the basin objectives, takes advantage of existing features within the basin, is more readily implementable, and has less adverse impacts on navigation interests than Strategy 1.

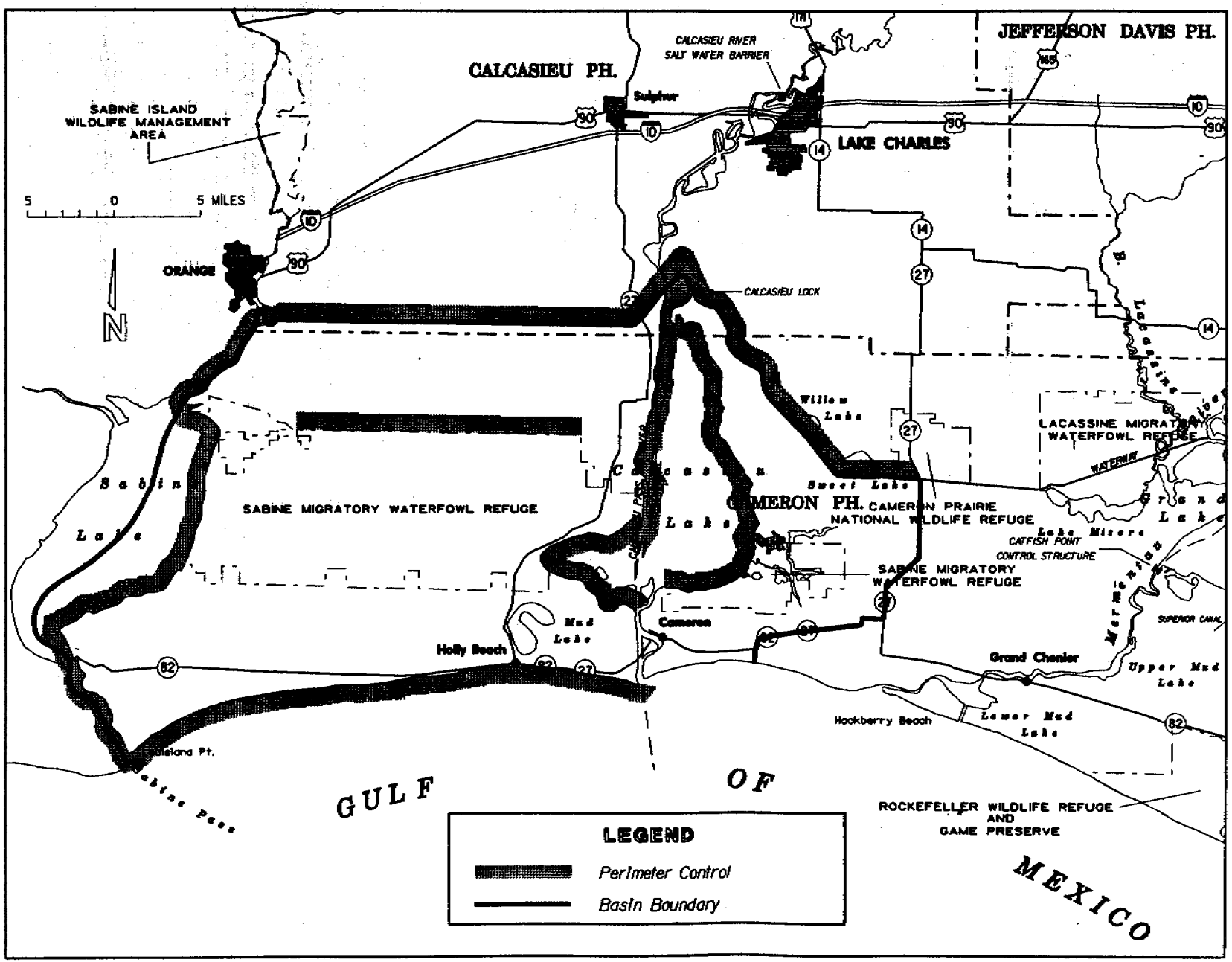

Figure 4. Calcasieu/Sabine Basin, Strategies 2 and 3 - Perimeter Control and Maintain Geologic Framework.

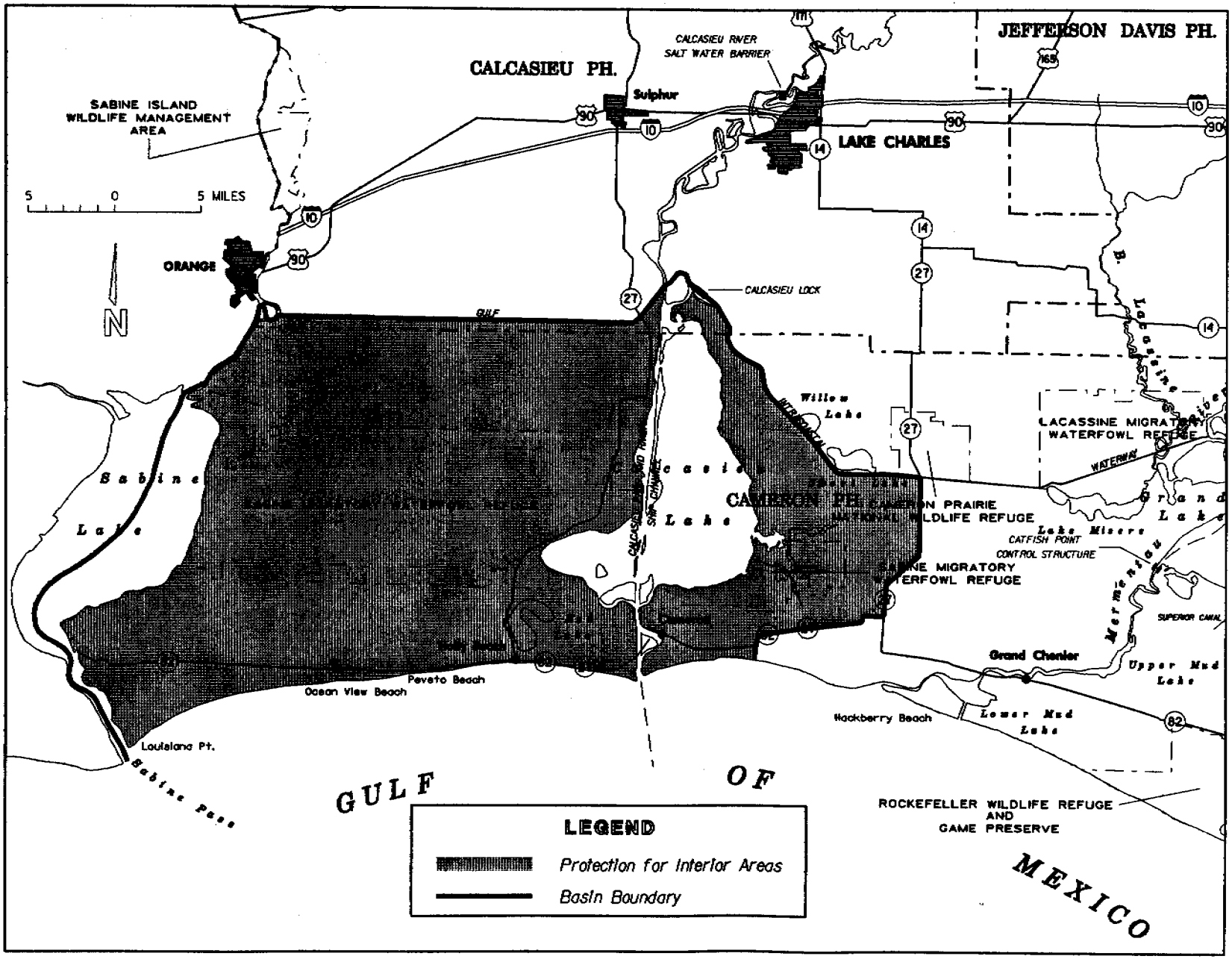

Figure 5. Calcasieu/Sabine Basin, Strategy 4 - Interior Restoration.

COMPONENT PROJECTS

Projects in the selected plan are classified as critical and supporting. Critical projects are those located along: 1) the perimeter of the lakes, 2) a key interior area, and 3) the Gulf of Mexico. Supporting projects are located in interior large open water areas and other severely eroding areas where perimeter projects alone would not provide a sufficient degree of protection.

The chronological order of project implementation will not be based solely upon classification as either critical or supporting. Instead, implementation will be based upon the degree of threat, amount of benefits, readiness of project design, and other relevant conditions or issues.

Figure 6 shows location of the critical short- term projects in the selected plan.

PRIORITY LIST PROJECTS

Nine CWPPRA projects in the Calcasieu/Sabine Basin are on the first 3 priority project lists. These include Cameron-Creole Watershed Hydrologic Restoration, Sabine Wildlife Refuge Shoreline Erosion Control, Vegetative Plantings Demonstration, Highway 384 Hydrologic Restoration (PCS-25), Clear Marais Shore Protection (PCS-27), East Mud Lake Hydrologic Restoration (PCS-24), Brown Lake Hydrologic Restoration (CS-9), Cameron-Creole Operation and Maintenance (CS-4a), and Sabine National Wildlife Refuge Head Quarters Canal Replacement (XCS-47, 48i,j,&p) projects. These projects will protect or restore a total of 12,350 acres of marsh. A detailed description can be found in the project description section of this appendix.

CRITICAL SHORT-TERM PROJECTS

The projects listed below are critical to addressing the basin objectives with strategies 2, 3, and 4. The thirty-two projects in the basin will reduce loss of interior marshes by controlling saltwater intrusion at the basin perimeter and protecting those of the basin's shorelines that are the barriers between the gulf and interior marshes.

XCS-48 (NO-13)	Northeast Gum Cove
CS-5a/12	Black Bayou Freshwater Diversion and Hydrologic Restoration
CS-2	Rycade Canal Structure
FCS-17	Cameron-Creole Plugs
PCS-10	Rock Weirs
PCS-11	Sabine Lake Canal Closures
PCS-14	Kelso Bayou Structure
PCS-25	Highway 384
PCS-31	Brannon Ditch Saltwater Barrier
XCS-51/44	Mine CSC Spoil and Plug West Cove Canal
XCS-46	North Line Canal Structure
XCS-47/48i, 48j, & 48p	Sabine Refuge Headquarters Structures
XCS-48 (NO-17)	Black Bayou Cutoff Area
XCS-48f	Long Point Structure

XCS-48 (NO-3)	North Black Lake Area
XCS-48 (NO-18)	Southeast Black Bayou Area
XCS-48 (NO-19)	Black Bayou Area
XCS-48 (SA-10)	West Cove Canal
XCS-52	Plug in Canal Near Bayou Peconi
XCS-53	Alkali Ditch Structure
XCS-54	Goose Lake Restoration Project
CS-4A/PCS-7	Cameron-Creole Operation and Maintenance
CS-9	Brown Lake
CS-1a	Peveto to Holly Beach Gulf Shore Protection
CS-1c	Constance Beach to Ocean View Gulf Shore Protection
CS-11b	Sweet Lake and Willow Lake - GIWW Bank Stabilization
FCS-18	Sabine Pool 3 Levee Repair
PCS-1	Erosion Protection along the GIWW
PCS-26	Perry Ridge Shoreline Protection
PCS-27	Clear Marais GIWW Bank Stabilization
XCS-42	GIWW Spoil Bank Maintenance
XCS-48a	GIWW Spoil Bank Repair Near Vinton Canal

SUPPORTING SHORT-TERM PROJECTS

The projects listed below will support by addressing the basin objectives with strategies 2, 3, and 4. The forty-seven projects in the basin will work with the critical short-term projects to reduce loss of interior marshes by controlling saltwater intrusion at the basin perimeter and protecting those of the basin's shorelines that are the barriers between the gulf and interior marshes.

CS-4b	Cameron-Creole Freshwater Introduction
CS-5a	Sabine Freshwater Introduction
CS-13	Back Ridge Freshwater Introduction
XCS-48b	GIWW Freshwater Introduction
PCS-12/18	Oyster and Mud Bayou
PCS-21	Moss Lake Hydrologic Restoration
XCS-48 (NO-5)	South Browns Lake Hydrologic Restoration
XCS-48 (NO-15)	Black Bayou Cutoff Canal Area
XCS-48 (NO-20)	West Black Bayou Area
XCS-48 (NO-21)	Southwest Black Bayou Area
XCS-48 (SA-5)	Greens Lake Unit
XCS-48 (SA-7)	South Willow Bayou Unit
XCS-48 (SA-8)	Northwest West Cove
XCS-48 (SO-1)	Johnsons Bayou Unit
XCS-48 (SO-5)	West Mud Lake Area
XCS-48 (SO-8)	Oyster Bayou/Lake Unit
XCS-48c	GIWW Canal Closures
XCS-48o	Rock Liner in Canal - Southwest Portion of West Cove
XCS-48m	Dredge Material for Beach Nourishment
XCS-48 (SA-9)	Hog Island Gully Area

XCS-50	St. Johns Island
CS-8/XCS-48 (NO-2a)	Black Lake North Area
CS-10	Grand Lake Ridge Area
CS-14	Tripod Bayou
PCS-24	East Mud Lake
XCS-48n	Structures at LA 27 West of Holly Beach
XCS-48 (NO-2)	Black Lake Northwest
CS-1b	Holly Beach to Calcasieu Pass Breakwaters
CS-7	West Black Lake Shore Protection
PCS-2	Breakwaters at Louisiana Point
PCS-4	Long Point Lake Shore Protection
PCS-29	Herbert-Precht Rip-Rap
PCS-32	Bayou Choupique
XCS-34	Spoil Along West Side of CSC
XCS-37	Rock Dike
XCS-39	Turners Bay Rock Revetment
XCS-48 (NO-4)	West Black Lake Area
XCS-48 (SO-2)	Southwest Johnson Bayou Unit
XCS-36	Compost Demo Project
XCS-48 (NO-8)	Southwest Black Lake Area
XCS-48 (NO-8a)	South Gum Cove Area
XCS-48 (SA-1)	Browns Lake-Starks Canal Area
XCS-48 (SA-6)	Deep Lake Bayou Unit
CS-15	Broussard-Boudreaux Marsh Protection
FCS-19	West Hackberry Plantings
PCS-34	Plantings to Build Bottom Elevation
XCS-49	Turners Bay Vegetative Planting

SUPPORTING LONG-TERM PROJECTS

The projects listed below will support the basin objectives with strategies 2, 3, and 4. The fifteen projects in the basin will work with the critical and supporting short-term projects to reduce loss of interior marshes by controlling saltwater intrusion at the basin perimeter and protecting those of the basin's shorelines that are the barriers between the gulf and interior marshes. The long-term supporting projects also include the XCS-33 Management of Water Release at Toledo Bend and Sam Rayburn Reservoirs which may be found to have a significant impact on the hydrology of the basin's western side. It was placed in this section because of the need for further study.

XCS-33	Management of Reservoir Water Releases
CS-5b/12	Sabine Freshwater Introduction and Hydrologic Restoration
XCS-48 (NO-14a)	Starks Bayou Unit
XCS-48 (SA-1a)	South Browns Lake - East Hog Island Gully
XCS-48 (SA-1b)	East Back Ridge Canal Area
XCS-48 (SA-2)	South Back Ridge Canal Area
XCS-48 (SO-4)	Four Mile Square Unit

XCS-48 (SO-9)	Rabbit Island
XCS-48h (SA-8)	Rebuild Spoil South Side of West Cove
XCS-48i	Louisiana Highway 27 Culverts
XCS-48 (SO-8a)	West Calcasieu River Chenier
XCS-48 (SA-3)	Pool 3 Unit
XCS-48 (SA-4)	Old North Bayou Unit
XCS-48 (SO-7)	Southwest West Cove Unit
XCS-48 (NO-10)	East Gum Cove Area

BENEFITS AND COSTS OF THE SELECTED PLAN

DEVELOPMENT OF BENEFITS AND COSTS

The benefits for most of the following projects were estimated according to a modified rapid-assessment Wetland Value Assessment (WVA) protocol, based in part on project-specific information which varied in quality and quantity among projects. The estimates are therefore rough approximations considered preliminary to a more in-depth assessment, and should be interpreted and used as such. Information for shoreline erosion and marsh creation projects may be accurate since it is quite site specific. Benefits for hydrologic restoration and marsh management are more generic and thus less accurate.

Projects which have been included on the first three priority lists have had a complete, in-depth WVA analysis.

Cost estimates for all projects were done according to a generic CWPPRA cost formula which includes the construction cost plus a construction cost multiplier of 12.5 percent for engineering and design; 11.5 percent for supervision and administration; and 25 percent for contingencies; plus monitoring and operation/maintenance for 20 years.

Projects on the first three Priority Project Lists received more rigorous and detailed costs estimates.

BENEFITS AND COSTS

Implementation of the short-term projects in the selected plan would enhance wetlands and decrease marsh losses over a period of twenty years. The plan will create, protect, or restore 24,810 acres, turning an anticipated loss of 21,900 acres into a net gain of approximately 2,900 acres, over the next twenty years at a cost of $136,460,000.

A summary table follows that lists all of the projects in the selected plan along with project type, short-term critical, long-term critical, short-term supporting, long-term supporting, cost estimates, and benefited acres estimates. Cost estimates include engineering and design, installation, project administration, operation and maintenance, and monitoring (Table 4). Figure 6 shows the project locations.

KEY ISSUES

Installation and operation of water control structures will could reduce access of estuarine-dependent organisms to structurally managed marshes, thereby reucing estuarine organism productivity. Productivity of freshwater fisheries will likely be increased in some managed areas. It is possible that plan implementation will

result in some degree of reduction in the harvest of economically important marine fisheries species.

Structures are normally located and designed in a manner that would not impede drainage of developed lands adjacent to managed wetlands. Adjustments would be made in structures or their operation at certain times to accommodate adverse situations.

Structure design and operation could increase the duration of periods when water levels exceed that of the marsh surface. Because this might adversely affect vegetation within managed areas, structure design and operation will be developed to avoid or reduce such possibilities.

Availability of suspended sediment is very limited throughout most of the basin. Freshwater diversions have been incorporated into projects where nutrient and sediment introduction may benefit wetlands. To the degree possible, actively managed perimeter structures will be opened during periods when nutrients and sediments can be introduced into wetlands.

To date, efforts have been made during the development of restoration project concepts to seek effective alternatives to features that would block boater access or make access more difficult. The use of boat-bays and other features to maintain a suitable degree of boater access will be addressed during detailed project and structure design.

The cost of implementing the selected plan is approximately $136,460,000. Thus, funding other than the Coastal Wetlands Planning, Protection, and Restoration Act will be required in order to implement all of the projects in the selected plan.

Table 4. Summary of the Calcasieu/Sabine Projects.

Project No.	Project Name	Project Type	Priority List Projects	Acres Created, Protected, or Restored	Net Benefited Acres	Estimated Cost ($)	Cost Per Benefited Acre ($/Ac)	Comments
Critical Projects, Short-Term								
XCS-48(NO-13)	N.W. Gum cove Area	FD		200	1,171	3,013,000	2,600	Related to XCS-48a, 48b, CS-5a, 5a/12, 5b & 5b/12.
CS-5a/12	Black Bayou FW Diver. & Hydro Rest	FD/HR		376	4,311	4,263,000	1,000	Contains CS-5a &12; related to XCS-48 (NO-15,17,18,19,20, 21), PCS-10, XCS-48c & 48d.
CS-12	Black Bayopu Hydrologic Restoration	FD		[215]	[3,413]	[4,263,000]	1,200	
CS-2	Rycade Canal Structure	HR	*	[3,000]	[10,000]	[650,000]		Relates to XCS-48 (NO-5), (SA-1), (SA-1a), and (SA-1b), completed by La. CRD
PCS-17	Camerol-Creole Plugs	HR	PPL1	600	1,741	534,000	300	Same as CS-17.
PCS-10	Rock Weirs	HR		23	259	1,607,000	6,200	Contained w/n CS-5a/12 & CS-12, rel. to XCS-48 (NO-17 to NO-21).
PCS-11	Sabine Lake Canal Closures	HR		12	58	2,090,000	36,000	Related to XCS-48 (NO-21), (SA-5), (SA-7), (SO-1), & (SO-2); XCS-48g.
PCS-14	Kelso Bayou Structure	HR		34	319	1,587,000	5,000	Contained w/n XCS-48 (NO-5); adj. to CS-9, XCS-48 (NO-1), XCS-53
PCS-25	Highway 384 Area	HR	PPL2	150	283	521,000	1,800	
PCS-31	Saltwater Barrier in Brannon Ditch	HR		na	na	686,000	na	Related to PCS-1
XCS-44	West Cove Canal Plug	HR		[52]	[985]	[253,000]	300	Related to XCS-48 (SA-10), contained w/n XCS-51/44.
XCS-46	North Line Canal Structure	HR		461	4,315	607,000	100	Benefits XCS-48 (SA-1),(Se-5), (NO-14a).
XCS-47,48i,j,k&p	Replace Sabine NWR HQ Structures	HR/MM	PPL3	953	6,490	3,841,000	600	Same as XCS-48i,j,k, & p combined; will benefit XCS-48 (SA-1),(SA-2),(SA-4),(NO-8a).
XCS-48d(NO-17)	Black B. Cutoff Spoil Rep. & Rock Weir	HR		[88]	[613]	[977,000]	1,600	Contained w/n CS-5a/12, CS-5b/12, related to XCS-48 (NO-17).
XCS-48f	Structure near Long Point Bridge	HR		52	3,672	526,000	100	XCS-48 (SA-10), PCS-4.
XCS-48(NO-3)	N. Black Lake Freshwater Impound	HR	*	238	800	1,314,000	1,600	Related to PCS-1
XCS-48(NO-17)	N.W. Black Bayou Area	HR		88	613	2,322,000	3,800	Relates to CS-5a/12,5b/12, PCS-10, XCS-48b, 48d.
XCS-48(NO-18)	SE Black Bayou Area	HR		[144]	[607]	[2,153,000]	3,500	Contained w/n CS-5a/12, CS-12, related to PCS-10.
XCS-48(NO-19)	Black Bayou Area	HR		126	1,110	3,243,000	2,900	Related to CS-5a/12, CS-12, PCS-10.
XCS-48(SA-10)	W. Cove Canal Unit	HR		76	599	2,573,000	4,300	Related to XCS-47/48ijkp, XCS-44, XCS-51/44, XCS-48o, PCS-4.
XCS-52	Plug Canal near B. Peconi	HR		77	165	443,000	2,700	Related to CS-4a.
XCS-53	Alkali Ditch Structure	HR		17	303	1,587,000	5,200	Related to CS-9, PCS-14, XCS-48 (NO-1).
XCS-54	Goose Lake Restoration Project	HR		34	105	1,718,000	16,400	Related to PCS-1
XCS-51/44	Mine Calc. SC Spoil & Plug W. Cove Canal	MC/HR		235	1,056	1,929,000	1,800	Contains XCS-44, related to XCS-48 (SA-10).
CS-04a/PCS7	Cameron-Creole O&M	MM	PPL3	2,602	10,682	2,895,000	300	Contains PCS-22
CS-09	Brown Lake Hydrologic Restoration	MM	PPL2	282	1,020	2,532,000	2,500	Same as XCS-48 (NO-1) & relates to (NO-5), PCS-14, and XCS-53
CS-01a	Peveto to Holly Beach S. Protection	SP		2,723	3,890	7,280,000	1,900	Relates to XCS-48n and XCS-48 (SO-5)
CS-01c	Constance Beach to Ocean View S. Pro	SP		55	99	5,900,000	59,600	Relates to XCS-48n and XCS-48 (SO-3), part of XCS-48r
CS-11b	Sweet & Willow Lake-GIWW Bank Stab.	SP/HR		294	4,477	2,626,000	600	Contains CS-11, CS-11a, XCS-41
PCS-18	Sabine Pool 3 Levee Repair	SP	PPL1	5,542	8,985	4,484,000	500	
PCS-01	Erosion Protection along GIWW	SP		1,542	1,613	20,000,000	12,400	Related to PCS-26, PCS-27, XCS-48 (NO-19).
PCS-26	Perry Ridge, Shoreline Protection	SP		109	657	3,886,000	5,900	Part of PCS-1
PCS-27	Clear Marais	SP	PPL2	1,067	2,966	1,521,000	500	Part of PCS-1
XCS-42	GIWW Spoil Bank Maintenance	SP		814	1,517	295,000	200	Relates to CS-4a, contains CS-11, 11a, &11b.
XCS-48a	Spoil bank rep.-GIWW at Vinton Canal	SP		7	73	357,000	4,900	Part of CS-5a, CS-5a/12, XCS-48 (NO-13) & (NO-15).
Subtotal: Critical Projects, Short-Term				18,790	63,350	86,180,000		

Table 4. Summary of the Calcasieu/Sabine Projects (Continued).

Project No.	Project Name	Project Type	Priority List Projects	Acres Created, Protected, or Restored	Net Benefited Acres	Estimated Cost ($)	Cost Per Benefited Acre ($/Ac)	Comments
Supporting Projects, Short-Term								
CS-04b	Freshwater Introduction & Outfall Mgt.	FD		132	400	1,018,000	2,500	Related to CS-4a.
CS-05a	Sabine Freshwater Introduction	FD		[376]	[4,311]	[2,228,000]	2,100	Contained w/n CS-5a/12 & 5b/12, relates to XCS-48 (NO-13,14, 14a &15).
CS-13	Back Ridge Freshwater Introduction	FD		2	27	1,425,000	52,800	Related to CS-4a, CS-4b, CS-14.
XCS-48b	Intro. Freshwater from GIWW	FD		[21]	[67]	[778,000]	11,600	Same as CS-5a, CS-5a/12, part of XCS-48 (NO13), (NO15).
PCS-12/18	Oyster Bayou & Mud Bayou Structures	HR		631	1,348	2,271,000	1,700	Contains XCS-48 (SO-8), XCS-48q, PCS-12, PCS-18.
PCS-21	Moss Lake Hydrologic Restoration	HR		19	92	1,245,000	13,500	
XCS-48(NO-05)	South Brown lake Hyd. Rest.	HR		500	1,387	3,683,000	2,700	Related to PCS-14, CS-9, XCS-48 (NO-1).
XCS-48(NO-15)	Black Bayou Cutoff Canal Area	HR		[16]	[122]	[1,617,000]	13,300	Contained w/n CS-5a/12, CS-5b/12, related to XCS-48b, XCS-48c.
XCS-48(NO-20)	W. Black Bayou Area	HR		[82]	[173]	[3,243,000]	200	Contained w/n CS-5a/12, CS-5b/12, related to PCS-10, PCS-11, PCS-17b.
XCS-48(NO-21)	SW Black Bayou Area	HR		[276]	[687]	[1,411,000]	2,100	Contained w/n CS-5a/12, CS-5b/12, related to PCS-10, PCS-11, PCS-17b.
XCS-48(SA-05)	Greens Lake Unit	HR		216	3,226	2,456,000	800	Contains part of PCS-11, related to PCS-17b.
XCS-48(SA-07)	S. Willow Bayou Unit	HR		46	777	1,707,000	2,200	Contains part of PCS-11, related to PCS-17b.
XCS-48(SA-08)	NW West Cove Unit	HR			25	332,000	13,300	Contains part of XCS-48h, related to XCS-47/48ljkp.
XCS-48(SO-01)	Johnsons Bayou Unit	HR		[1,147]	[3,854]	[2,430,000]	600	Related to PCS-11, PCS-17 b & XCS-48g.
XCS-48(SO-05)	W. Mud Lake Area	HR		300	1,281	1,017,000	800	Related to CS-1a, XCS-48l, XCS-48n.
XCS-48(SO-08)	Oyster Bayou/Lake Unit	HR	•	[2,080]	[7,000]	[4,989,000]	700	Major structures w/n PCS-12/18, XCS-48q, PCS-18.
XCS-48c	GIWW Canal Closures	HR		[21]	[119]	[918,000]	7,700	Related to XCS-48 (NO-15) & (NO-17).
XCS-48o	Rock Liner in Canal-SW portion of W. Cove	HR		[25]	[53]	[147,000]	2,800	Related to PCS-24, contained w/n XCS-48 (SO-7).
XCS-48m	Utilize Dredge Material-Beach Nourishment	MC		70	88	1,647,000	18,700	Related to PCS-2, benefits XCS-48 (SO-2).
XCS-48(SA-09)	Hog island Gulley Area	MC		16	644	1,329,000	2,100	Related to XCS-47/48ljkp.
XCS-50	St. Johns Island	MC		137	295	1,934,000	6,600	Related to XCS-48 (SO-8).
CS-8/ XCS-48 & (NO-2a)	Black Lake North Area	MM		14	298	1,144,000	3,800	Same as CS-8, related to PCS-23.
CS-10	Grand Lake Ridge Area	MM		662	832	1,117,000	1,300	
CS-14	Tripod Bayou	MM		51	190	1,127,000	5,900	Related to CS-4a, CS-4b, CS-13.

Table 4. Summary of the Calcasieu/Sabine Projects (Continued).

Project No.	Project Name	Project Type	Priority List Projects		Acres Created, Protected, or Restored	Net Benefited Acres	Estimated Cost ($)	Cost Per Benefited Acre ($/Ac)	Comments
Supporting Projects, Short-Term (Continued)									
PCS-24	East Mud Lake	MM	PPL2		1,520	3,121	2,268,000	700	Related to CS-1b, XCS-48 (SO6).
XCS-48n	Structure at LA Hwy. 27 W. of Holly Beach	MM		•	[na]	[500]	[224,000]	400	Related to PCS-24, contained w/n XCS-48 (SO-5).
XCS-48(NO-02)	Black Lake NE Area	MM			10	386	1,954,000	5,100	Contains part of PCS-23.
CS-01b	Holly Beach to Cal. Pass	SP			90	301	5,734,000	19,000	Relates to XCS-48 (SO-8 & 8a) and PCS-24
CS-07	West Black Lake Shore Protection	SP			120	640	743,000	1,200	Relates to XCS-48 (NO-4) and PCS-23
PCS-02(SO-02)	Breakwater at LA Point	SP			[73]	[93]	[2,227,000]	23,900	Related to XCS-48n, contained w/n XCS-48 (SO-2).
PCS-04	Long Point Lake Shore Protection	SP			25	25	710,000	28,400	Related to XCS-48 (SA-10).
PCS-29	Hebert-Precht Rip-rap	SP		•	75	250	126,000	500	Related to CS-4a
PCS-32	Bayou Choupique	SP			[30]	[30]	[667,000]	22,200	Contained w/n PCS-1.
XCS-34	Spoil along West Side CSC	SP			na	na	na		Related to XCS-48 (SA-10).
XCS-37	Rock Dike	SP			50	58	2,087,000	36,000	Located from mile 5 to 9.5 on E. side of channel.
XCS-39	Turners Bay Rock Revetment	SP			30	61	1,087,000	17,800	
XCS-48(NO-04)	West Black Lake Area	SP			[242]	[1,763]	[1,282,000]	700	Contained w/n CS-7 and PCS-23.
XCS-48(SO-02)	SW Johnsons Bayou Unit	SP			891	2,994	4,719,000	1,600	Related to PCS-11, PCS-2, XCS-48m.
XCS-36	Compost Demo Project	ST		•	10	10	250,000	25,000	Within XCS-48(NO-5) area.
XCS-48(NO-08)	S.W. Black Lake Area	ST			29	1,583	2,474,000	1,600	Related to CS-2, PCS-34.
XCS-48(NO-08a)	S. Gum Cove Area	ST			101	264	230,000	900	Related to XCS-46.
XCS-48(SA-01)	Browns Lake-Starks Canal Area	ST			87	6,583	1,619,000	200	Related to XCS-47/48ikp.
XCS-48(SA-06)	Deep Lake Bayou Unit	ST			5	789	1,185,000	1,500	
CS-15	Boudreaux-Broussard Marsh Protect	T			68	369	1,127,000	3,100	Related to CS-4a, CS-4b.
PCS-19	W. Hackberry Plantings	VP	PPL1		96	96	100,000	1,000	
PCS-34	Plantings to build bottom elevation	VP		•	2	5	128,000	25,600	w/n XCS-48 (NO-8) area.
XCS-49	Turners Bay Vegetative Planting	VP			18	18	287,000	15,900	
Subtotal: Supporting Projects, Short-Term					6,020	28,460	50,280,000		

Table 4. Summary of the Calcasieu/Sabine Projects (Continued).

Project No.	Project Name	Project Type	Priority List Projects	Acres Created, Protected, or Restored	Net Benefited Acres	Estimated Cost ($)	Cost Per Benefited Acre ($/Ac)	Comments
Supporting, Long-Term Projects								
CS-05b/12	Sabine Freshwater Inro. & Hydro. Rest.	FD/HR		[376]	[4,311]	[8,119,000]	500	Contained w/n CS-5b &12, related to CS-5a/12, XCS-48 (NO-13, 14, 14a, &15).
XCS-33	Toledo Bend Water Mgt.	FD		920	10,770	na	na	Further study required. Benefits CS-5a/12, XCS-48 (NO-19 & 20), (SA-5 & 7) & (SO-1).
XCS-48(NO-14a)	Starks Bayou Unit	HR	*	[16]	[122]	[1,617,000]	2,000	Contained w/n CS-5a/12 and CS-12.
XCS-48(SA-01a)	S. Browns Lake-E. Hog Is. Gulley	HR	*	445	1,500	994,000	700	Related to XCS-47/48ijkp.
XCS-48(SA-01b)	E. Back Ridge Canal Area	HR	*	238	800	913,000	1,100	Related to XCS-47/48ijkp.
XCS-48(SA-02)	S. Back Ridge Canal Area	HR	*	[356]	[1,200]	[605,000]	500	Contained w/n XCS-47/48ijkp.
XCS-48(SO-04)	Four Mile Square Unit	HR	*	594	2,000	1,288,000	600	Related to XCS-47/48ijkp.
XCS-48(SO-09)	Rabbit Island	MC	*	239	300	249,000	800	Benefitted by PCS-17a.
XCS-48h(SA-08)	Rebuild spoil-S. side	MM	*	[59]	[200]	[30,000]	200	Related to XCS-47/48ijkp and XCS-48 (SA-08).
XCS-48l	Hwy. 27 culverts	MM	*	[59]	[200]	[180,000]	900	Related to XCS-48 (SA-1) & (SA-10).
XCS-48(NO-14)	W. Gum Cove-Black Bayou Area	MM	*	[120]	[400]	[994,000]	3,000	Same as CS-5a/12, CS-5b/12, & CS-12.
CS-06	Black Lake Shore Protection	SP		2	2	107,000	53,500	Relates to PCS-23
PCS-05	Calcasieu Ship Channel Erosion	SP	*	30	100	1,500,000	15,000	
XCS-38	Rock Revetment at Dugas Landing	SP	*	40	50	1,083,000	21,700	
XCS-48(SO-08a)	W. Calcasieu River Chenier	SP	*	327	1,100	11,171,000	10,200	Related to CS-1b.
XCS-48(SA-03)	Pool 3 Unit	ST	*	1,160	4,000	2,085,000	500	Related to CS-18 PPL 1 project.
XCS-48(SA-04)	Old North Bayou Unit	ST	*	356	1,200	1,036,000	900	Related to XCS-47/48ijkp.
XCS-48(SO-07)	SW West Cove Unit	ST	*	238	800	944,000	1,200	Related to XCS-48o.
XCS-48(NO-10)	E. Gum Cove Area	VP	*	[240]	[800]	[684,000]	900	Adjacent to XCS-48 (NO-4) & (NO-9).
Total Calcasieu/Sabine Basin **				24,810	91,810	136,460,000		Only Critical Short-Term and Supporting Short-Term projects included in total

Table 4. Summary of the Calcasieu/Sabine Projects (Continued).

Project No.	Project Name	Project Type	Priority List Projects	Acres Created, Protected, or Restored	Net Benefited Acres	Estimated Cost ($)	Cost Per Benefited Acre ($/Ac)	Comments
Projects not in Plan								
CS-11a	Sweet Lake Shore Stab. and Hydro. Rest.	SP/HR						Contained w/n CS-11b.
XCS-41	Willow Lake-GIWW Bank Stabilization	SP						Contained w/n CS-11b.
CS-5b	Sabine R. FW Diversion	FD						Contained w/n CS-5b/12.
PCS-16	West GIWW Lock	HR						Benefits to area served by XCS-48 (NO-1 to NO-19) all along GIWW.
PCS-17a	Calcasieu River Lock	HR						Benefits to wetlands around Calcasieu Lake.
PCS-17b	Sabine River Lock	HR						Benefits Sabine Lake area, related to XCS-48 (SO-1), (SA-5 & 7), (NO-20 & 21).
CS-5a	Black B. FW Diversion from GIWW	FD/HR						Contained w/n CS-5a/12.
CS-11	Sweet Lake Shore Stabilization	SP						Contained w/n CS-11b.
PCS-7	Rip-rap Cameron Creole structures	MM						Contained w/n CS-4a.
PCS-18	Oyster and Mud Bayou Contrl. Struct.	HR						Contained w/n PCS-12/18, XCS-48q.
PCS-22	Cameron-Creole Oper. and Maintenance	MM						Same as CS-4a.
PCS-23	Maintain Black L. Shoreline	SP						Contained w/n CS-6, CS-7, CS-8, XCS-48 (NO-2), (NO-2a).
XCS-48 (NO-1)	Brown Lake Management	MM						Same as CS-9.
XCS-48 (NO-2a)	No. Black L. Management	MM						Same as CS-8.
XCS-48 (NO-12)	SW Gum Cove Management	HR						Same as XCS-46
XCS-48e	Rock Weirs - Blk. Bayou Cutoff	HR						Contained within XCS-48d.
XCS-48g	Control Structure in Green's Bayou	HR						Contained w/n PCS-11.
XCS-48i	Replace West Cove Control Structure	HR						Part of XCS-47/48ijkp.
XCS-48j	Culverts in Headquarters Canal & Hwy 27	HR						Part of XCS-47/48ijkp
XCS-48k	Replace Control Structure at Hog Is. Gully	HR						Part of XCS-47/48ijkp
XCS-48p	Control Str canal near Hwy 27 W of W Cove	HR						Part of XCS-47/48ijkp
XCS-48q	Rock Weir in Mud Bayou	HR						
XCS-48r	Gulf of Mexico Shore Breakwaters	SP						Contained w/n CS-1a, CS-1b, and CS-1c.
XCS-51	Mine Calc S C Spoil, place in W Cove Canal	MC						Contained w/n XCS-51/44
XCS-48 (SO-3)	E. Johnson's B. Unit Management	SP						Same as CS-1c.
XCS-48 (SO-6)	E. Mud Lake Management	MM						Same as PCS-24.

FD Freshwater Diversion
HR Hydrologic Restoration
MC Marsh Creation
MM Marsh Management
SD Sediment Diversion
SP Shoreline Protection
ST Sediment/Nutrient Trapping
T Terracing
VP Vegetative Plantings
Net Benefited Acres include aquatic vegetation enhanced wetlands.
[#] Indicates cost and benefits are dulicates of other projects; values are not contained in the totals.
* Denotes benefits were not verified by the Wetland Value Assessment Work Group.
** Total cost and benefits include only Critical Short-Term and Supporting Short-Term projects
Projects in the Black Bayou region (i. e. XCS-48 (NO-13 through NO-21)) are part of an SCS Watershed Program under the authority of PL-566.

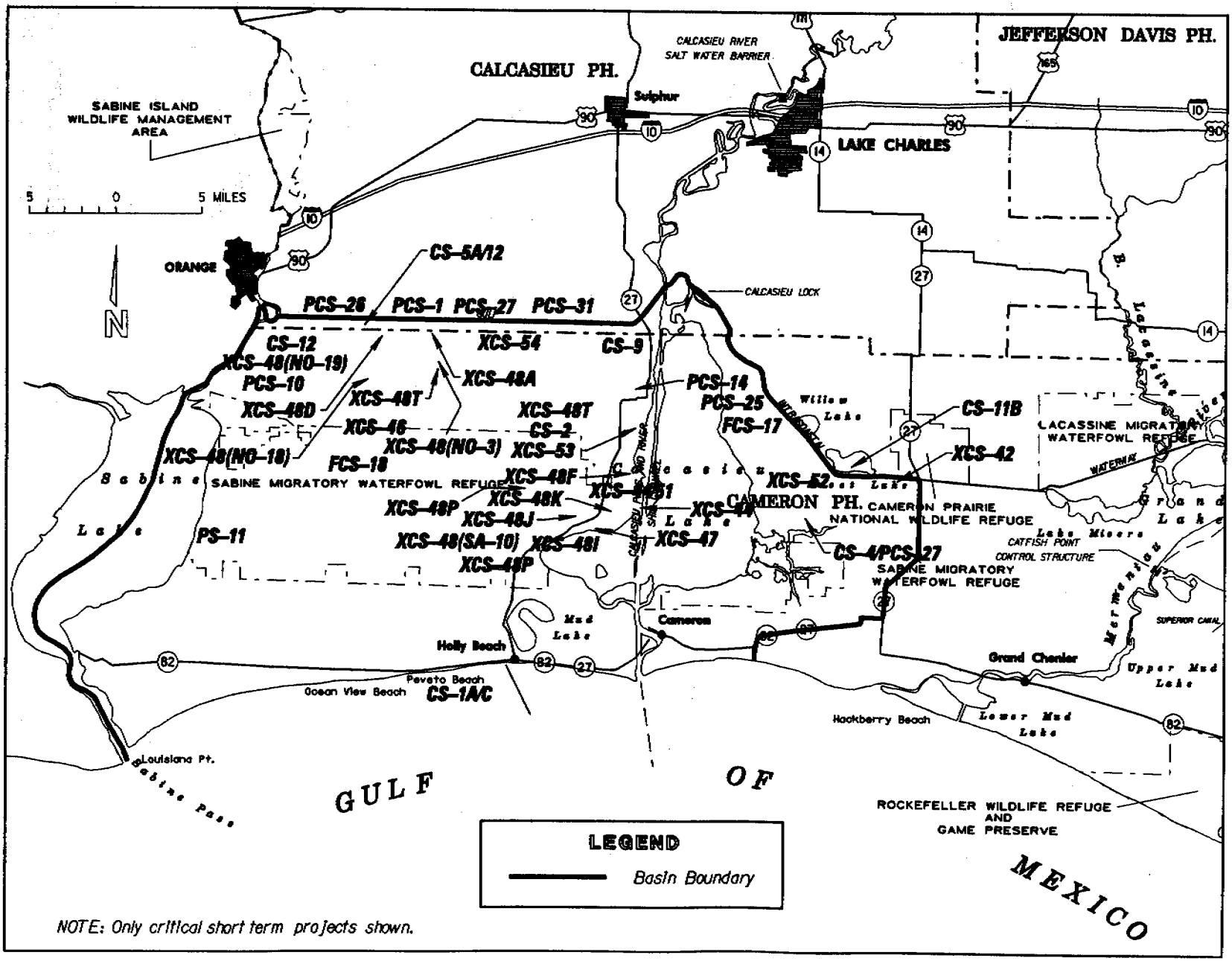

Figure 6. Calcasieu/Sabine Basin, Project Locations.

PROJECT DESCRIPTIONS

CRITICAL SHORT-TERM PROJECTS

XCS-48 (NO-13) NORTHWEST GUM COVE ACTIVE MANAGEMENT

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 7). It is bordered by the GIWW on the north, Black Bayou on the west, Shell Road on the south, and a management levee on the east. The project area is comprised of 5,342 acres of intermediate marsh and open water.

Problems and Opportunities

This area has suffered loss of most of the historic fresh marsh between 1968 and 1984. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be actively managed for intermediate emergent marsh. The project plans include closing breaches along the GIWW to reduce water exchange and salinity spikes, replacing three failed water control structures at the south boundary, vegetative plantings, and installing wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 200 acres, enhance 227 acres of emergent marsh and stimulate growth of aquatic vegetation by 744 acres for a net benefit of 1,171 acres. The estimated cost of the project is $3,013,000.

Effects and Issues

Stabilizing salinity and water level spikes, periodic draw-downs and vegetative plantings will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures and during periods of draw-down, however, productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-5b) Sabine Freshwater Introduction. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

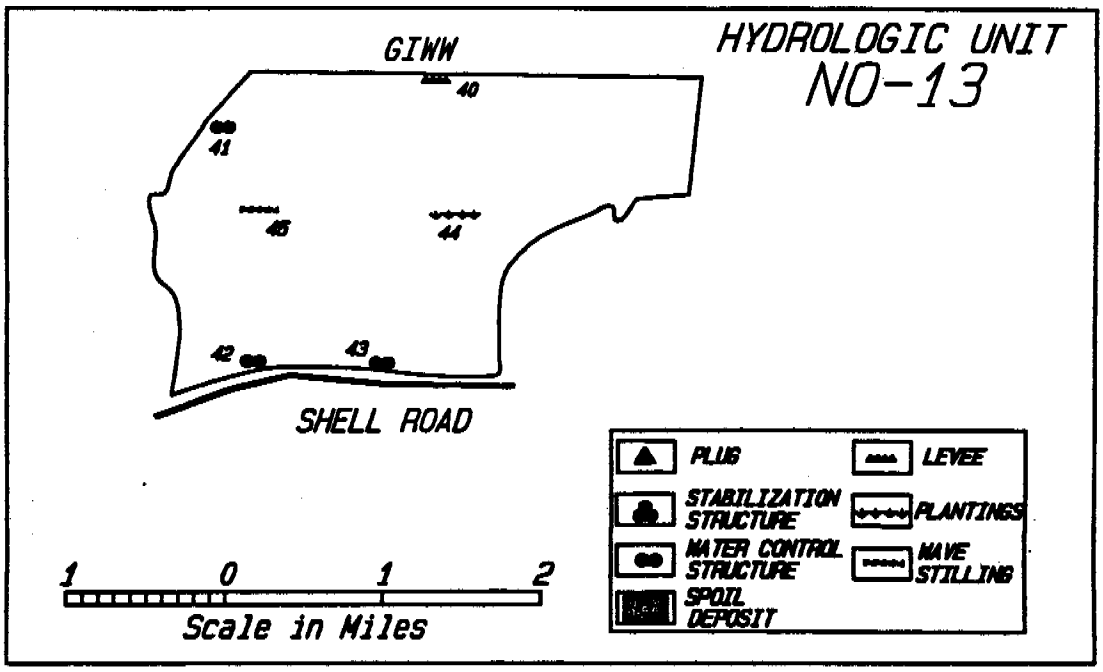

Figure 7. XCS-48 (NO-13) Northwest Gum Cove Active Management

CS-5A/12 SABINE FRESHWATER INTRODUCTION FROM GIWW AND BLACK BAYOU MARSH

Location

The project area comprises approximately 28,000 acres of fresh/intermediate to brackish marshes, riparian hardwood forests, and small intermixed prairie areas south of the GIWW between the Sabine River, Gum Cove Ridge, and Black Bayou, approximately 18 miles west-northwest of Hackberry, Louisiana in northwestern Cameron Parish (Figures 6 and 8).

Problems and Opportunities

Wetlands in the Black Bayou area have suffered a loss of approximately 10,000 acres or 33% of the project area from 1956 to 1990 resulting from hydrological changes. These changes included; reduced freshwater inflow, increased magnitude and duration of tidal fluctuations, increased salinities, higher water levels, excessive water exchange, and artificial water circulation patterns.

The objectives of the project are to divert 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 implement water management measures in the Black Bayou Wetlands to reduce and moderate salinity levels and restore emergent marsh.

Description of Features

Outfall management and freshwater introduction structures recommended under Alternative 5 in the DNR/CRD-Crowley feasibility report for Project C/S-5A (see CS-12 description below).

a. Repair four existing breaches and areas where erosion threatens breaching in the spoil bank along the GIWW. Approximately 18,000 ft. of bank is need of repair.

b. Replace an existing structure in the western boundary of NO-13 with a variable crest flapgated structure. Suggest using five (5) 48" culverts with screwgates on the exterior and flapgates in the interior.

c. Install variable crest flapgated structure in spoil bank breaches along the Cutoff Canal.

d. Repair spoil bank along Black Bayou Cutoff Canal. Approximately 8,500 ft. of spoil bank will be repaired with dredged material from the canal.

e. Install a plug in the canal entering the Sabine River north of Black Bayou.

f. Install plugs in old Black Bayou and Vinton Drainage Ditch at the south GIWW spoil bank.

g. Replace the three culverts under the Shell Road with variable crest flapgated structures. Suggest using a 36" diameter culvert.

h. Install rock weirs through the natural levee along Black Bayou. Proposed elevation of the center of each rock weir is 6 inches below marsh level. There is a total of 44 openings average 20 ft. in width producing a total crest length of 880 ft. Assume channels to be 3 ft. deep.

i. Install flapgated culverts under cattle walkways at two sites (NO-14, NO-17) and also under the road just west of the Black Bayou salt dome. The flapgates will be

designed to allow one way flow toward Black Bayou.

j. Excavate openings in spoil bank on oil well canal located west of the Black Bayou salt dome and oil field. Spoil banks should be degraded to adjacent marsh level. Estimate that eight (8) 50 ft. gaps at 500 ft. intervals will be required.

k. Construct approximately 83,000 ft of shallow water straight line terrace in the large ponded area within NO-13. Preliminary calculations estimate 150 terraces will be constructed. Terraces should be planted with appropriate wetland vegetation.

l. Construct approximately one mile of Christmas tree sediment trapping fence in Unit NO-17.

Benefits and Costs

The area contains 19,600 acres of fresh intermediate and brackish marshes and 8,400 acres of open water for a total of 28,000 acres. The Black Bayou Freshwater Introduction and Hydrologic Restoration project is expected to protect 376 acres of fresh to brackish marsh and stimulate the production of 2,688 acres of aquatic vegetation and enhance 1,247 acres of marsh for a total benefit to 4,311 acres. The rough estimated project cost is $4,262,760.

Effects and Issues

The project will conserve and protect wetlands along in the Black Bayou area of the northwestern portion of the basin for a total benefit to 4,311 acres. The project should reduce marsh loss due to saltwater intrusion and increased hydrology caused by connections of Black Bayou to the GIWW to the north. The project structures will have to be designed to allow for the limited navigation that presently exists in the small tributaries adjacent to Black Bayou and provide for the continued access of fisheries into and out of the marshes north of Black Bayou.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It presently is in the conceptual phase of development. A feasibility report has been prepared by the La. DNR Coastal Restoration Division for part of this project as it relates to CS-5a.

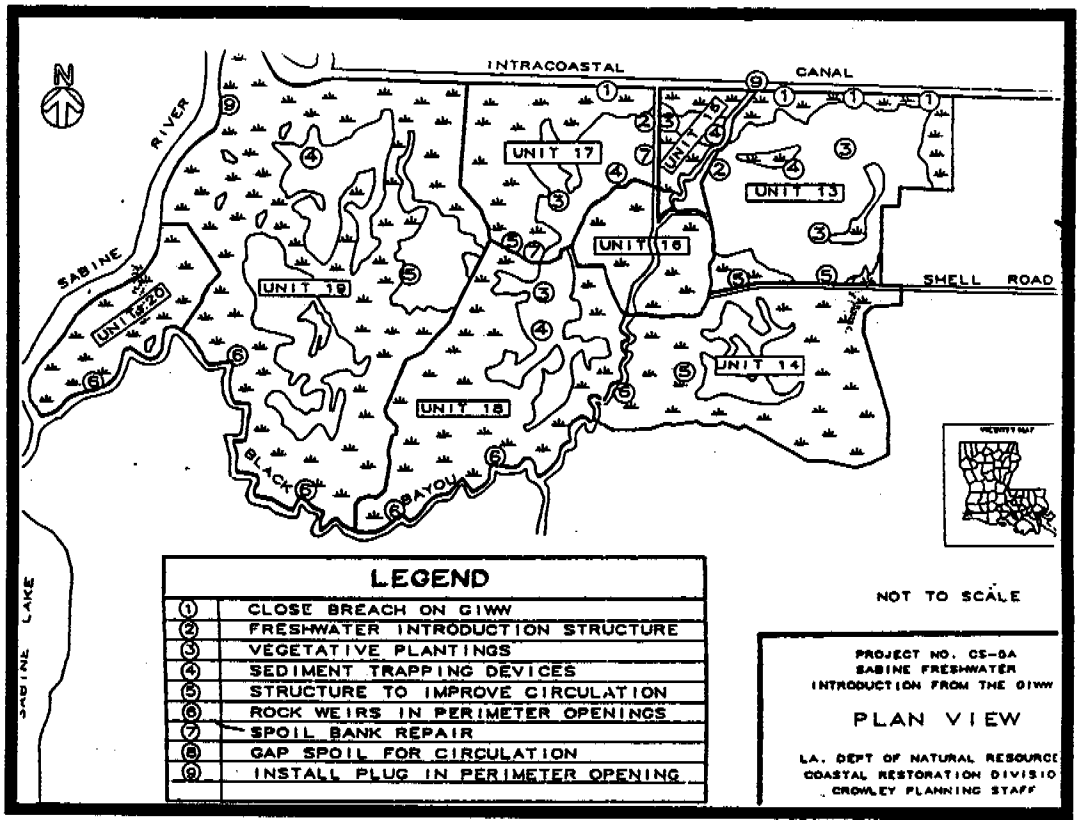

Figure 8. CS-5A/12 Sabine Freshwater Introduction From GIWW And Black Bayou Marsh

CS-12 BLACK BAYOU HYDROLOGIC RESTORATION

Location

The project area comprises approximately 18,700 acres of fresh/intermediate to brackish marshes, riparian hardwood forests, and small intermixed prairie areas south of the GIWW between the Sabine River, Gum Cove Ridge, and Black Bayou, about 18 miles west-northwest of Hackberry, Louisiana in northwestern Cameron Parish (Figures 6 and 9).

Problems and Opportunities

Wetlands in the Black Bayou area have suffered a loss of approximately 10,000 acres or 33% of the project area from 1956 to 1990 resulting from hydrological changes. These changes included; reduced freshwater inflow, increased magnitude and duration of tidal fluctuations, increased salinities, higher water levels, excessive water exchange, and artificial water circulation patterns.

The objectives of the project are to implement water management measures in the Black Bayou Wetlands to reduce and moderate salinity levels and restore emergent marsh.

Project Components

Outfall management structures recommended under Alternative 5 in the DNR/CRD-Crowley feasibility report for Project C/S-5A.

a. Repair four existing breaches and areas where erosion threatens breaching in the spoil bank along the GIWW. Approximately 18,000 ft. of bank is need of repair.

b. Replace an existing structure in the western boundary of NO-13 with a variable crest flapgated structure.

c. Install variable crest flapgated structure in spoil bank breaches along the Cutoff Canal.

d. Repair spoil bank along Black Bayou Cutoff Canal. Approximately 8,500 ft. of spoil bank will be repaired with dredged material from the canal.

e. Install a plug in the canal entering the Sabine River north of Black Bayou.

f. Install plugs in old Black Bayou and Vinton Drainage Ditch at the south GIWW spoil bank.

g. Replace the three culverts under the Shell Road with variable crest flapgated structures. Suggest using a 36" diameter culvert.

h. Install rock weirs through the natural levee along Black Bayou. Proposed elevation of the center of each rock weir is 6 inches below marsh level. There is a total of 44 openings average 20 ft. in width producing a total crest length of 880 ft.

i. Install flapgated culverts under cattle walkways at two sites (NO-14, NO-17) and also under the road just west of the Black Bayou salt dome.

j. Excavate openings in spoil bank on oil well canal located west of the Black Bayou salt dome and oil field. Spoil banks should be degraded to adjacent marsh level. Estimate that eight (8) 50 ft. gaps at 500 ft. intervals will be required.

k. Construct approximately 83,000 ft of shallow water straight line terrace in the large ponded area within NO-13. Preliminary calculations estimate 150 terraces will be constructed. Terraces should be planted with appropriate wetland vegetation.

1. Construct approximately one mile of sediment trapping fence in Unit NO-17.

Benefits and Costs

The area contains 11,220 acres of fresh intermediate and brackish marshes and 7,480 acres of open water for a total of 18,700 acres. The Black Bayou Hydrologic Restoration project is expected to protect 215 acres of fresh to brackish marsh and stimulate the production of 2,394 acres of aquatic vegetation and enhance 805 acres of marsh for a total benefit to 3,413 acres. The rough estimated project cost is $4,262,760.

Effects and Issues

The project will conserve and protect wetlands along in the Black Bayou area of the northwestern portion of the basin for a total benefit to 3,413 acres. The project should reduce marsh loss due to saltwater intrusion and increased hydrology caused by connections of Black Bayou to the GIWW to the north. The project structures will have to allow for the limited navigation that presently exists in the small tributaries adjacent to Black Bayou and provide for continued access of fisheries into the marshes north the area.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It presently is in the conceptual phase of development. A feasibility report has been prepared by the La. DNR Coastal Restoration Division for part of this project as it relates to CS-5a.

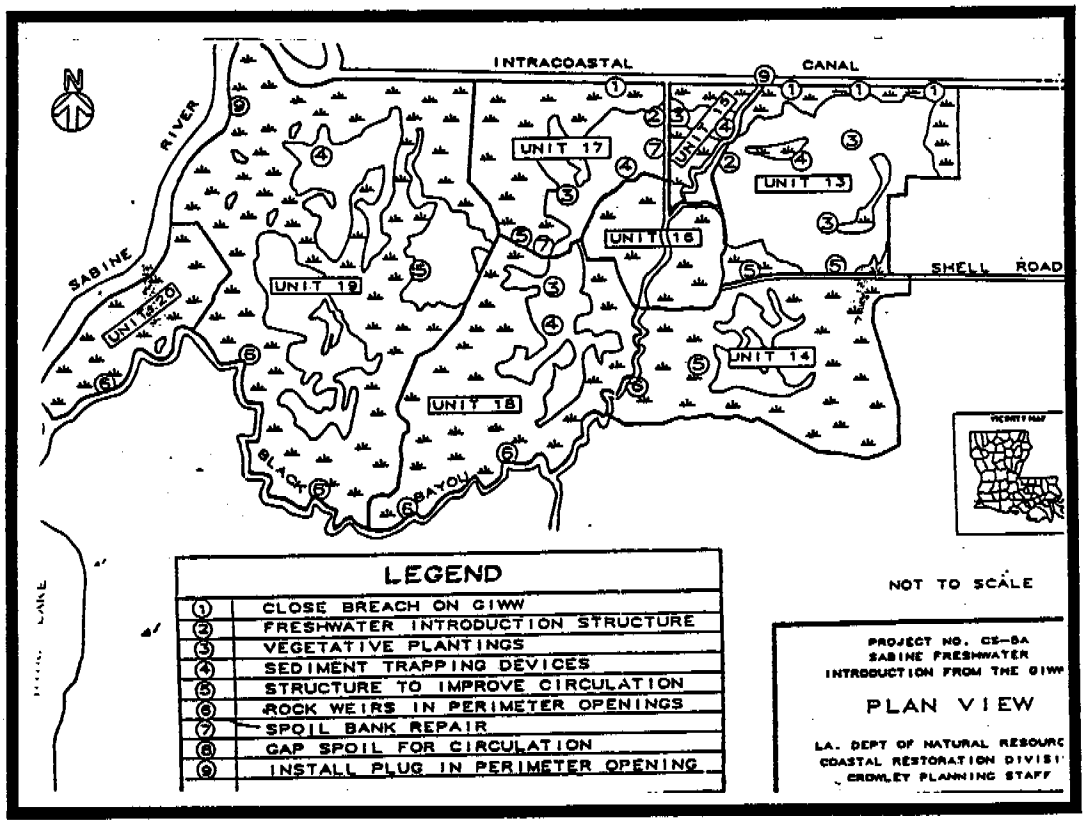

Figure 9. CS-12 Black Bayou Hydrologic Restoration

CS-2 RYCADE CANAL STRUCTURE

Location

The project is located in Cameron Parish at Rycade Canal immediately west of Hackberry, La. The project area is bounded to the south by the Browns Lake area of the Sabine National Wildlife Refuge, to the west by an area south of the W. Black Lake Management Area to the north by Black Lake and to the east by the Hackberry Salt Dome (see Figures 6 and 10). The project may benefit a total of 10,000 acres of brackish and saline marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Calcasieu Ship Channel, the Alkali Ditch, the GIWW, the oil and gas canals north of Hackberry, the Alkali Ditch itself, and the removal of the sand bar at the mouth of the Calcasieu River. This has resulted in the conversion of area brackish marshes to saline marshes and open water. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a water control structure in Rycade Canal north of the bridge.

Description of Features.

The project features consist of the placement of a 7 barreled box (each box = 4 ft. wide) culvert water control structure across Rycade Canal north of the bridge and three 36" culverts in an oil and gas field road west of the canal. The purpose is to reduce saltwater intrusion and water level fluctuations into the brackish marshes to the south.

Benefits and Costs.

The project may benefit approximately 10,000 acres of brackish marshes in the area south of the Rycade Canal and the Hackberry Salt Dome. The estimated project cost is $650,000.

Effects and Issues.

This project will protect and benefit about 10,000 acres of brackish marsh by reducing saltwater intrusion and water level fluctuations. Brackish marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for existing navigation and estuarine migratory fisheries access to the area to the degree possible in keeping with project goals.

Status.

This project is a short term critical project in the Calcasieu-Sabine Basin Plan. It is part of the State Coastal Wetlands Conservation and Restoration Plan (State of Louisiana 1990) and it is an integral part of the preferred "Perimeter Plan" for the basin. This project is slated to be constructed by the state in cooperation with the Cameron Parish Gravity Drainage District No. 9 in the spring of 1994.

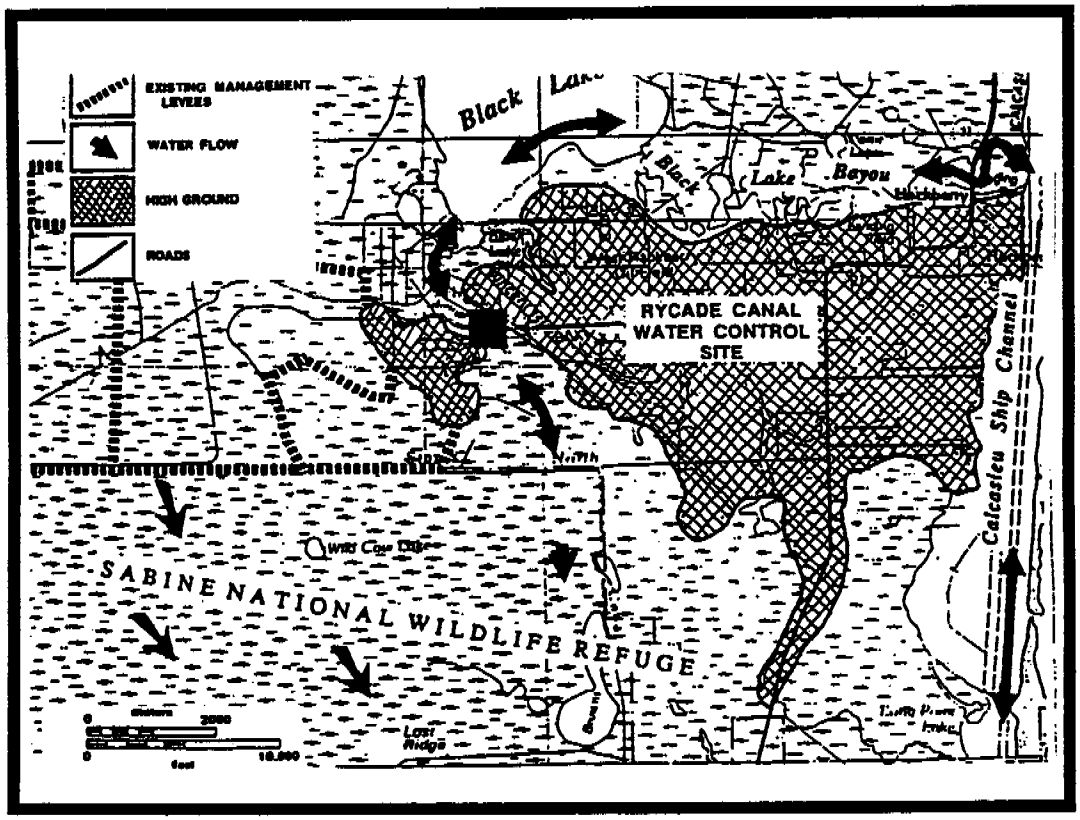

Figure 10. CS-2 Rycade Canal Structure

FCS-17 CAMERON CREOLE PLUGS

Location.

Cameron Parish about 6 miles north east of Cameron, La. The project is part of the Cameron-Creole Watershed management project. The area is bounded by Hwy. 27 on the east, the Cameron Chenier ridge to the south, the Calcasieu River and Calcasieu Lake to the west and the GIWW to the north (see Figures 6 and 11). The project will benefit about 1,741 acres of fresh to saline marsh within the management area.

Problems and Opportunities.

The Calcasieu Ship Channel has caused an increase of salt water and tidal amplitudes within the entire Calcasieu Lake system. This has caused increased marsh loss in the areas surrounding the lake. The Cameron-Creole Plugs Project consists of the installation of two plugs with boat bays and adjustable gates located south of Grand and Mangrove Bayous. This project allows for the more efficient operation of the Cameron-Creole Watershed Project by preventing movement of saltwater north and south within the borrow ditch adjacent to the levee. It will lower marsh salinities in the north and reduce excessive water pooling to the south thereby reducing wetland loss.

Description of Features.

This project the installation of two sheet metal plugs in the borrow canals of the Cameron-Creole Watershed Project south of Grand and Mangrove Bayous. The plugs will be set at normal marsh level and will be provided with a boat bay/water control structure combination. The principal goal of this project is to assist in maintaining the existing project's ability to restore the marsh to its former hydrology prior to the construction of the Calcasieu Ship Channel.

Benefits and Costs.

The area contains 40,000 acres of fresh to saline marsh and 24,000 acres of open water for a total of 64,000 acres. The Cameron-Creole Plugs project is may restore and protect 600 acres of fresh to saline marsh and benefit another 1,141 acres for a total benefit to 1,741 acres. The estimated project cost is $534,000.

Effects and Issues.

This project will protect fresh to saline marsh and submerged vegetation east of Calcasieu Lake within the Cameron-Creole Watershed project for a total benefit to over 1,741 acres. The project will maintain the existing Cameron-Creole project by preventing north-south water movement within the borrow canals adjacent to the levee. The project will allow for navigation and a certain degree of estuarine fisheries movement in keeping with the overall management plan objectives. There are existing bayous in the area which provide for natural fisheries access to the marshes. Freshwater and estuarine fish species as well as wildlife will be benefited by the plug project.

Status.

This project is presently listed on the Louisiana's state Coastal Wetlands Conservation and Restoration Program (State of La. 1992). It was chosen as a CWPPRA

Priority List project for 1991. It is presently in the planning stages between the state of Louisiana and the USFWS prior to project construction. Presently, the Cameron-Creole Watershed structures are operated by Cameron Prairie National Wildlife Refuge personnel assisted by Maimi Corporation personnel. The project area is being monitored by the USFWS with assistance from Miami Corp. and by the USDA Soil Conservation Service (SCS 1993).

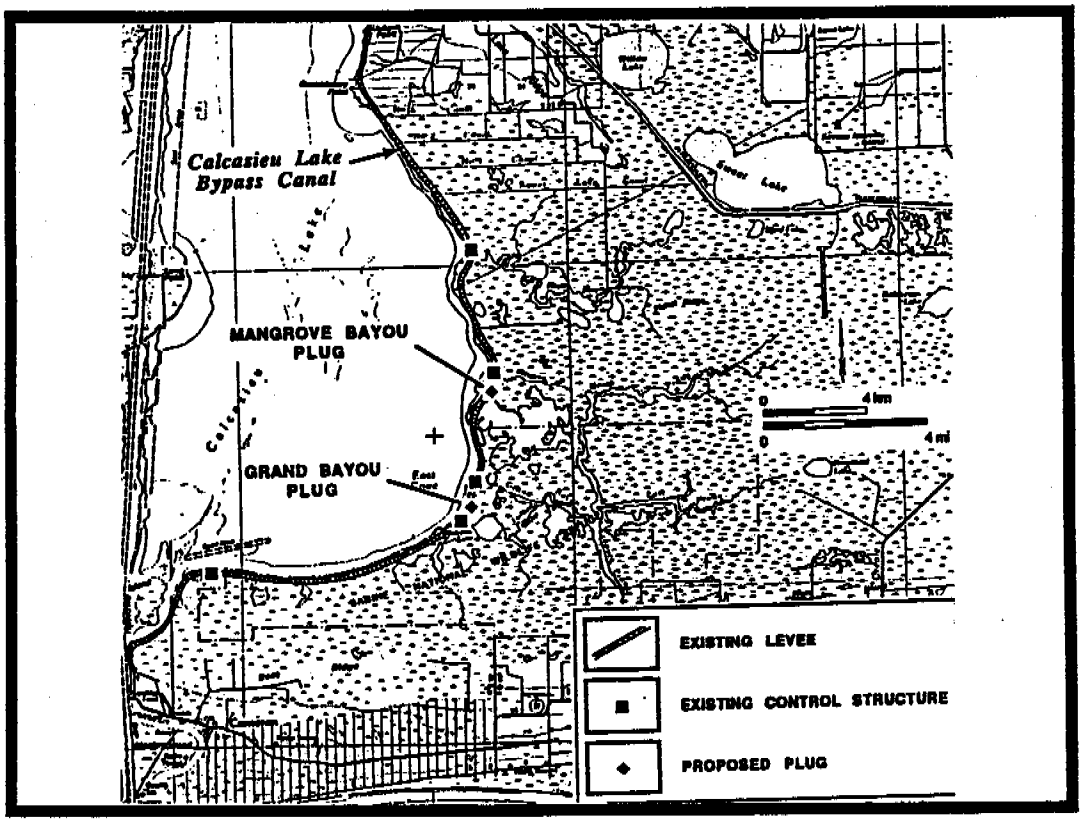

Figure 11. FCS-17 Cameron Creole Plugs

PCS-10 ROCK WEIR IN EXCHANGE POINTS ALONG GIWW AND SABINE RIVER

Location

The project is located in Cameron and Calcasieu Parishes at canals south of the junction of the GIWW and the Sabine River about 35 miles northwest form Hackberry, La. The project area is bounded to the south by Black Bayou, to the west by the Sabine River and to the north by the GIWW (see Figures 6 and 12). The project may benefit a total of 259 acres of intermediate to brackish marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations caused by the Sabine Pass channel and the operation of the Toledo Bend Reservoir. This has resulted in the conversion of intermediate and fresh marshes to brackish marshes and open water. Canals connecting to the Sabine River and the GIWW have increased these marsh destruction processes. This hydrologic restoration and passive marsh management project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of weirs at the mouths of area canals.

Description of Features.

The project features consist of the replacement of the Hog Island Gully, Headquarters Canal and West Cove Canal water control structures. The existing structures will be replaced with larger and more manipulative structures in order to reduce high water levels and to provide for water level lowering capacity to restore, protect existing intermediate and brackish marshes in the area. Presently, the Hog Island Gully and the West Cove Canal structures are fixed crest weir with 8 ft. wide "tainter" gates in the center. The Headquarters canal structure presently consists of two 48" diameter flapgated culverts. Engineering design will dictate the final replacement structure designs.

Benefits and Costs.

Approximately 23 acres of intermediate and brackish marsh and 161 acres of aquatic vegetation will be protected and another 75 acres will be enhanced by the project for a total benefit to 259 acres. The estimated project cost is $1,607,000.

Effects and Issues

This project will protect and benefit about 259 acres of intermediate and brackish marshes. Intermediate and brackish marsh fish and wildlife will benefit from the project by a reduction in saltwater intrusion and water level fluctuations. The project should be designed so as to provide for existing estuarine migratory fisheries access to the degree allowable in keeping with the goals of the project.

Status

This project is a short term critical project in the Calcasieu-Sabine Basin Plan. It is an integral part of the preferred "Perimeter Plan." The project is within the small watershed project area (P. L. 566) being developed by the USDA Soil Conservation Service. It is also within the state of Louisiana's project area for CS-5a/12 in the region of Black Bayou.

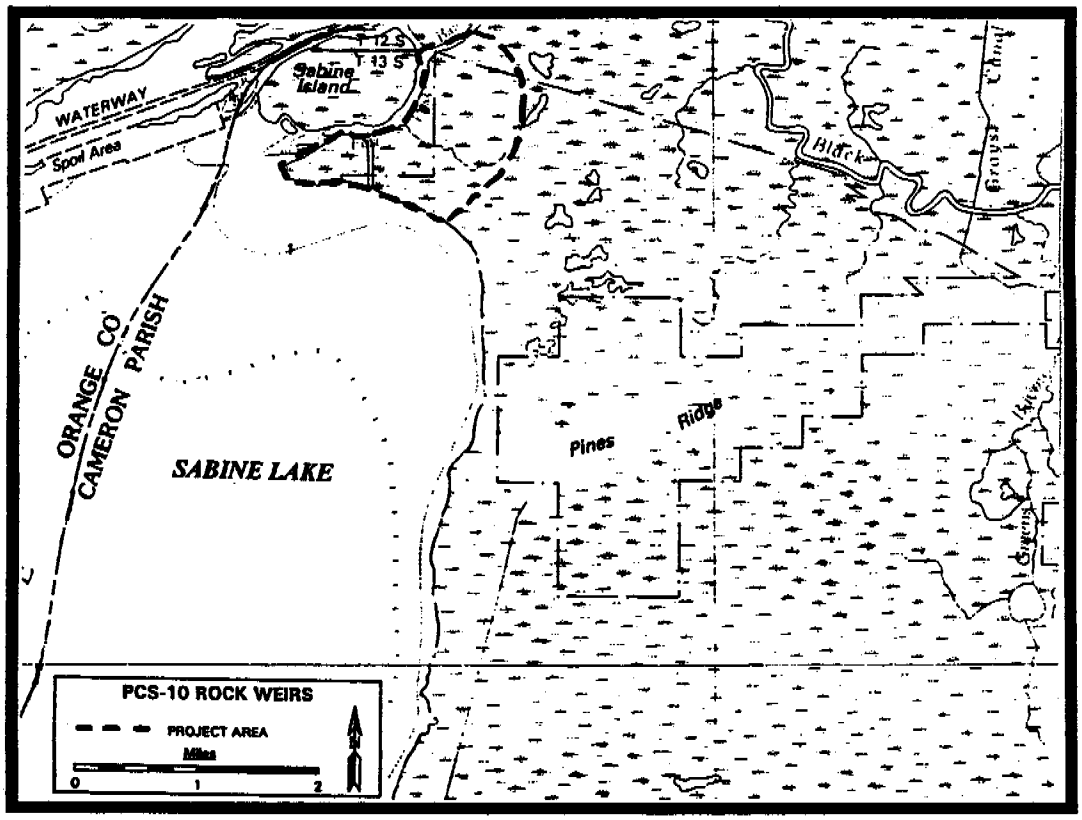

Figure 12. PCS-10 Rock Weir In Exchange Points Along GIWW and Sabine River

PCS-11 SABINE LAKE CANAL CLOSURES

Location

The project is located in Cameron Parish at canals midway along the eastern shoreline of Sabine Lake in the vicinity of Grays Ditch north of Johnson's Bayou within the Sabine National Wildlife Refuge (SNWR). The project area is bounded to the south by Johnsons Bayou to the west by Sabine Lake to the north by Willow Bayou and to the east by Gray's Ditch (see Figures 6 and 13). The project may benefit a total of 58 acres of brackish marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations caused by the Sabine Pass channel and the operation of the Toledo Bend Reservoir. This has resulted in the conversion of intermediate and brackish marshes to brackish marshes and open water. Canals connecting existing marshes to Sabine Lake have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of plugs/weirs at the mouths of area canals.

Description of Features.

The project features consist of the placement of plugs/weirs at the intersections of area canals and Sabine Lake to reduce saltwater intrusion and water level fluctuations into the brackish marshes to the east. Engineering design will dictate the final structure designs.

Benefits and Costs.

Approximately 12 acres of brackish marsh and 17 acres of aquatic vegetation will be protected and another 29 acres will be enhanced by the project for a total benefit to 58 acres. The estimated project cost is $2,090,000.

Effects and Issues.

This project will protect and benefit about 58 acres of brackish marshes by reducing saltwater intrusion and water level fluctuations. Brackish marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for any navigation and estuarine migratory fisheries access to the degree allowable in keeping with the goals of the project.

Status.

This project is a short term critical project in the Calcasieu-Sabine Basin Plan. It is an integral part of the preferred "Perimeter Plan." The project is within the Sabine National Wildlife Refuge. Some of the project components are contained within XCS-48 (SA-7).

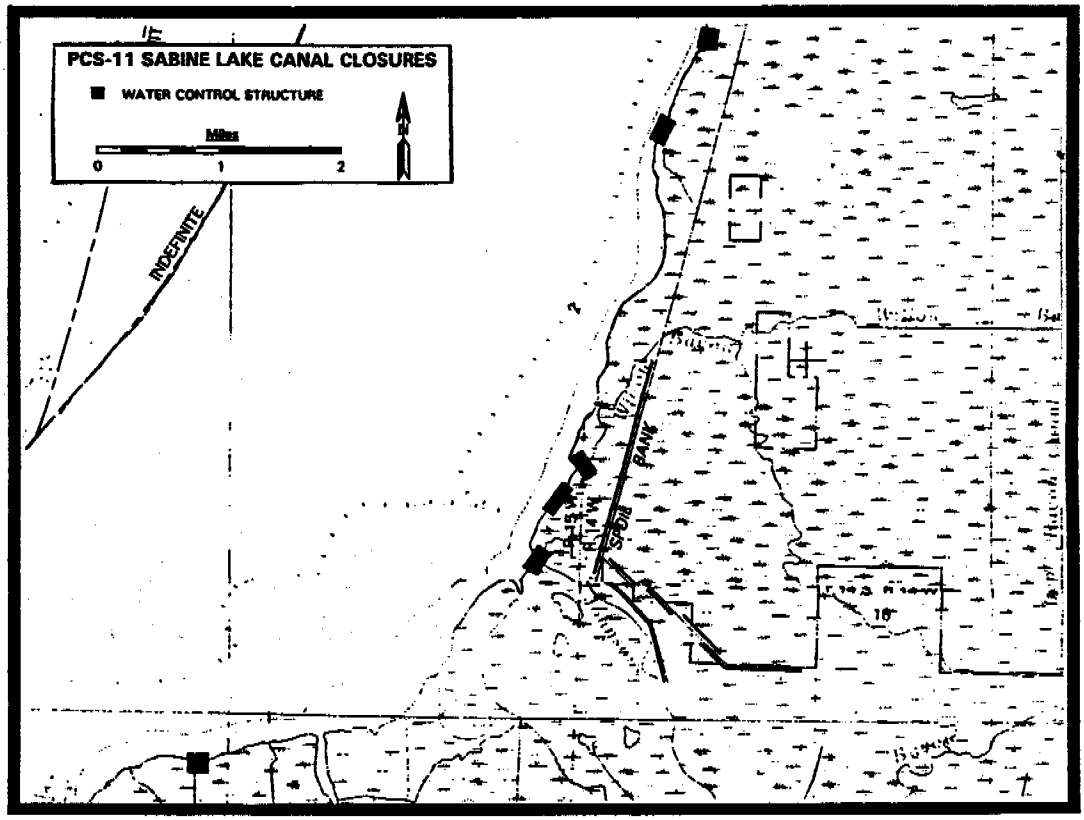

Figure 13. PCS-11 Sabine Lake Canal Closures

PCS-14 KELSO BAYOU STRUCTURE

Location

The project is located in Cameron Parish at the mouth of Kelso or Black Bayou near its intersection with the Calcasieu Ship Channel at the northwestern section of Calcasieu Lake. The project is located about a half mile north from Hackberry, La. The project area is bounded to the south by the Hackberry Salt Dome, to the west by Black Lake, to the north by Browns Lake and to the east by Hwy. 27 and the Calcasieu Ship Channel (see Figures 6 and 14). The project may benefit a total of 319 acres of brackish and saline marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Calcasieu Ship Channel, the Alkali Ditch to the west, the GIWW, the oil and gas canals north of Hackberry, and the removal of the sand bar at the mouth of the Calcasieu River. This has resulted in the conversion of area brackish marshes to saline marshes and open water. Canals connecting existing marshes to Calcasieu Lake have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a weir in Kelso Bayou just west from Hwy. 27.

Description of Features.

The project features consist of the placement of a weir with a boat bay east of Hwy. 27 and Kelso Bayou. The purpose is to reduce saltwater intrusion and water level fluctuations into the brackish and saline marshes to the west between Brown and Black Lakes.

Benefits and Costs.

Approximately 34 acres of brackish and saline marshes and 170 acres of aquatic vegetation will be protected and another 115 acres will be enhanced by the project for a total benefit to 319 acres. The estimated project cost is $1,587,000.

Effects and Issues.

This project will protect and benefit about 319 acres of brackish and saline marshes by reducing saltwater intrusion and water level fluctuations. Brackish and saline marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for existing navigation and estuarine migratory fisheries access to the area. The conceptual project design includes a weir with a boat bay for navigation and estuarine organism access.

Status.

This project is a short term critical project in the Calcasieu-Sabine Basin Plan. It is an integral part of the preferred "Perimeter Plan" for the basin. An alternative structure planned for the Alkali Ditch near its intersection with the GIWW will accomplish some of the same goals as this Kelso Bayou structure.

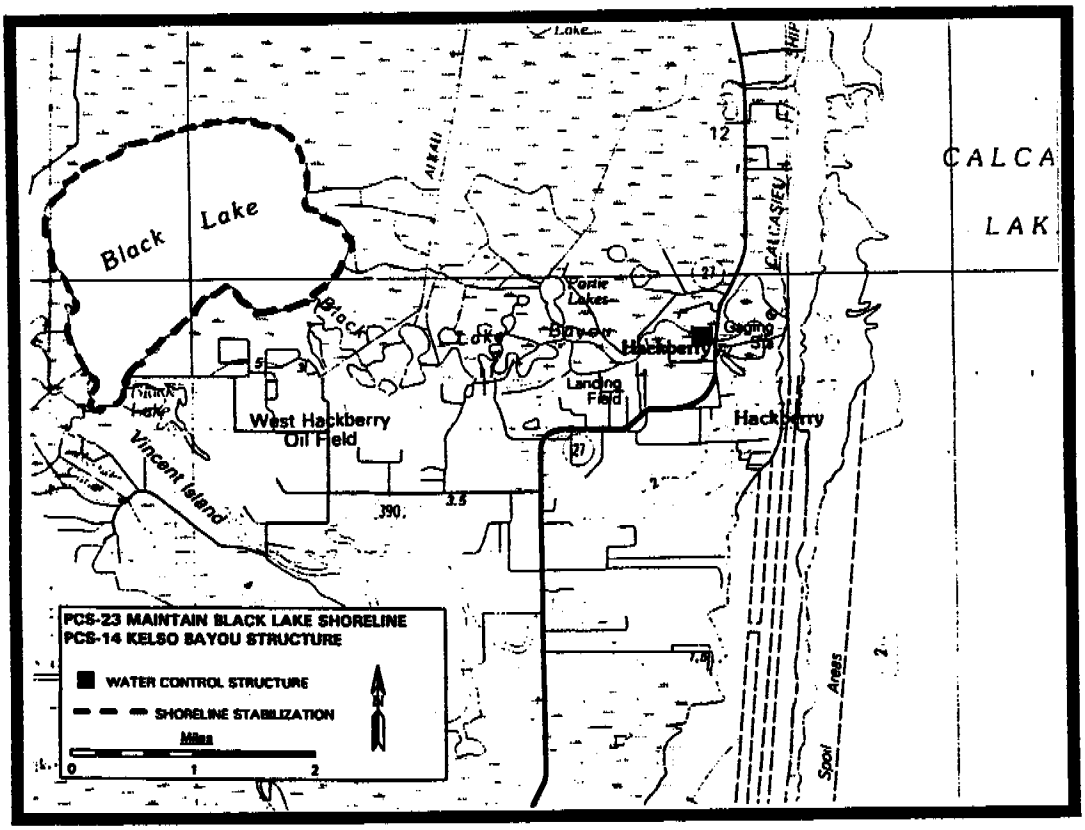

Figure 14. PCS-14 Kelso Bayou Structure

PCS-25 HIGHWAY 384 HYDROLOGIC RESTORATION

Location

The project is located in Cameron Parish surrounding the community of Grand Lake, La. in the northeastern portion of Calcasieu Lake. The project is bounded by Calcasieu Lake to the west, the GIWW to the east and Hwy: 384 and the community of Grand Lake to the south (see Figures 6 and 15). The project may benefit a total of 283 acres of fresh to brackish marshes.

Problems and Opportunities

Marsh loss in the vicinity of the Grand Lake ridge has been caused by saltwater intrusion and tidal scour moving into the marshes from Calcasieu Lake. This has resulted in the destruction of fresh to intermediate marshes in the area. Breaks along the Calcasieu Lake shoreline and canals have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and tidal scour in the area and returning the area to its former hydrologic condition. This project will benefit fresh to brackish marshes in the area by restoring the area's former hydrology.

Description of Features.

The project features consist of the installation of five 48" flapgated culverts, the replacement of an existing 48" culvert, the installation of three 22 " flapgated culverts and the placement of a shell plug along the Calcasieu Lake shoreline.

Benefits and Costs.

Approximately 150 acres of fresh to brackish marsh will be restored and protected and another 133 acres will be benefited by the project. The estimated project cost is $521,000.

Effects and Issues.

This project will restore, protect and benefit about 283 acres of fresh to brackish marshes in the vicinity of the Grand Lake ridge in the northeastern portion of Calcasieu Lake. Fresh, intermediate and brackish marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for any existing navigation and estuarine migratory fisheries access to the degree allowable in keeping with the goals of the project.

Status.

This project was selected as Priority Project for the 1992 CWPPRA List submitted to Congress in November of 1992. The project is sponsored by the USDA Soil Conservation Service and the state of Louisiana and is presently in the preliminary design phase of development. The project is projected for construction in 1995.

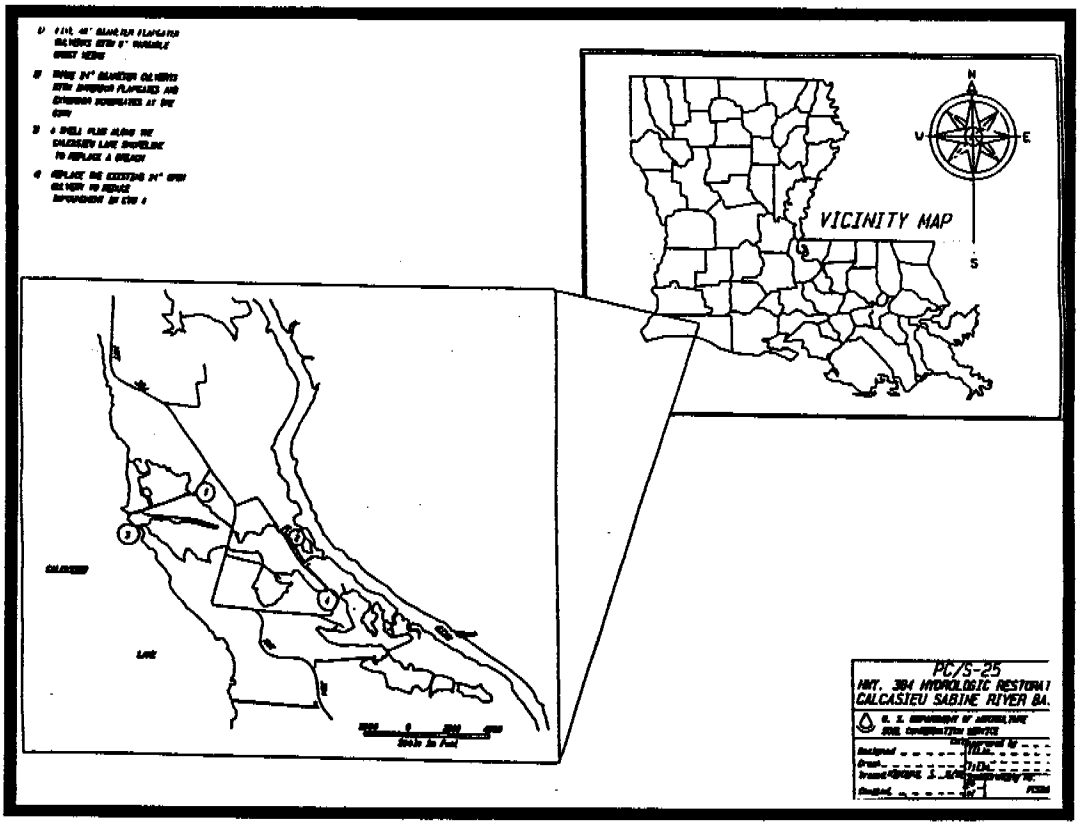

Figure 15. PCS-25 Highway 384 Hydrologic Restoration

PCS-31 SALTWATER BARRIER AT THE MOUTH OF BRANNON DITCH

Location

The project is located in Calcasieu Parish north of the GIWW about 5 miles north of Hackberry, La and about 1.5 miles west of the Ellender Bridge at La. Hwy 27. The project is bounded by the Gulf Intracoastal Waterway to the south, and the Brannon Ditch spoil banks to the east and west (see Figures 6 and 16). The project may benefit fresh marshes in the Brannon Ditch area north of the GIWW.

Problems and Opportunities

Marsh loss in the vicinity of the Brannon Ditch north of the GIWW has been caused by saltwater intrusion, shoreline erosion and water level fluctuations in turn caused by the GIWW and the Calcasieu Ship Channel. This hydrologic restoration project has the goal of reducing saltwater intrusion and tidal scour in the Brannon Ditch area by placing a structure at the mouth of the Brannon Ditch at its intersection with the GIWW. This project will benefit fresh marshes to the north by restoring hydrology to what it was prior to the construction of area canals.

Description of Features.

The project features consist of the installation of an active water control structure to allow for drainage from the Brannon Ditch to the GIWW, but which will not allow for saltwater intrusion to the north from the GIWW to the Brannon Ditch.

Benefits and Costs.

The project will protect an undetermined amount of fresh marsh north of the GIWW in the vicinity of Brannon Ditch. The WVA Working Group did not evaluate the project's benefits. The estimated project cost is $686,000.

Effects and Issues.

This project will protect and benefit fresh marsh and aquatic vegetation north of the GIWW near Brannon Ditch. Fresh marsh fish and wildlife, especially waterfowl, will benefit from the project by the reduction of saltwater intrusion and water level fluctuations caused by the GIWW and the Calcasieu Ship Channel. The project should be designed so as to provide for any existing navigation and drainage for flood control in the area. There have been some landowner concerns about the project's effects on drainage.

Status.

This project is presently a short term critical project on the Calcasieu-Sabine Basin Plan for the CWPPRA.

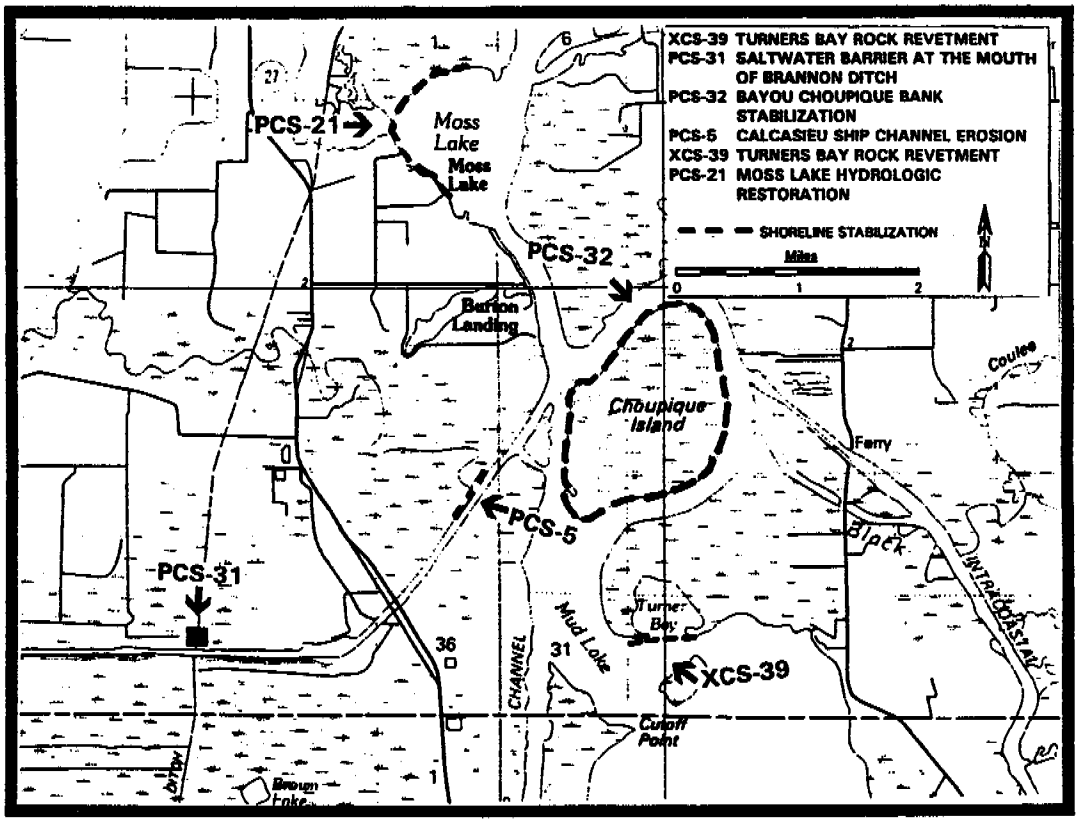

Figure 16. PCS-31 Saltwater Barrier At The Mouth Of Brannon Ditch

XCS-44 WEST COVE CANAL PLUG

Location

The project is located in Cameron Parish in the Sabine National Wildlife Refuge near the intersection of the West Cove Canal and the Calcasieu Ship Channel. The project area is bounded by West Cove of Calcasieu Lake to the south, La. hwy. 27 to the west, Long Point Bayou to the north and the Calcasieu Ship Channel to the east. It is located about seven miles south from Hackberry, La (see Figures 6 and 28). The project may benefit a total of 985 acres of saline marshes.

Problems and Opportunities

Marsh loss is occurring is this area from water level fluctuations, saltwater intrusion and shoreline erosion caused by the Calcasieu Ship Channel (CSC) and the removal of the Calcasieu River sand bar. This project will provide for protection for 985 acres of saline marsh adjacent to the West Cove Canal by reducing some of the hydrologic alterations caused by the CSC.

Description of Features.

This is a hydrologic restoration project which consists of placing an earthen reinforced or shell or limestone plug at the mouth of the West Cove Canal near the Calcasieu Ship Channel.

Benefits and Costs.

The project area contains 2,547 acres of saline marshes and 3,821 acres of open water for a total area of 6,368 acres. The West Cove Canal Plug project is projected to protect 52 acres of saline marsh, 650 acres of submerged vegetation and enhance another 283 acres for a total benefit to 985 acres. The estimated project cost is $253,000.

Effects and Issues.

This project will benefit about 985 acres of saline marshes in the vicinity of the West Cove Canal northeast of West Cove. The project should reduce Calcasieu Ship Channel saltwater intrusion, increased water level exchanges and shoreline erosion. Salt marsh fish and wildlife species will be benefited by the project. The structure may have to be implemented so that it does not interfere with navigation and so it provides for some estuarine fisheries access to marshes adjacent to the West Cove Canal.

Status.

This project is presently listed as a short term critical project in the Calcasieu-Sabine Basin plan. It therefore is an integral part of the preferred "Perimeter Plan" basin restoration strategy. It is related to the Mine Calcasieu Ship Channel Spoil and Plug the West Cove Canal project (XCS-51/44).

XCS-46 NORTH LINE CANAL STRUCTURE

Location

The project is located on the Sabine National Wildlife Refuge (SNWR) in the Starks North Canal north of Pool 3, about 14 miles west of Hackberry La. The project may benefit a total of 4,314 acres of intermediate to brackish marshes north and east and west of Pool 3 (Figures 6 and 17).

Problems and Opportunities

Marshes in the area surrounding the "Pool 3" impoundment have experiences marsh loss caused by saltwater intrusion, increased water level fluctuations and increased impoundment. These have been in turn caused by increased water fluctuations and tidal scour moving into the marshes from the West Cove area of Calcasieu Lake after the construction of the Calcasieu Ship Channel and from the Sabine Lake area after the Sabine Pass Channel construction. This has resulted in the conversion of intermediate and fresh marshes to brackish marshes and open water. The existing Headquarters Canal, Hog Island Gully and West Cove structures constructed in the late 1970's may be inadequate to drain the area of excess water and additional marsh loss may be caused by this impoundment of water. Canals have increased these marsh destruction processes by allowing saltwater intrusion and tidal scour into the interior marsh areas. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a structure in the North Canal north of Pool 3. This project will benefit intermediate and brackish marshes in the area by restoring the area's hydrology.

Description of Features.

The project features consist of the installation of a structure in the North Line Canal for water control east and west of Pool 3. This structure would work with the Hog Island Gully, Headquarters Canal and West Cove structures to reduce water levels and saltwater intrusion into the marshes east of Pool 3. Engineering design will dictate the final structure design.

Benefits and Costs.

The project area consists of about 19,217 acres of marsh and 8,236 acres of open water for a total area of 27,453 acres. Approximately 461 acres of intermediate and brackish marsh and 2,636 acres of aquatic vegetation will be protected and another 1,218 acres will be benefited for a total benefit to 4,314 acres. The estimated project cost is $607,000.

Effects and Issues.

This project will protect and benefit about 4,314 acres of intermediate and brackish marshes in the north central portion of the Sabine NWR. Intermediate and brackish marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for existing estuarine migratory fisheries access and recreational access to the degree allowable in keeping with the goals of the project.

Status.

The project is presently a short term critical project in the Calcasieu-Sabine Basin Plan for the CWPPRA. It therefore is an integral part of the basin's "Perimeter Plan" restoration strategy.

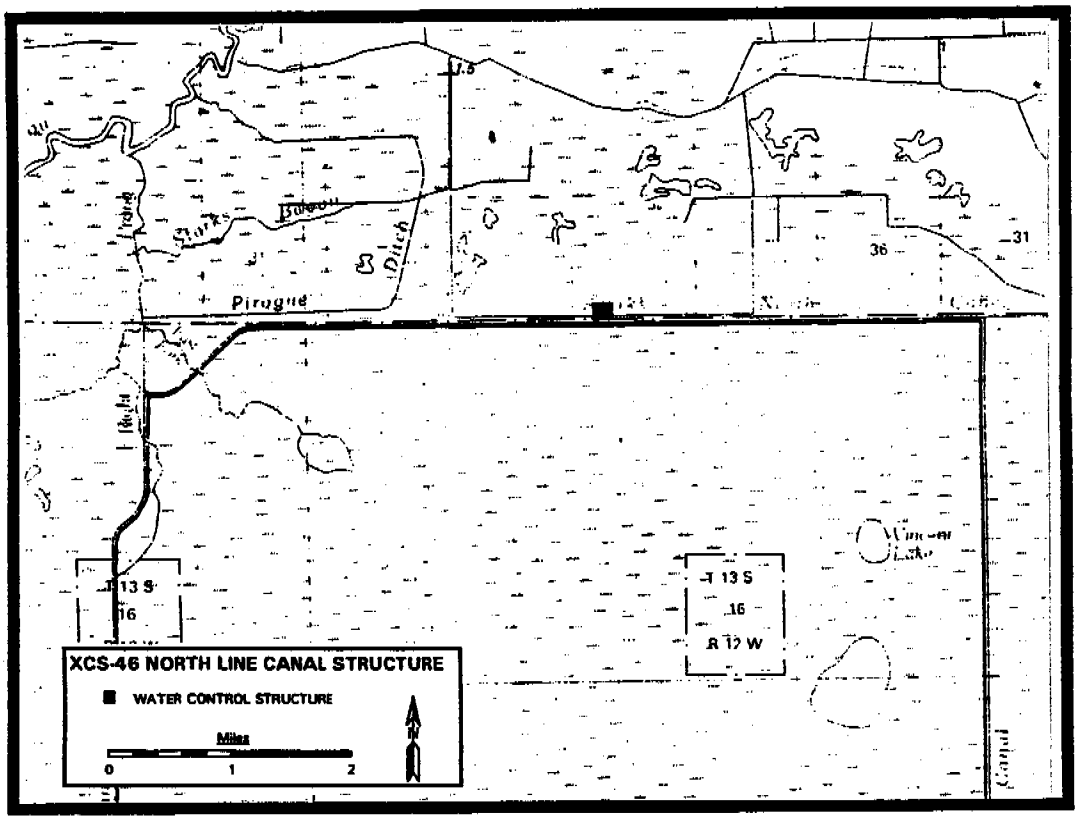

Figure 17. XCS-46 North Line Canal Structure

XCS-47, 48I,J,K,&P REPLACE SABINE NATIONAL WILDLIFE REFUGE HEADQUARTERS STRUCTURES

Location

The project is located in Cameron Parish about 15 miles southwest form Hackberry, La. within the Sabine National Wildlife Refuge (SNWR). The 42,247 acre project area is bounded to the south by the South Starks Canal, to the west by the Pool 3 Impoundment and the Beach Canal to the north by the Starks North Canal and to the east by the Back Ridge Canal and Hwy. 27 (see Figures 6 and 18). The project may benefit a total of 6,490 acres of intermediate to brackish marshes within the refuge.

Problems and Opportunities

Marsh loss in the vicinity of the project area has been caused by saltwater intrusion and increased impoundment caused by increased water fluctuations and tidal scour moving into the marshes from the West Cove area of Calcasieu Lake after the construction of the Calcasieu Ship Channel. This has resulted in the conversion of intermediate and fresh marshes to brackish marshes and open water. The existing structures constructed in the late 1970's may be inadequate to drain the area of excess water and additional marsh loss may be caused by this impoundment of water. Canals have increased these marsh destruction processes. This hydrologic restoration and marsh management project has the goals of reducing saltwater intrusion, water level fluctuations and impoundment in the area through the installation of larger and more flexible water control structures. This project will benefit intermediate and brackish marshes in the area by restoring the area's former hydrology.

Description of Features

The project features consist of the replacement of the Hog Island Gully, Headquarters Canal and West Cove Canal water control structures. The existing structures will be replaced with larger and more manipulative structures in order to reduce high water levels and to provide for water level lowering capacity to restore, protect existing intermediate and brackish marshes in the area. Presently, the Hog Island Gully and the West Cove Canal structures are fixed crest weir with 8 ft. wide "tainter" gates in the center. The Headquarters canal structure presently consists of two 48" diameter flapgated culverts. Engineering design will dictate the final replacement structure designs.

Benefits and Costs

Approximately 953 acres of brackish marsh and 2,846 acres of aquatic vegetation will be restored and protected, and another 2,691 acres will be enhanced by the project for a total benefit of 6,490. The estimated project first cost is $3,841,000.

Effects and Issues

Status.

This project was selected as Priority Project for the 1993 CWPPRA List submitted to Congress in November of 1993. The project is sponsored by the US Fish and Wildlife Service and the state of Louisiana and is presently in the preliminary design phase of development. The project is projected for construction in 1996.

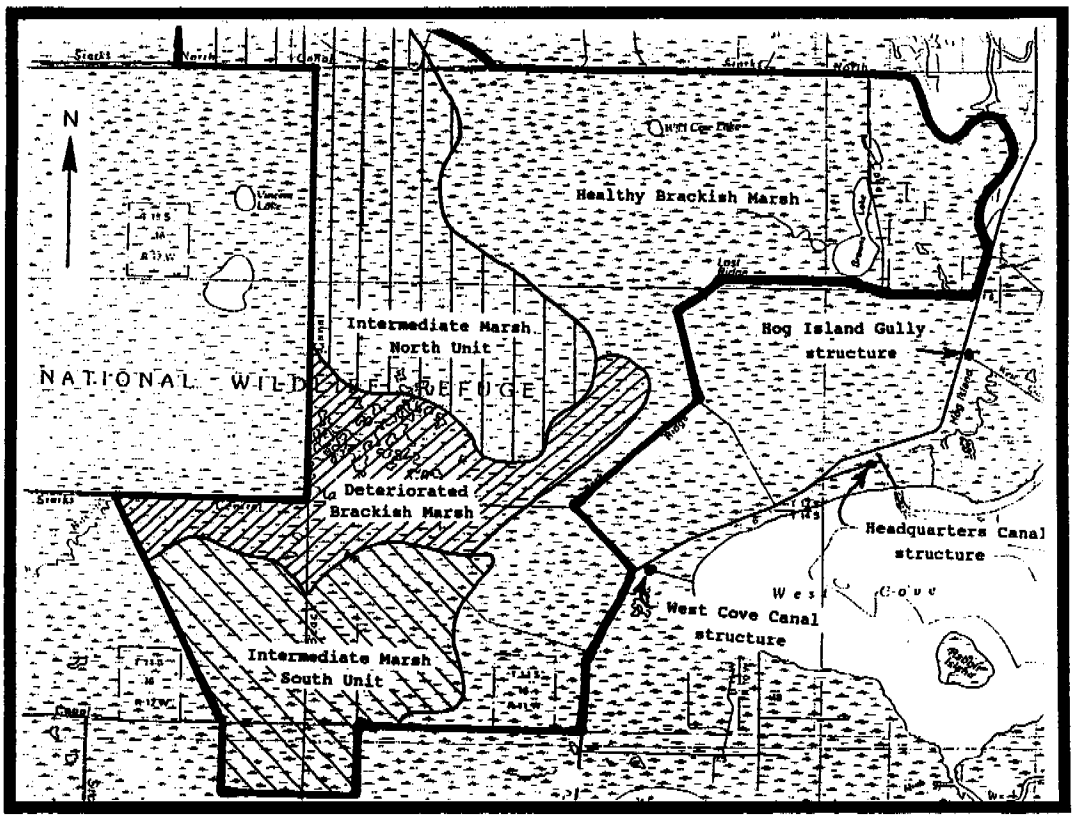

Figure 18. XCS-47, 48I,J,K,&P Replace Sabine National Wildlife Refuge Headquarters Structures

XCS-48D (NO-17) BLACK BAYOU CUTOFF AND SPOIL BANK REPAIR

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 21). It is bordered by the GIWW on the north, Black Bayou Cutoff Canal and the Black Bayou Oil Field on the east, and Perry Ridge on the west and south. The project area is comprised of 3,300 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

This area has suffered loss of much of the historic fresh marsh between 1956 and 1978. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, introduce additional freshwater from Black Bayou Cutoff Canal, and dampen wave energy to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 8,500 feet of spoil bank repair along the Black Bayou Cutoff Canal to enhance water management capabilities and installation of two rock weirs in openings along the Black Bayou Cutoff Canal.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 88 acres, enhance 141 acres of emergent marsh and stimulate growth of aquatic vegetation by 384 acres for a net benefit of 613 acres. The estimated cost of the project is $977,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study is a component of XCS-48 (NO-17) and is interactive with project (CS-5b) Sabine Freshwater Introduction and (CS-12) Black Bayou Hydrologic Restoration. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

XCS-48F STRUCTURE NEAR LONG POINT BRIDGE

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 19). The project area is part of the Sabine National Wildlife Refuge and is located along the west side of LA 27 approximately five miles south of Hackberry and is situated within the XCS-48 (SA-1A) South Browns Lake/East Hog Island Gully Area.

Problems and Opportunities

This area has suffered loss of much of the historic fresh marsh between 1968 and 1984. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity and rapid water level fluctuations to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project plans include call levee construction and installation of flapgated culverts along the marsh adjacent to the west side of LA 27 in the vicinity of the Long Point Bridge.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $526,500.

Effects and Issues

Stabilizing salinity and water level spikes will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. This project interacts with project (XCS-1A) South Browns Lake/East Hog Island Gully Area. Fisheries access will be reduced by the water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

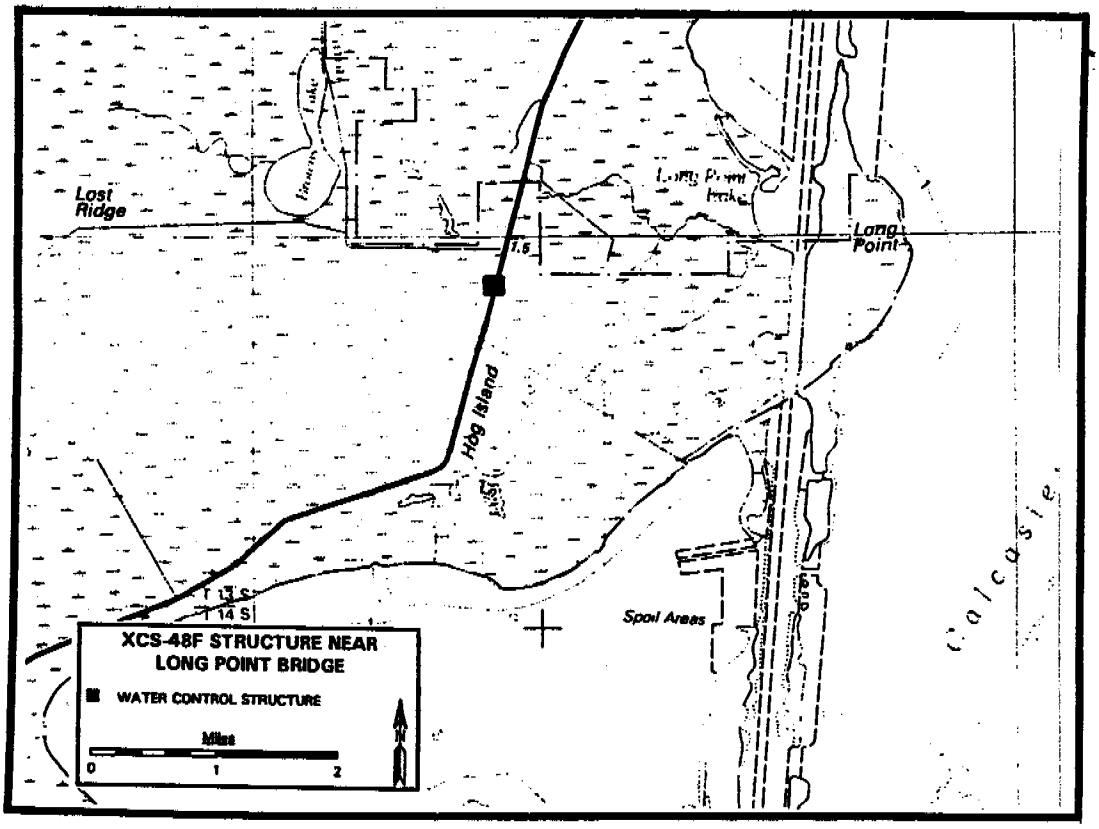

Figure 19. XCS-48F Structure Near Long Point Bridge

XCS-48 (NO-3) BLACK BAYOU CUTOFF CANAL MANAGEMENT AREA

Location

The project is located in Cameron Parish, Louisiana in the northeast corner of the Calcasieu-Sabine River Basin Area (Figures 6 & 20). It is bordered by the GIWW on the north, Alkali Ditch on the east and management levees on the south and west. The project area is comprised of 4,100 acres of intermediate marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. Historically the project area was almost solid marsh. Presently, the area is beginning to convert to broken marsh and open water. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project plans includes maintaining and armoring the existing perimeter levee system, installing a freshwater introduction structure in the northern boundary and install two water control structures on the south boundary.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. Preliminary estimation is that the project will benefit 800 acres of marsh at an estimated cost of the project is $1,314,000.

Effects and Issues

Stabilizing salinity and water level spikes and periodic draw-downs will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures and during periods of draw-down, however, productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

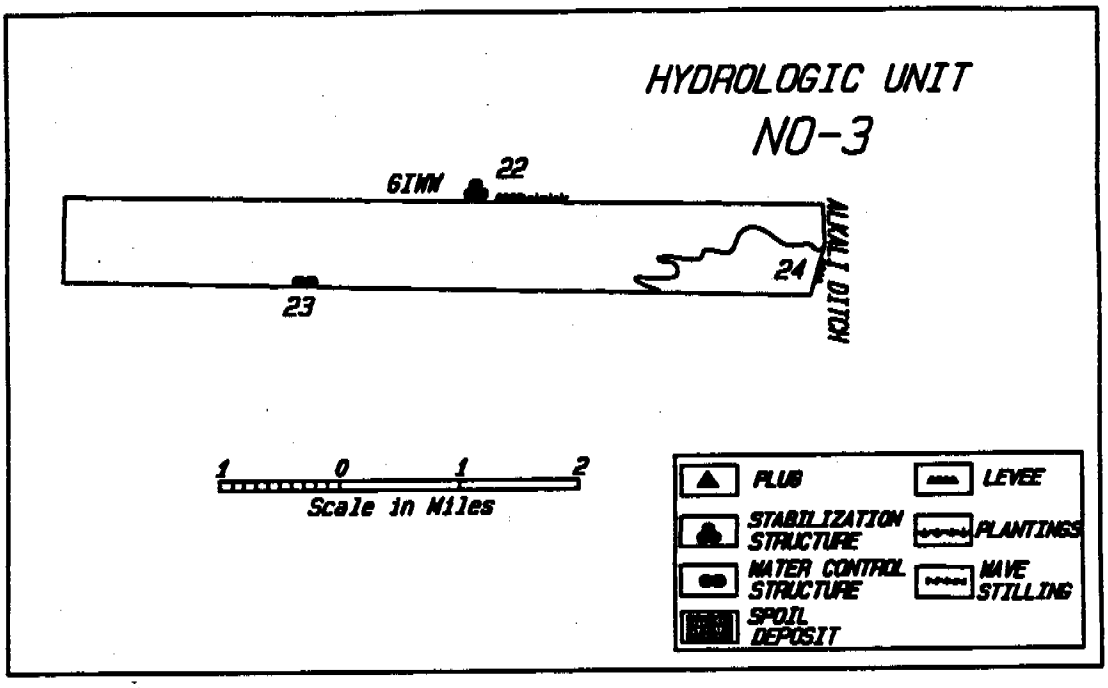

Figure 20. XCS-48 (NO-3) Black Bayou Cutoff Canal Management Area

XCS-48 (NO-17) NORTHWEST BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 21). It is bordered by the GIWW on the north, Black Bayou Cutoff Canal and the Black Bayou Oil Field on the east, and Perry Ridge on the west and south. The project area is comprised of 3,300 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

This area has suffered loss of much of the historic fresh marsh between 1956 and 1978. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, introduce additional freshwater from Black Bayou Cutoff Canal, and dampen wave energy to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 1) 8,500 feet of spoil bank repair along the Black Bayou Cutoff Canal to enhance water management capabilities, 2) place two rock weirs in openings along the Black Bayou Cutoff Canal, 3) a flapgated culvert under the road at the southern-most part of the unit, 3) installing wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition, 4) and to gap interior spoil banks to prevent northward flow from Unit 18.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 88 acres, enhance 141 acres of emergent marsh and stimulate growth of aquatic vegetation by 384 acres for a net benefit of 613 acres. The estimated cost of the project is $2,322,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-5b) Sabine Freshwater Introduction and (CS-12) Black Bayou

Hydrologic Restoration. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

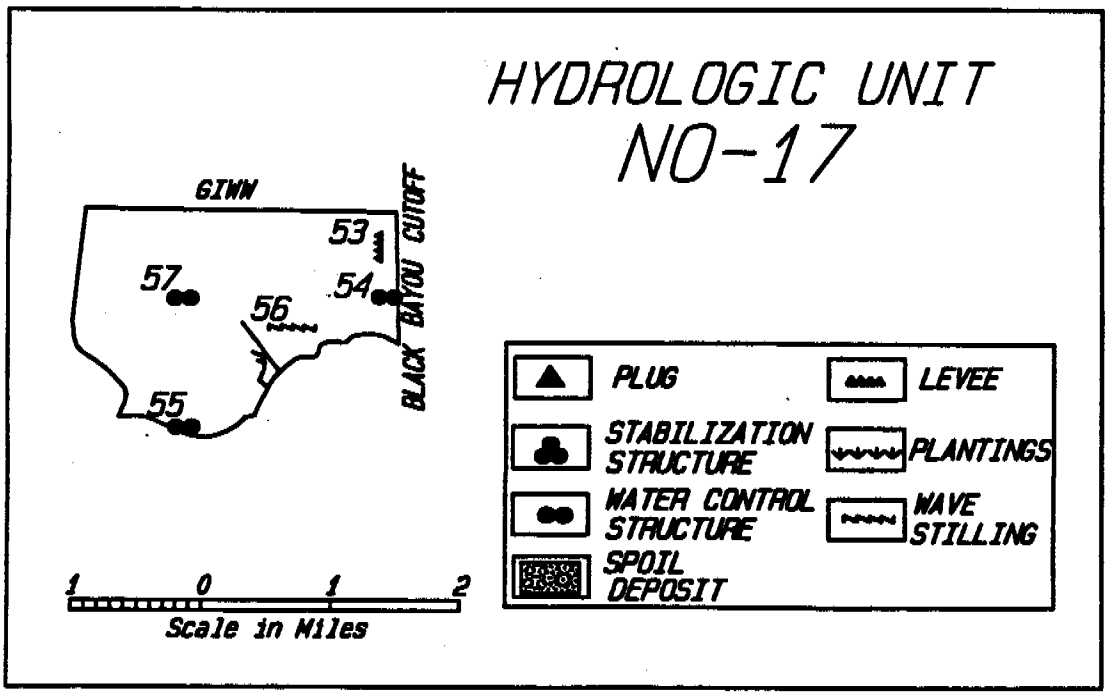

Figure 21. XCS-48 (NO-17) NORTHWEST BLACK BAYOU AREA

XCS-48 (NO-18) SOUTHEAST BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 22). It is bordered by Unit NO-17 on the north, Black Bayou on the south, and a natural ridge and cattle walkway on the west. The project area is comprised of 4,422 acres of prairie, intermediate and brackish marsh, and open water.

Problems and Opportunities

This area has suffered conversion of much of the historic intermediate marsh to open water between 1956 and 1978. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, introduce additional freshwater from Black Bayou Cutoff Canal, and dampen wave energy to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 1) installation of 22 rock weirs in openings along the Black Bayou , 2) installation of a flapgated culvert through an existing cattle walkway between Units NO-18 and NO-19 to allow for flow through to Unit NO-19, 3) installing 47,000 feet of wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition and, 4) vegetative plantings to accelerate colonization of shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 144 acres, enhance 201 acres of emergent marsh and stimulate growth of aquatic vegetation by 262 acres for a net benefit of 607 acres. The estimated cost of the project is $2,153,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping and vegetative planting will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced slightly by rock weirs in Black Bayou although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be slightly reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-12) Black Bayou Hydrologic Restoration. A feasibility study is

required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

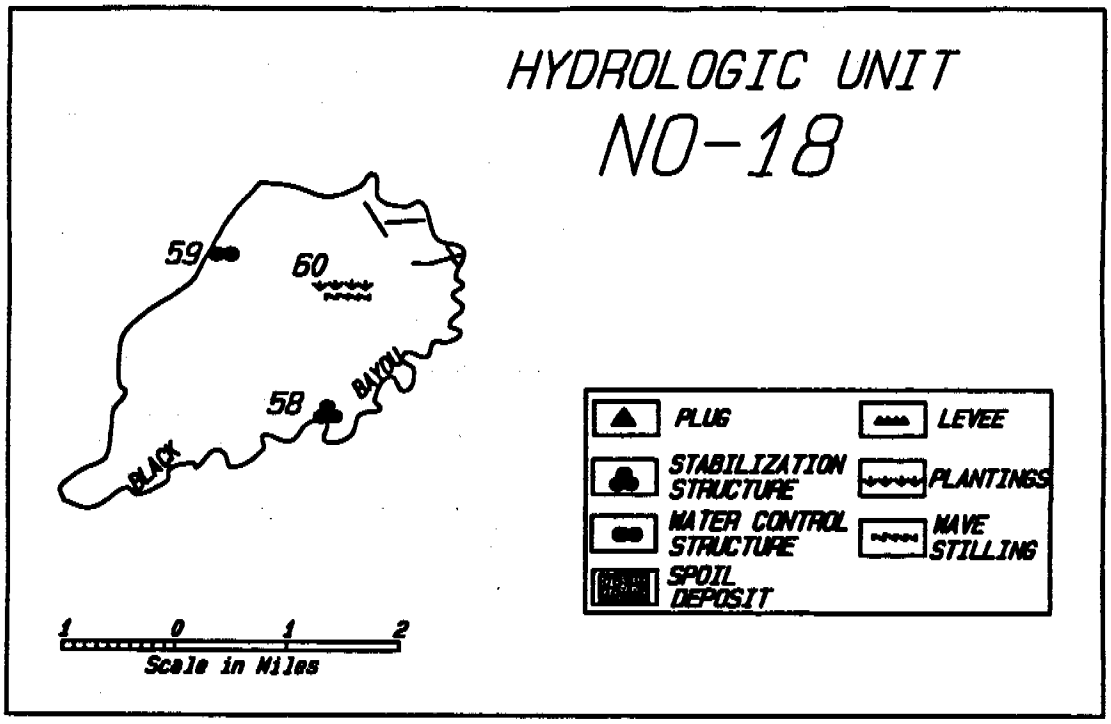

Figure 22. XCS-48 (NO-18) Southeast Black Bayou Area

XCS-48 (NO-19) BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 23). It is bordered by the GIWW on the north, Black Bayou on the south, and a natural ridge and cattle walkway on the east, and a natural ridge/cattle walkway, pipeline canal, and Sabine River to the west. The project area is comprised of 9,677 acres of prairie, intermediate and brackish marsh, and open water.

Problems and Opportunities

This area is suffering only moderate loss of marsh and habitat modification resultant from high salinity events and winter droughts. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, vegetative plantings and dampening wave energy to enhance the growth and expansion of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 1) installation of 7 rock weirs in openings along the Black Bayou , 2) a canal plug at the junction of Units NO-19 and NO-20 along the Sabine River, 3) installing 200,000 feet of wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition and, 4) 200,000 linear feet of vegetative plantings to accelerate colonization of shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 126 acres, enhance 451 acres of emergent marsh and stimulate growth of aquatic vegetation by 533 acres for a net benefit of 1,110 acres. The estimated cost of the project is $3,243,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping and vegetative planting will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced slightly by rock weirs in Black Bayou although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be slightly reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-12) Black Bayou Hydrologic Restoration. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

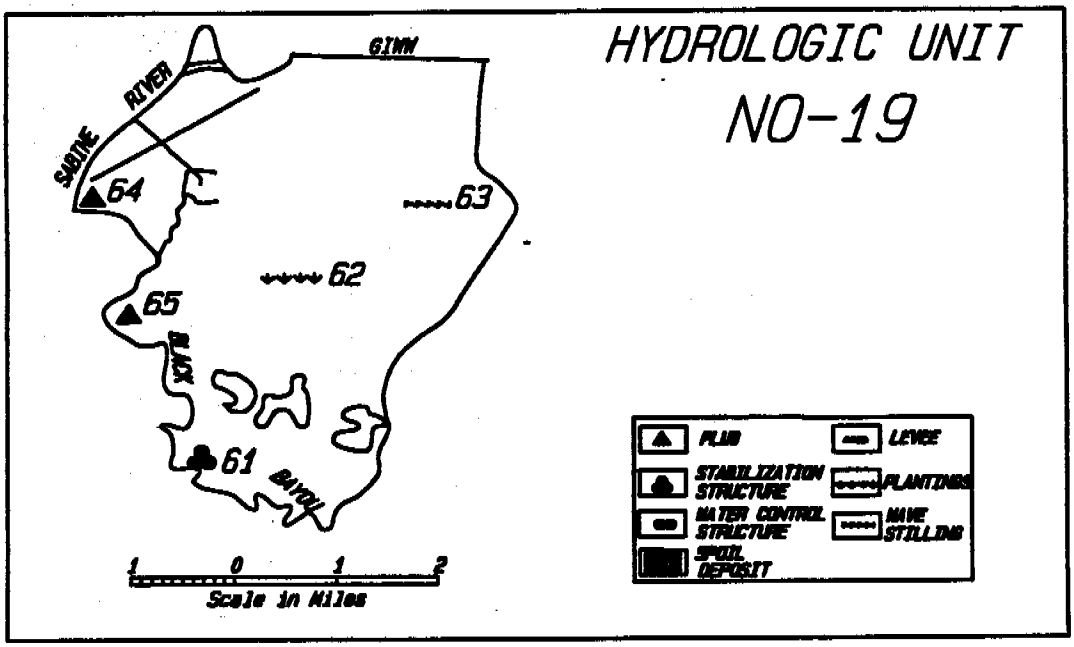

Figure 23. XCS-48 (NO-19) Black Bayou Area

XCS-48 (SA-10) WEST COVE CANAL UNIT

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 24). It is part of the Sabine National Wildlife Refuge and is bordered on the north by an unnamed bayou just south of the North Starks Canal, on the south by the West Cove Canal, on the east by the Calcasieu Ship Channel and on the west by LA 27. The project area is comprised of 4,600 acres of brackish marsh, saline marsh and open water.

Problems and Opportunities

The unit historically had bulrush and sawgrass in the northern part, a small forested island in the center, and submerged vegetation along with wiregrass, cane, and three square grass in the southern part of the unit. The 1949, 1968, 1978, and 1988 vegetative maps document the unit converting from brackish to a part brackish and part saline condition. The central and southern areas had large areas of marsh converted to water equal to about one-third of the unit between 1956-1978. The 1984 classified satellite data shows the further deterioration of marsh as only the northern one-fifth of the unit was still solid marsh and the remaining unit was water and broken marsh.

The unit consists of brackish and saline marsh and open water. Interior marshes have experienced moderate deterioration. In existing open water areas, physical erosion of adjacent marshes could be reduced by the construction of wave-break devices. The objective of the hydrologic unit is to maintain the present physical condition and enhance vegetative productivity. This project is compatible with the basin strategy of treating critical areas of wetland loss in the basin's interior

Description of Features

The objective of the hydrologic unit is to maintain the present physical condition and enhance vegetative productivity. West Cove Canal currently has an outlet into West Cove and the Calcasieu Ship Channel. The amount of flow going directly into the ship channel will be reduced by installing a plug across the outlet at the channel. An existing structure will be modified to increase its capability to regulate flow and reduce saltwater intrusion from the Calcasieu Ship Channel into the marshes west of Louisiana Highway 27 by adding flapgates and/or stoplogs to the existing Sabine NWR structure. This is a major fisheries access site and any modification will address this issue. This structure would be actively managed by the Sabine NWR. Flapgates on the two culverts under Louisiana Highway 27 will be replaced. These culverts were initially equipped with flapgates on the east side of Louisiana Highway 27 to prevent westward flow of tidal waters. These flapgates have since deteriorated and no longer exist. Wave stilling/sediment trapping devices will serve to trap suspended sediment and promote growth of submerged vegetation. It is also proposed to utilize dredge material from the Calcasieu Ship Channel to fill in the deeper ponds and establish emergent vegetation.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 76 acres, enhance 211 acres of emergent marsh and stimulate growth of aquatic vegetation by 313 acres for a net benefit of 599 acres. The estimated cost of the project is

$2,573,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

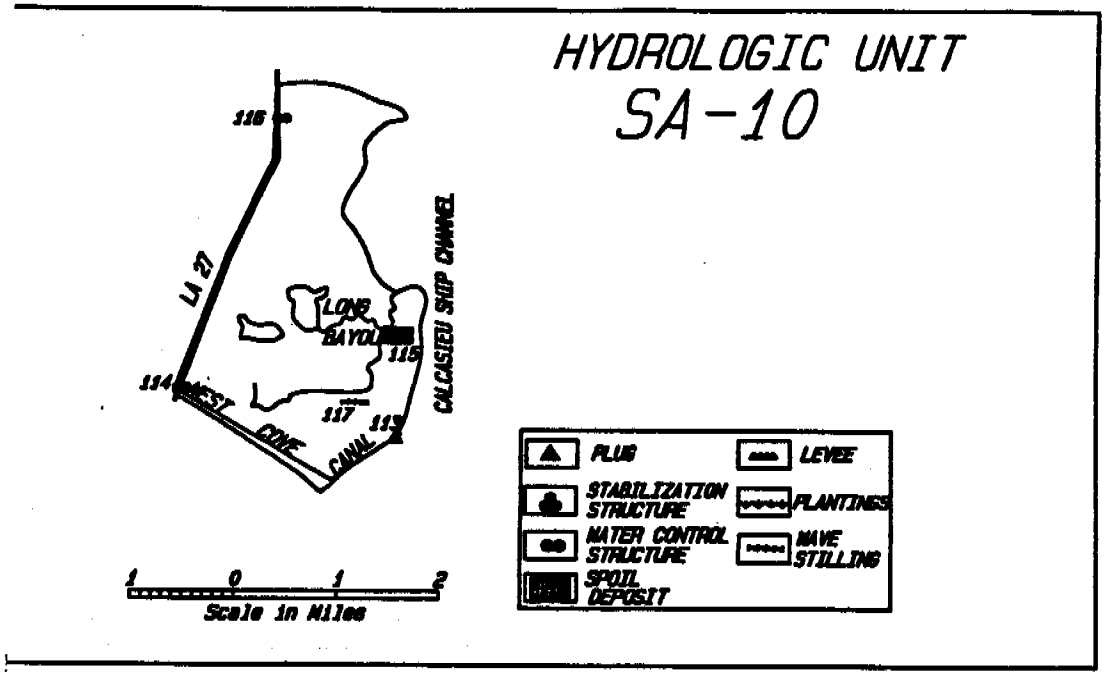

Figure 24. XCS-48 (SA-10) West Cove Canal Unit

XCS-52 PLUG PIPELINE CANAL NEAR BAYOU PECONI

Location

The project is located in Cameron Parish, Louisiana near the north end of the Cameron Creole Watershed on a pipeline canal near Bayou Peconi on the east shore of Calcasieu Lake (Figures 6 & 25).

Problems and Opportunities

Saltwater from Calcasieu Lake is entering marshes east of the lake via a pipeline canal. The existing plug on the canal has deteriorated and been cut around allowing saltwater intrusion into low salinity brackish marsh. There is an opportunity to halt saltwater intrusion in this area by replacing the plug. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project calls for construction of a plug across the pipeline canal south of Bayou Peconi near it's intersection with the Lake Shore Canal.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will protect 77 acres and benefit another 88 acres. The estimated project cost is $443,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced by the plug on the pipeline canal.

Status

This project is a concept. A feasibility study is required and it may be a candidate for future priority lists.

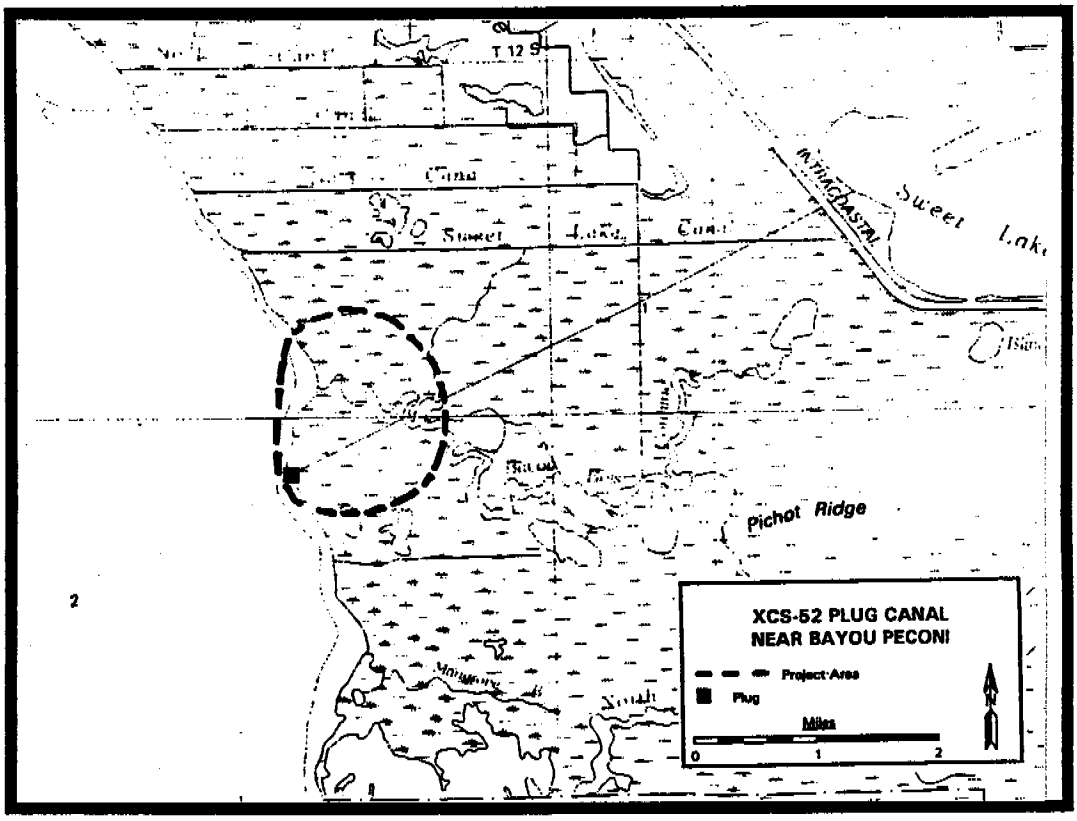

Figure 25. XCS-52 Plug Pipeline Canal Near Bayou Peconi

XCS-53 ALKALI DITCH STRUCTURE

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 26) at Alkali Ditch near its intersection with the GIWW.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. In 1940, the project area was almost solid marsh that by 1983 had deteriorated to a large open water pond. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project calls for construction of a weir with a boat bay across the Alkali Ditch near it's intersection with the GIWW.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will protect 17 acres and benefit another 286 acres. The estimated project cost is $1,587,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is inter active with XCS-48 (NO-2) Black Lake Northeast Area. A feasibility study is required and it may be a candidate for future priority lists.

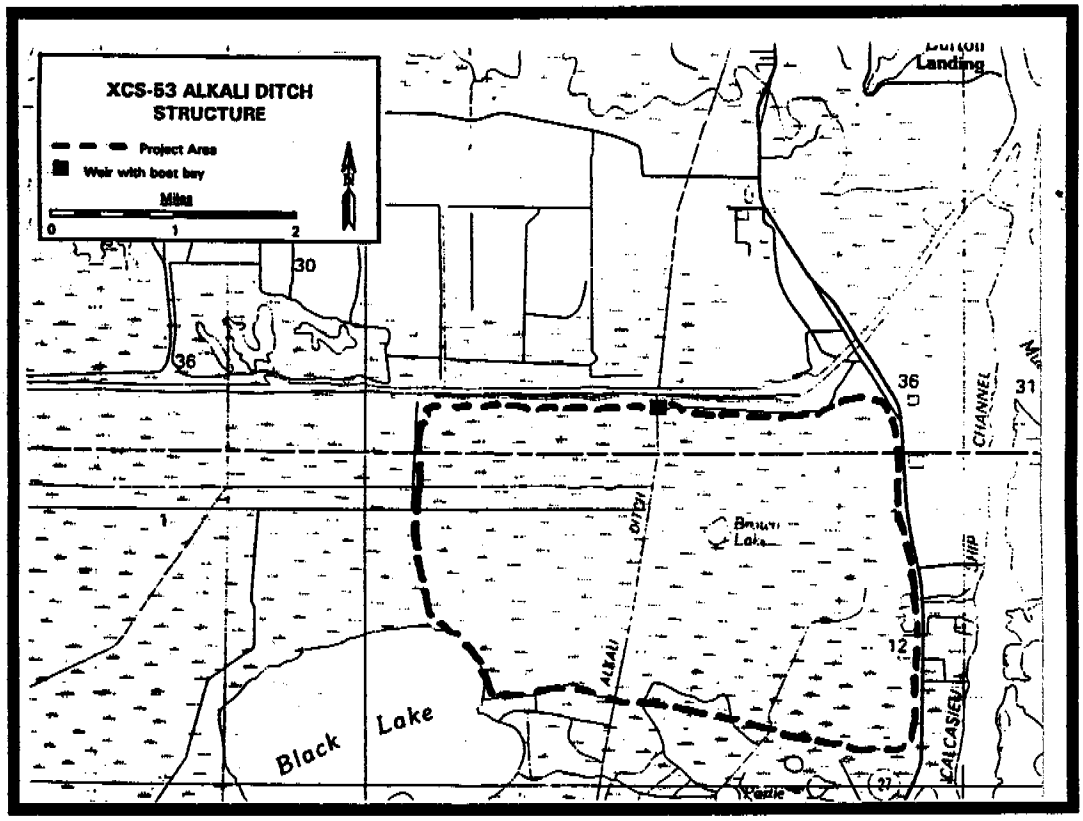

Figure 26. XCS-53 Alkali Ditch Structure

XCS-54 GOOSE LAKE RESTORATION PROJECT

Location

The project is located in Cameron Parish, Louisiana approximately 10 miles northwest of Hackberry on the north shore of the GIWW in the vicinity of Goose Lake (Figures 6 & 27).

Problems and Opportunities

The marshes surrounding Goose Lake are suffering from tidal scour and saltwater intrusion via gaps in the GIWW north spoil bank. There is an opportunity to increase freshwater introduction and retention by deepening an existing drainage ditch, stabilizing part the north bank of the GIWW and installing a water control structure to improve water circulation in the area. This project is compatible with the basin strategies of treating critical areas of wetland loss within the basin's interior and reducing shoreline erosion on navigation channels.

Description of Features

The project calls for stabilizing 5,000 linear feet of the GIWW shoreline, installing a water control structure on the north bank of the GIWW south of Goose Lake and a 400 foot diversion channel.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will restore 7 acres, protect 27 acres, and benefit another 71 acres. The estimated project cost is $1,718,000.

Effects and Issues

This project would offset marsh loss and shoreline erosion while increasing habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. No adverse impacts are anticipated.

Status

This project is conceptual. A feasibility study is required and it may be a candidate for future priority lists.

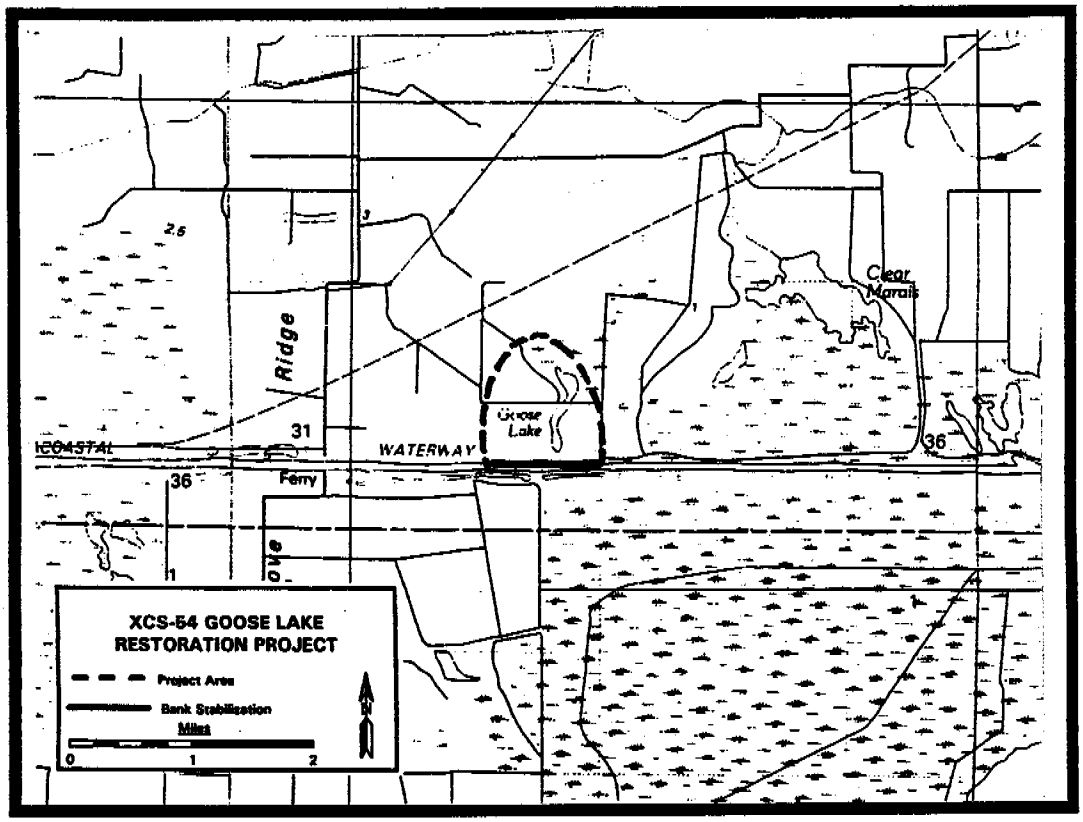

Figure 27. XCS-54 Goose Lake Restoration Project

XCS-51/44 MINE SHIP CHANNEL SPOIL AND PLUG WEST COVE CANAL

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 28) along the west side of LA 27 approximately . It is part of the Sabine National Wildlife Refuge and is bordered on the north by West Cove Canal, on the south by Calcasieu Lake and on the west by LA 27. The project area is comprised of 1,647 acres of saline marsh and open water.

Problems and Opportunities

Hog Island Gully Bayou historically drained area marshes into West Cove. West Cove Canal and Shell Canal were dredged around 1917. Saltwater flooding over a marsh burn contributed to some of the marsh break-up adjacent to West Cove Canal. Interior marshes have converted to brackish and saline marshes. Those areas have also experienced moderate to severe deterioration. West Cove Canal appears to have captured the flow of the old Hog Island Gully Bayou. Consequently, the bayou has filled in considerably. As a result, the natural sediment delivery and deposition mechanisms to a large portion of interior marshes have been reduced and altered. The plan objective of the hydrologic unit is to maintain and enhance existing vegetation and create new marsh through the beneficial use of dredged material.

Description of Features

The project calls for construction of a plug across West Cove Canal using dredged material from the Calcasieu Ship Channel. This would revive flow through Hog Island Gully Bayou, increase accretion rates of marshes in the western portion of the unit, and reduce excessive canal-induced water exchange and salinity fluxes. This element might also provide benefits to Unit SA-1 by reducing salinities entering via the Hog Island Gully water control structure. In addition, dredged material from the ship channel will be used to create a leveed impoundment that will be used to contain material dredged and used beneficially for marsh creation.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will create 183, protect 52 acres and benefit another 821 acres. The estimated project cost is $1,929,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced by the plug on the West Cove Canal.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is a component of XCS-48 (SA-9) Hog Island Gully Area. A feasibility study is required and it may be a candidate for future priority lists.

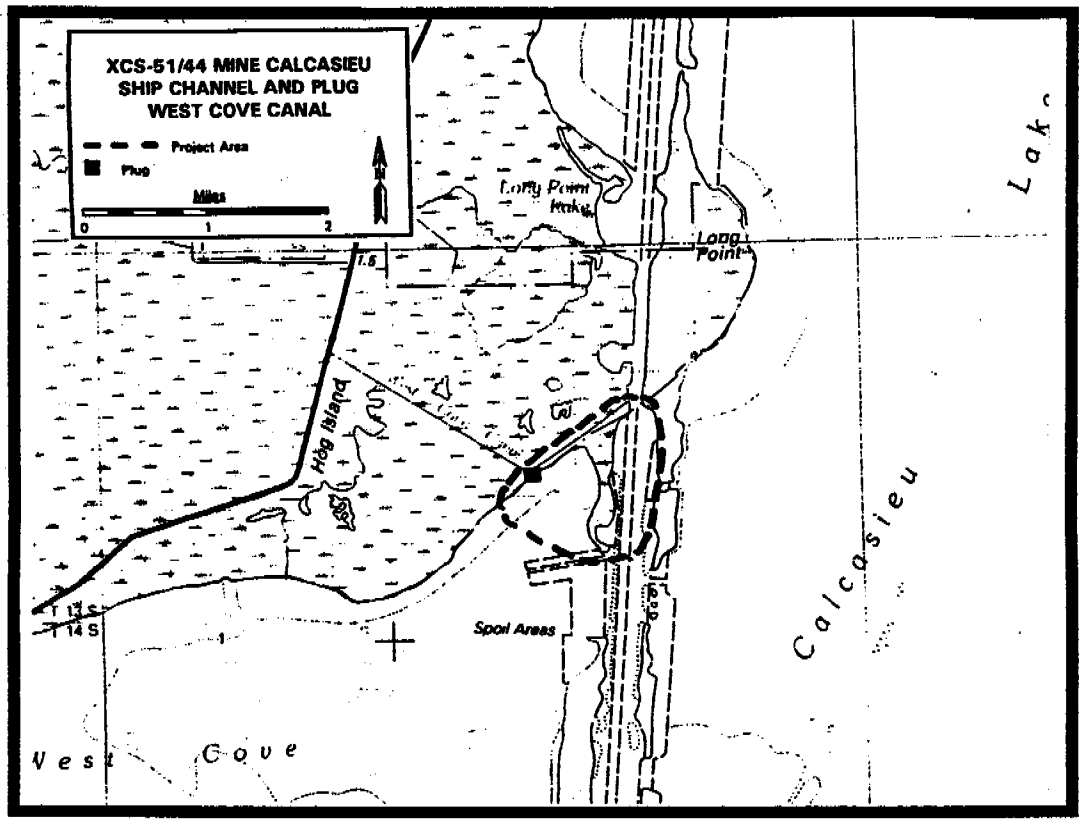

Figure 28. XCS-51/44 Mine Ship Channel Spoil And Plug West Cove Canal

CS-4A/PCS-57 CAMERON CREOLE OPERATION AND MAINTENANCE.

Location.

Cameron Parish about 6 miles north east of Cameron, La. The project is part of the Cameron-Creole Watershed management project. The area is bounded by Hwy. 27 on the east, the Cameron Chenier ridge to the south, the Calcasieu River and Calcasieu Lake to the west and the GIWW to the north (see Figures 6 and 29). The project will benefit about 12,065 acres of fresh to saline marsh within the management area.

Problems and Opportunities.

The Calcasieu Ship Channel has caused an increase of salt water and tidal amplitudes within the entire Calcasieu Lake system. This has caused increased marsh loss in the areas surrounding the lake. The Cameron-Creole Watershed Management Project consists of five control structures and a 19 mile levee along the eastern rim of Calcasieu Lake. This project was constructed in 1989 with the results have been reduced salinities and increased submergent and emergent vegetation within the 60,000 acre management area. Funding for maintenance was not included in the original construction costs.

The maintenance project will enable the Cameron-Creole Watershed Project to continue for another 20 years to provide for the management of water levels and reduction in water exchange rates and salinities. Any breach in the existing levee would quickly expand and the integrity of the entire project could be lost. The land loss rates could revert to the high rates experienced from 1974 to 1983.

Description of Features.

This "project" involves the establishment of a fund to provide for maintenance for the 60,000 acre Cameron-Creole Management Project completed in 1989 by the USDA Soil Conservation Service and sponsored by the Cameron Parish Police Jury. The principal goal of maintaining the existing project's ability to restore the marsh to its former hydrology prior to the construction of the Calcasieu Ship Channel.

The Cameron-Creole Watershed Management Project consists of five large concrete water control structures, two fixed crest weirs (No Name and Mangrove Bayou structures) and two variable crest weirs (Peconi and Lambert Bayou structures) and one flapgated structure with a boat bay (Grand Bayou) and a 19 mile levee 100 ft. wide at its base. The "project" consists of maintaining these structures for 20 years.

Benefits and Costs

The area contains 40,000 acres of fresh to saline marsh and 24,000 acres of open water for a total of 64,000 acres. The Cameron-Creole Maintenance project is projected to 2,602 acres of brackish marsh and stimulate the production of 4,814 acres of aquatic vegetation and enhance 3,266 acres of marsh for a total of 10,682 acres. The estimated project first cost is $2,895,000.

Effects and Issues.

This project will protect fresh to saline marsh and submerged vegetation east of Calcasieu Lake within the Cameron-Creole Watershed project for a total benefit to over 12,065 acres. The project will maintain the existing Cameron-Creole project with the goal of restoring area hydrology and marsh. Freshwater and estuarine resident fish species as well as wildlife will continue to be benefited by the maintenance project.

Status.

This project is presently listed on the Louisiana's state Coastal Wetlands Conservation and Restoration Program (State of La. 1991). It was chosen as a CWPPRA Priority List project for 1993. It is presently awaiting formal agreements between the state of Louisiana and the SCS prior to the expenditure of maintenance funds. PCS-22 is wholly contained within CS-4a/PCS-7. The operation of the Cameron-Creole Watershed Project was assisted greatly with the "structure automation project" funded by the USFWS and the state of Louisiana Coastal Wetlands Trust Fund in 1993. This project provides for the "automation" of the five large control structures so that manpower needs are not increased and so that the structure operation can be operated more quickly in response to physical conditions such as hurricanes or frontal passages. Presently, the structures are operated by the Cameron Prairie National Wildlife Refuge personnel assisted by Maimi Corporation personnel. The project area is being monitored by the USFWS with assistance from Miami Corp. and by the SCS (SCS 1993).

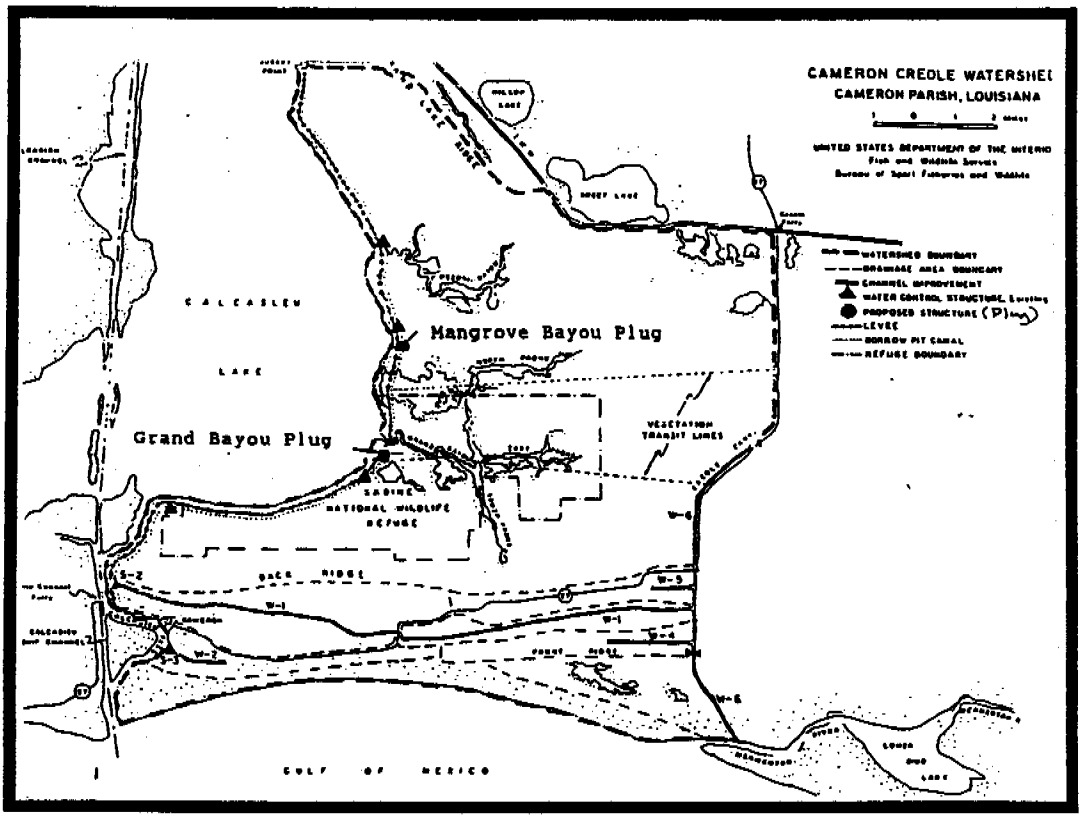

Figure 29. CS-4A/PCS-57 Cameron Creole Operation And Maintenance

CS-9 BROWN LAKE HYDROLOGIC RESTORATION

Location.

Cameron and Calcasieu Parishes east of Black Lake and about 3 miles north of Hackberry, La. The project boundaries include Hwy. 27 to the east, Portie Lake and oil and gas canal system to the south, the Alkali Ditch to the west and the GIWW to the north (see Figures 6 and 30). The project will benefit about 1,020 acres of brackish marsh.

Problems and Opportunities.

Hydrologic connections to the Calcasieu Ship Channel have caused major hydrologic changes to the area in the form of saltwater intrusion and tidal scour. This has caused a conversion of nearly 90% of the marsh to open water. This project will provide for the management of water levels and reduction in water exchange rates with the resulting reduction in salinity. Submerged aquatic vegetation will be stimulated to develop as a result of the management and the construction of terraces. The project will stabilize salinities and water depths and provide for partial revegetation of the area with both submerged and emergent vegetation.

Description of Features.

This is a marsh management project with the principal goals of restoring the area to its former hydrology prior to the construction of the Calcasieu Ship Channel and the Alkali Ditch. The following is the conceptual project plan.

Specific Project Components

1. Construct 11,460 ft. of levee on the east side of the Alkali Ditch.
2. Construct 400 ft. of levee to tie into the Alkali Ditch with the oil and gas canal system to the south of the project.
3. Install one 48" flapgated culvert and screw gate to introduce freshwater from the northwest.
4. Install two 48" diameter flapgated culverts.
5. Install 5 48" flapgated culverts with 12 ft. variable crest slotted weirs.
6. Rebuild 20,000 ft. of spoil banks along existing oil and gas canals.
7. Construct 24,000 ft. of terraces.

Benefits and Costs.

The area contains 419 acres of brackish marsh and 2,375 acres of open water for a total of 2,794 acres. The Browns Lake management project is projected to create 8 acres, protect 274 acres of brackish marsh and stimulate the production of 604 acres of aquatic vegetation and enhance 134 acres of marsh for a total benefit to 1,019 acres. The estimated project cost is $2,532,000.

Effects and Issues.

This project will create and protect brackish marsh and submerged vegetation east of Black Lake for a total benefit to over 1,019 acres. The project should reduce lake turbidity and reduce export of organic material to the Alkali Ditch and the GIWW. The

project will have to allow for some existing navigation into the Browns Lake area for oil and gas production and commercial and recreational fishing. The conceptual project plan includes structures with fisheries access modifications (i. e. slots) which should reduce impacts to estuarine migratory fisheries. Freshwater and estuarine resident fish species as well as wildlife will be benefited by the project.

Status.

This project is presently listed on the Louisiana's state Coastal Wetlands Conservation and Restoration Program (State of La. 1991). It was chosen as a CWPPRA Priority List project for 1992. It is presently in the design phase of development with 50% design review scheduled for November 1993.

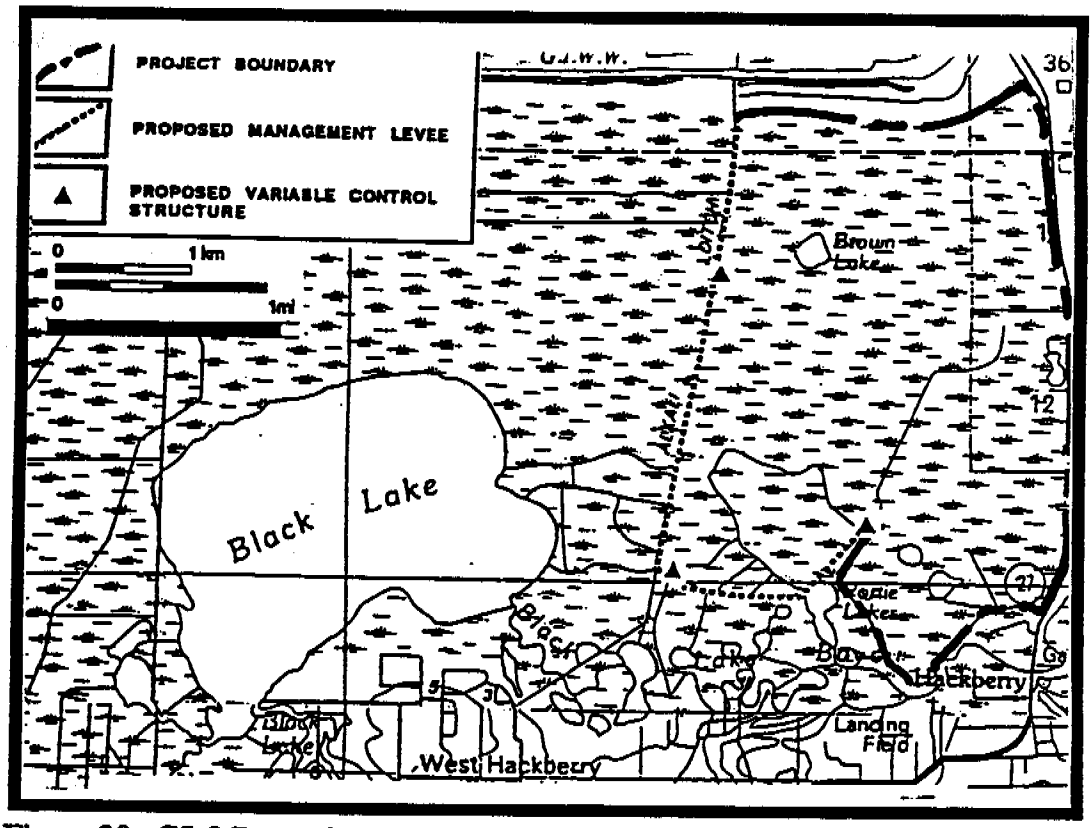

Figure 30. CS-9 Brown Lake Hydrologic Restoration

CS-1A PEVETO TO HOLLY BEACH SHORE PROTECTION

Location

The project area extends along 3.7 miles of Gulf of Mexico shoreline from the communities of Peveto to Holly Beach in Cameron Parish. The project area is bounded to the west by the beach canal, to the east by La. Hwy. 27, to the north by Starks South Canal, and to the south by the Gulf of Mexico (Figures 6 and 31). It is 11,747 acres in size.

Problems and Opportunities

This section of Cameron Parish chenier beach ridge shoreline has been eroding at an average of 4.0 m/yr. At the present nearly all of the beach fronting this project area has been eroded leaving La. Highway 82 as the only remaining barrier protecting more than 11,000 acres of brackish and intermediate wetland from direct wave attack and rapid destruction by intrusion of Gulf waters. Erosion is undermining some sections of the highway. If saltwater penetrates this marsh for an extended period of time an estimated 2,821 acres of intermediate marsh may be lost to open water. This project presents the opportunity of halting beach erosion in this area which will prevent saltwater intrusion and tidal scour from the Gulf from causing marsh loss to the marshes immediately north of the project. The project should also stimulate the accretion of sand on the beach which will add further protection from erosion in the future.

Description of Features

The objective of this project is to protect approximately 10,200 acres of coastal wetland from direct wave attack and or flooding by saline waters from the Gulf of Mexico and to rebuild the beach seaward of this wetland.

The only project features in this area call for the construction of 25 rock breakwaters of same design as the 55 which had been installed from Ocean View to Peveto Beach. The breakwaters are 150' in length, 10' wide at the crown, with 3:1 side slopes. The breakwaters will be placed 300 to 500' offshore in 4' of water on 300' centers. This project will being the total number of segmented breakwaters in the area to 80.

Benefits and Costs

The area contains 11,035 acres of brackish marshes and beach and 711 acres of open water for a total of 11,746 acres. The Peveto-Holly Beach Shoreline Protection project is expected to protect 2,723 acres of brackish marsh and stimulate the production of 483 acres of aquatic vegetation and enhance 683 acres of marsh for a total benefit to 3,890 acres. The rough estimated project cost is $7,280,000.

Effects and Issues

The project will protect wetlands in a 11,035 acre project area north of Hwy. 27. It will also stimulate the building of the barrier beach between the communities of Peveto and Holly Beach. This will have the added benefits to the protection of property infrastructure in the area namely the communities of Holly and Peveto Beach and La. Hwy. 27. The segmented breakwaters provide for enhanced recreational and commercial fisheries opportunities in the area by creating artificial reefs. The breakwaters will have

to be built so that they do not pose a hazard to navigation.

Status

This is a State Coastal Wetlands Conservation and Restoration Program project which is presently in the construction phase. It should be completed by the end of 1993. It was a candidate project for the 1992 CWPPRA Priority List.

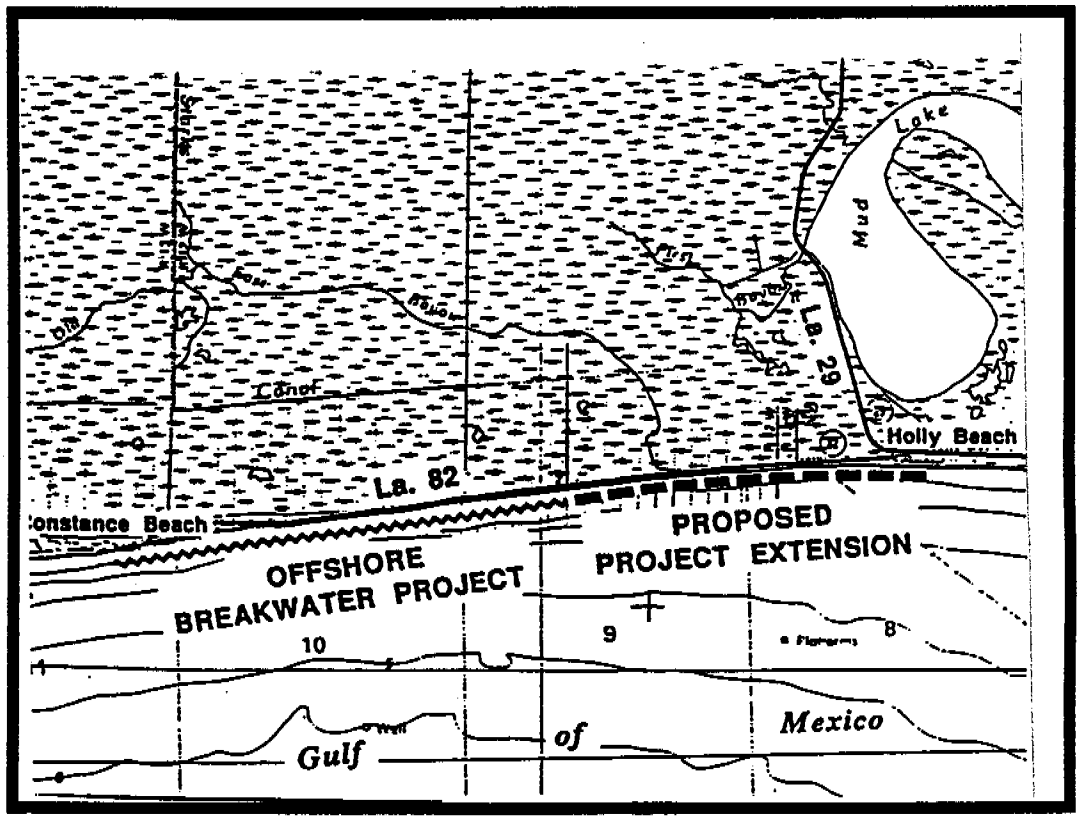

Figure 31. CS-1A Peveto To Holly Beach Shore Protection

CS-1C CONSTANCE BEACH TO OCEAN VIEW SHORE PROTECTION

Location

The project area extends along 3.2 miles (17,000 ft) of Gulf of Mexico shoreline from the communities of Constance Beach to Ocean View in Cameron Parish. The project area is bounded to the west by Ocean View, to the east by Constance Beach, to the north by La. Hwy. 82, and to the south by the Gulf of Mexico (Figures 6 and 32). It is 449 acres in size.

Problems and Opportunities

This section of Cameron Parish chenier beach ridge shoreline has been eroding at an average of 4.0 m/yr. La. Highway 82 as the only remaining barrier protecting the brackish and intermediate wetlands from direct wave attack and rapid destruction by intrusion of Gulf waters. This project is halting beach erosion in this area which will prevent saltwater intrusion and tidal scour from the Gulf from causing marsh loss to the marshes immediately north of the project. The project is also stimulating the accretion of sand on the beach which will add further protection from erosion in the future.

Description of Features

The objective of this project is to protect approximately 449 acres of coastal wetland from direct wave attack and or flooding by saline waters from the Gulf of Mexico and to rebuild the beach seaward of this wetland.

The project features consisted of the construction of segmented rock breakwaters. The breakwaters are 150'e length, 10' wide at the crown, with 3:1 side slopes. The breakwaters were placed 300 to 500' offshore in 4' of water on 300' centers.

Benefits and Costs

The area contains 407 acres of brackish and intermediate marshes and beach and 42 acres of open water for a total of 449 acres. The Constance Beach to Ocean View Shoreline Protection project is creating 22 acres and protecting 33 acres of brackish marsh and stimulate the production of 14 acres of aquatic vegetation and enhancing 30 acres of marsh for a total benefit to 99 acres. The project cost was approximately $5,900,000.

Effects and Issues

The project will protect wetlands in a 449 acre project area south of Hwy. 27 and hundreds of acres of brackish marsh north of the hwy. It will also stimulate the building of the barrier beach between the communities of Constance Beach and Ocean View. It will have the added benefits to the protection of property infrastructure in the communities and to La. Hwy. 27. The segmented breakwaters provide for enhanced recreational and commercial fisheries opportunities in the area by creating artificial reefs. The breakwaters were constructed so that they were not a hazard to navigation.

Status

This is a State Coastal Wetlands Conservation and Restoration Program project which was constructed in 1992.

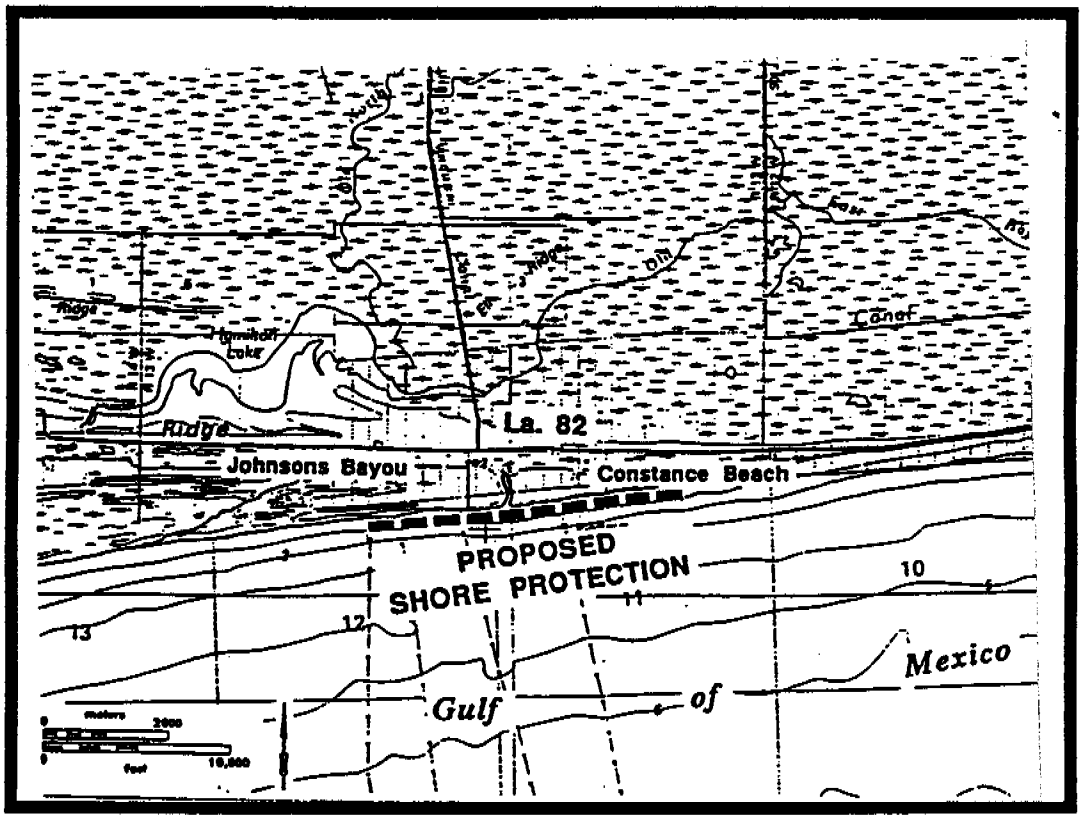

Figure 32. CS-1C Constance Beach To Ocean View Shore Protection

CS-11b SWEET LAKE/WILLOW LAKE SHORE PROTECTION

Location

Cameron Parish at the boundary between the GIWW and Sweet Willow Lakes, approximately 3.5 miles west of LA Hwy. 27 Gibstown bridge (see Figures 6 and 33). The project consists of 7,138 acres of open water and fresh marsh. Approximately 3.0 miles southwest from the town of Sweet Lake.

Problems and Opportunities

The northern shoreline of the GIWW has eroded into Sweet Lake for approx. 1.3 mile, and into Willow Lake for approx. 0.5 mile. Prevailing southerly winds push water northward across the lakes, holding water at higher than normal levels in the marshes north of these lakes, resulting in the loss of emergent marsh. Water exchange will be reduced by re-establishing the hydrologic boundary; the shoreline, between the GIWW and the two lakes. This will reduce turbidity in the lake waters, encouraging the re-growth of submerged aquatic plants. The vegetation will help reduce wave action, protecting the restored shoreline from further erosion. Water control structures will be installed at four locations on the north side of the lakes to allow for proper water management in the marshes north of the lakes, including drawdown capabilities needed to encourage re-growth of emergent marsh.

Description of Features

This is a shoreline protection and re-establishment project which restores the hydrologic boundary between the GIWW and Sweet and Willow Lakes with an 3.5 mile armor plated dike, dedicated spoil placement, vegetative plantings, sediment trapping wave dampening fences, and wetland management. Specific Project Components include:

Sweet Lake:

1. Construct approx. 2.7 mi. of rip rap breakwater between the GIWW and Sweet Lake to re-establish the shoreline between the lake and canal.
2. Deposit spoil material from maintenance dredging of the GIWW along the north side of the proposed breakwater to rebuild the shoreline
3. Transplant . 2,850 units of Giant Cutgrass north side of the breakwater.
4. Construct 8,000 linear feet of sediment fencing along an equal length of the northern and western shorelines of Sweet Lake.
5. Transplant approx. 1,600 units of Giant Cutgrass (*Zizaniopsis miliacea*) or Bulrush (either *Scirpus californicus* of *Scirpus validus*) along the northern and western shoreline of Sweet Lake adjacent to the proposed sediment fencing.

Willow Lake:

1. Construct . 0.8 mi. of rip rap breakwater between GIWW and Willow Lake.
2. Deposit spoil material from maintenance dredging of the GIWW along the north side of the proposed breakwater to rebuild the shoreline.
3. Transplant . 845 units of Giant Cutgrass along the north side of the breakwater.

Northern Wetlands:

1. Install three 42 inch culverts with flapgates one at each of three openings

leading into the northern marshes from the lakes. These structures will be operated so as to allow for maintenance of water levels in the northern marshes within a range suitable for the growth of emergent marsh vegetation and for periodic drawdowns in the northern marshes to encourage revegetation of shallow water areas with emergent marsh vegetation.

Benefits and Costs

The area contains 1,327 acres of fresh marsh, 5,811 acres of open water for a total of 7,138 acres. The Sweet/Willow Lake shoreline and marsh restoration project is expected to protect 294 acres of fresh marsh and stimulate the production of 3,951 acres of aquatic vegetation and enhance 231 acres of marsh for a total benefit to 4,477 acres. The rough estimated project cost is $2,262,000.

Effects and Issues

The project should reduce shoreline erosion, marsh loss, lake turbidity and the export of organic material to the GIWW. The project will have to allow for navigation to the Sweet Lake and Willow Lake areas due to oil platforms and commercial and recreational fishing in the lakes.

Status

This project is presently listed on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It was a CWPPRA candidate project for 1993. It is in the conceptual phase of development.

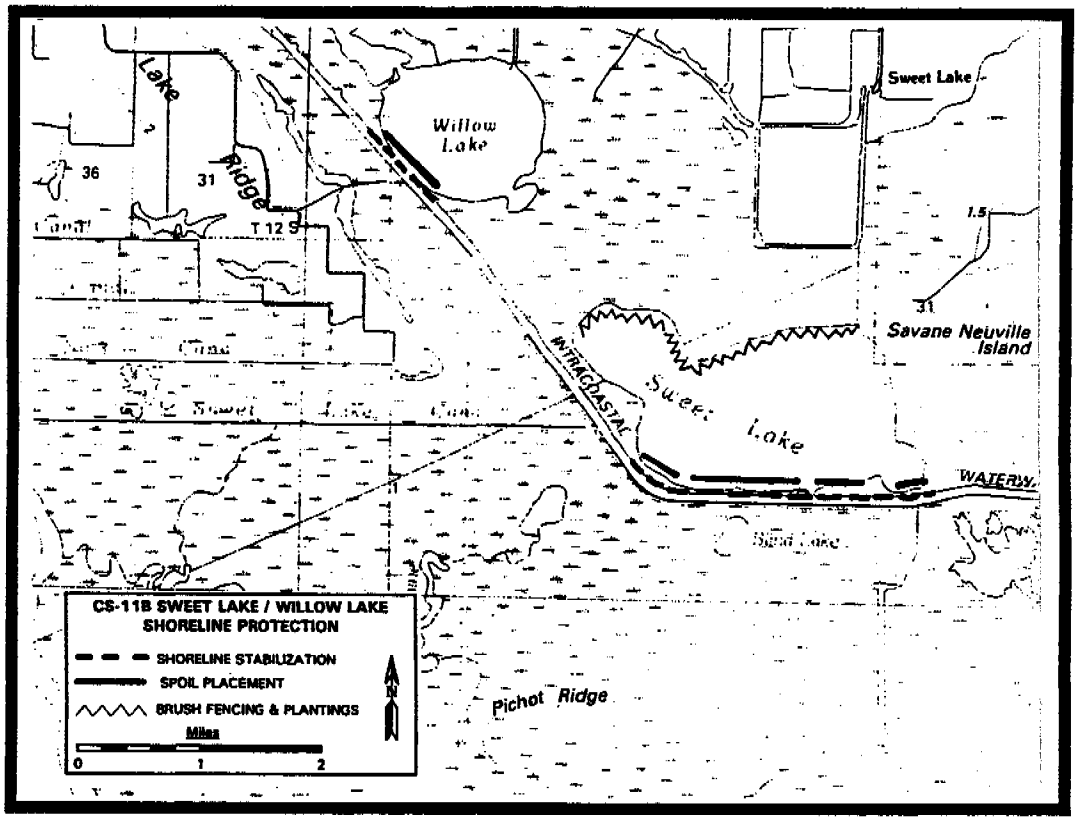

Figure 33. CS-11b Sweet Lake/Willow Lake Shore Protection

FCS-18. SABINE POOL THREE UNIT LEVEE REPAIR

Location

The project is located in Cameron Parish on the border of "Pool 3" within the Sabine National Wildlife Refuge. The project is bounded by the Beach Canal to the east, the Central Canal to the south, the Burton-Sutton Canal to the west and the Starks/North Canal to the north. It is located about ten miles northwest from Holly Beach, La. (see Figures 6 and 34). The project may benefit a total of 8,985 acres of fresh marsh.

Problems and Opportunities

The existing "Pool 3" impoundment contains approximately 13,000 acres of fresh marsh which are surrounded by intermediate and brackish marshes. The existing impoundment levee was constructed in 1951. Many portions of this levee have deteriorated due to erosion and sloughing of the levee material into the Burton-Sutton Canal. Continued erosion will result in multiple levee breaches which would cause saltwater intrusion and tidal scour to enter the freshwater impoundment. This would cause the fresh marshes within the impoundment to deteriorate to open water or to more saline marsh types less favorable to wildlife and waterfowl. This project will benefit about 8,985 acres of fresh marshes.

Description of Features.

This is a shoreline protection project which consists of repairing breaks in the Pool 3 levee along the 5.5 mile Burton-Sutton Canal. The eroded levee would be restored to 6 ft. high and 8 ft. crown at the top. Rip-rap and vegetation (oyster grass, *Spartina alterniflora*) would also be placed along the levee for erosion control.

Benefits and Costs.

The "Pool 3" Impoundment of the Sabine National Wildlife Refuge (SNWR) contains about 26,000 acres of fresh marsh. The Sabine Pool 3 Levee Project will protect approximately 5,542 acres and enhance another 3,443 acres of fresh marsh for a total benefit to 8,985 acres. The estimated project cost is $4,484,000.

Effects and Issues.

This project will protect or enhance about 8,985 acres of fresh marsh within the 26,000 acre Pool 3 Impoundment of the Sabine National Wildlife Refuge. The project will repair breaches in the western levee near the Burton-Sutton Canal. This will reduce the threat of saltwater intrusion and tidal scour which would adversely impact the fresh marshes within the impoundment. Fresh marsh fish and wildlife will be benefited by the project. The levee repair is designed with rip-rap and vegetation plantings to reduce future erosion.

Status

This project was selected as Priority Project for the 1991 CWPPRA List submitted to Congress in November of 1991. The project is sponsored by the USFWS and the state

of Louisiana and is presently in the design phase of development. Recent surveys have indicated that the amount of levee repair may be less than had originally projected.

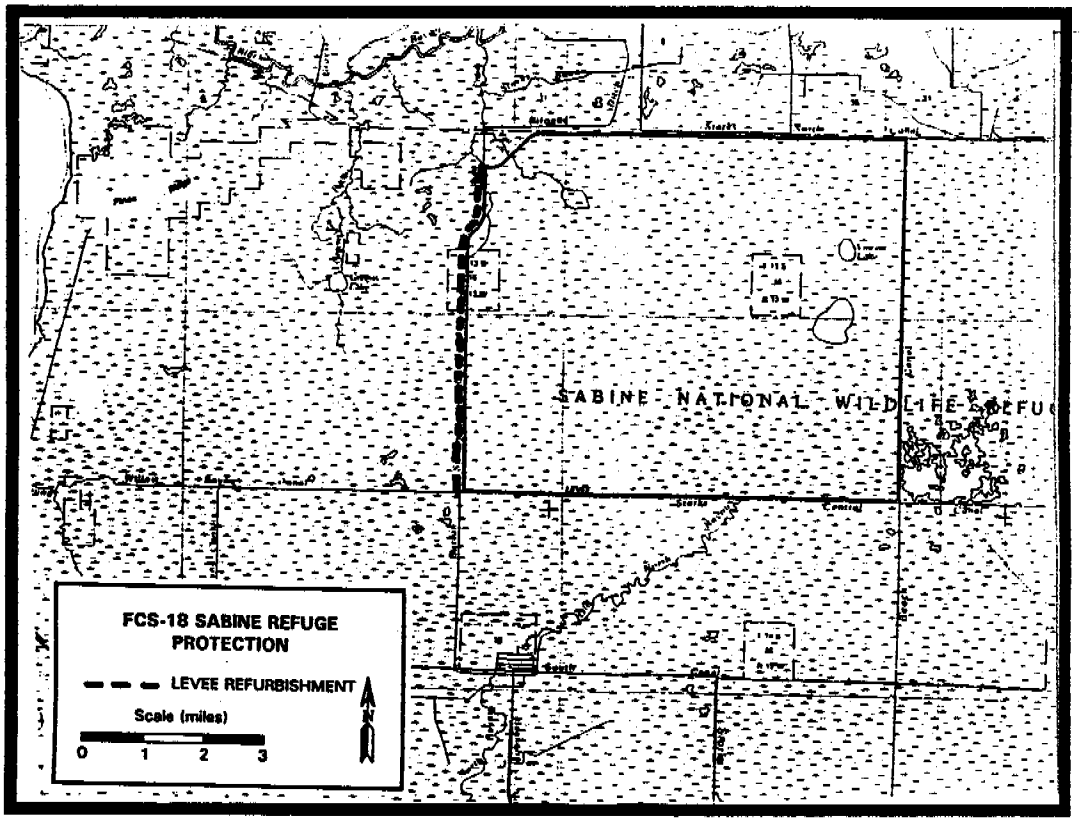

Figure 34. FCS-18 Sabine Pool Three Unit Levee Repair

PCS-01 EROSION PROTECTION ALONG THE GIWW

Location

The project is located in Calcasieu Parish along the banks of the GIWW from the Calcasieu River to the Sabine River along the northern portion of the SCS Calcasieu-Sabine River Basin Study area. The project is bounded by the Calcasieu River to the east, the southern spoil bank of the GIWW to the south, the Sabine River to the west and the northern spoil bank of the GIWW to the north. The central portion of the project is located about 10 miles northwest from Hackberry, La (see Figures 6 and 35). The project may benefit a total of 1,642 acres of fresh to intermediate marshes.

Problems and Opportunities

The Calcasieu and the Sabine River Ship Channels have caused major hydrologic changes to the area in the form of saltwater intrusion and tidal scour to the marshes located between Calcasieu and Sabine Lakes. This has caused a conversion of marshes to open water and a transformation of fresher marshes to more saline marsh types. Boat traffic along the GIWW has caused additional erosion along the banks of the waterway. This project will provide for shoreline protection along the nearly 50 miles of GIWW spoil bank between these two lakes. Submerged aquatic vegetation and existing fresh and intermediate marsh will be protected from saltwater intrusion and tidal scour caused when the GIWW spoil banks erode into sensitive areas.

Description of Features.

This is a shoreline stabilization project which consists of placing rip- rap along the northern and southern banks of the GIWW in "sensitive" areas along the 50 mile area between the Calcasieu and Sabine Rivers. The project will be similar to the Clear Marais (PCS-27) and Perry Ridge (PCS-26) projects described in this report.

Benefits and Costs.

The area contains 1,542 acres of fresh to brackish marshes and 100 acres of open water for a total of 1,642 acres along the GIWW project route. The GIWW shoreline protection project is projected to protect 1,542 acres of fresh to brackish marsh and stimulate the production of 68 acres of aquatic vegetation and enhance 3 acres of marsh for a total benefit to 1,613acres. The estimated project cost is $20,000,000.

Effects and Issues.

This project will protect fresh to brackish marshes and submerged vegetation along the GIWW from Calcasieu Lake to Sabine Lake for a total benefit to over 1,661 acres. The project should reduce GIWW spoil bank erosion and in turn protect marshes behind these spoil banks from tidal scour and salt water intrusion by preventing break-throughs in the spoil bank. This will reduce the export of organic material from the marshes to the GIWW. The project will have to allow for some existing navigation into oil and gas production areas and commercial and recreational fishing areas. Freshwater and estuarine resident fish species as well as wildlife will be benefited by the project.

Status.

This project is presently listed in the Calcasieu-Sabine Basin plan as a short term critical project. A component project, Clear Marais Shore Protection (PCS-27), was chosen for funding in the 1993 Priority Project List.

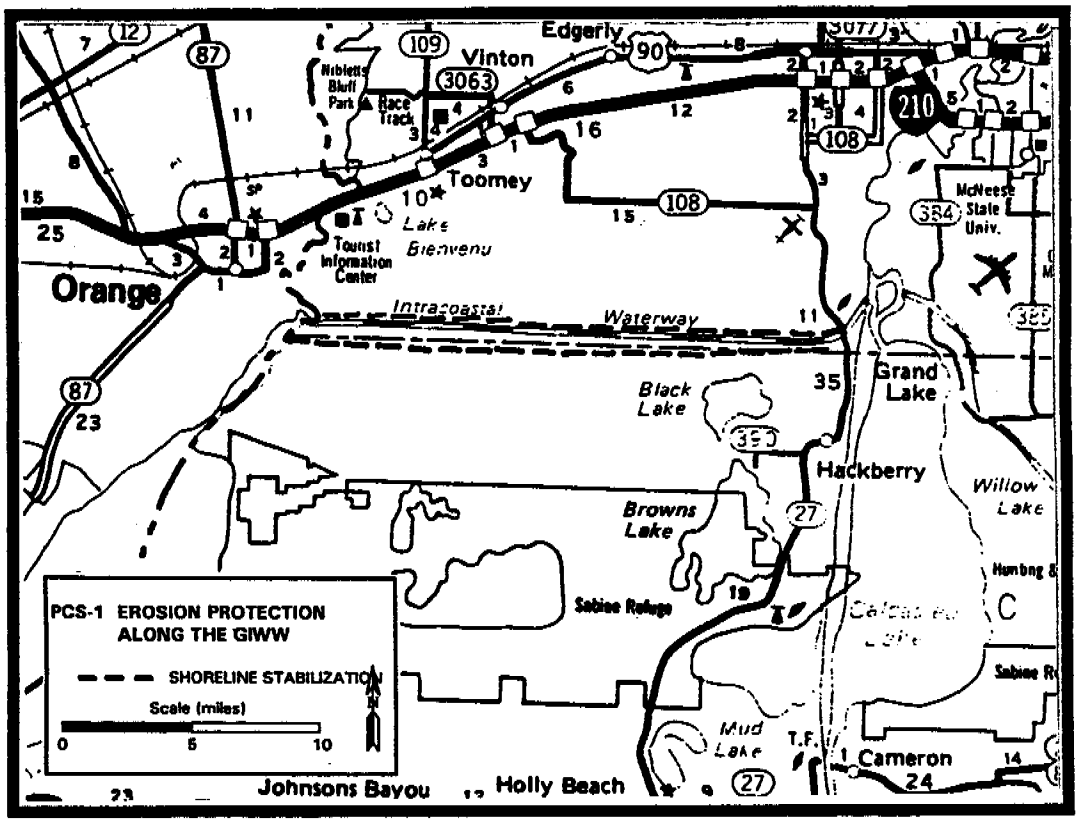

Figure 35. PCS-01 Erosion Protection Along the GIWW

PCS-26 PERRY RIDGE SHORELINE PROTECTION

Location

The project is located in Calcasieu Parish north of the GIWW about six miles east of the Sabine River and thirty (30) miles northwest from Hackberry, La. The project is bounded by the Gulf Intracoastal Waterway to the south and Perry Ridge to the north (Figures 6 and 36). The project may benefit 658 acres of fresh marshes.

Problems and Opportunities

Marsh loss in the vicinity of Perry Ridge has been caused by saltwater intrusion, tidal scour and water level fluctuations from the GIWW as the result of breaches in the GIWW's northern spoil bank. Salinities and water currents in the GIWW have increased as the result of the construction of the Calcasieu Ship Channel, the deepening of Sabine Pass, and the removal of the bar at the mouth of the Calcasieu River. This has resulted in the destruction of fresh marshes in the area. Additional breaks along the GIWW northern shoreline will increase these marsh destruction processes. This shoreline protection project has the goal of reducing saltwater intrusion and tidal scour in the area by maintaining the GIWW spoil bank which forms the area's southern boundary. This project will benefit Perry Ridge fresh marshes by restoring the spoil bank and preventing saltwater intrusion and increased tidal currents.

Description of Features.

The project features consist of the installation of repairing about 10 miles of the northern spoil bank/levee of the GIWW in the vicinity of Perry Ridge with rip-rap limestone similar to PCS-1 and the Clear Marais Project (PCS-27).

Benefits and Costs.

Approximately 109 acres of fresh marsh and 522 acres of submerged aquatic vegetation will be protected and another 26 acres will be benefited by the project for a total benefit to 658 acres of fresh marsh and aquatic vegetation. The estimated project cost is $3,886,000.

Effects and Issues.

This project will protect and benefit about 658 acres of fresh marsh and aquatic vegetation in the vicinity of Perry Ridge north of the GIWW. Fresh marsh fish and wildlife, especially waterfowl, will benefit from the project by the reduction of saltwater intrusion and water level fluctuations caused by breaches in the GIWW spoil bank. The project should be designed so as to provide for any existing navigation and should not interfere with navigation in the GIWW.

Status.

This project is presently listed as a short term critical project in the Calcasieu-Sabine Basin Plan.

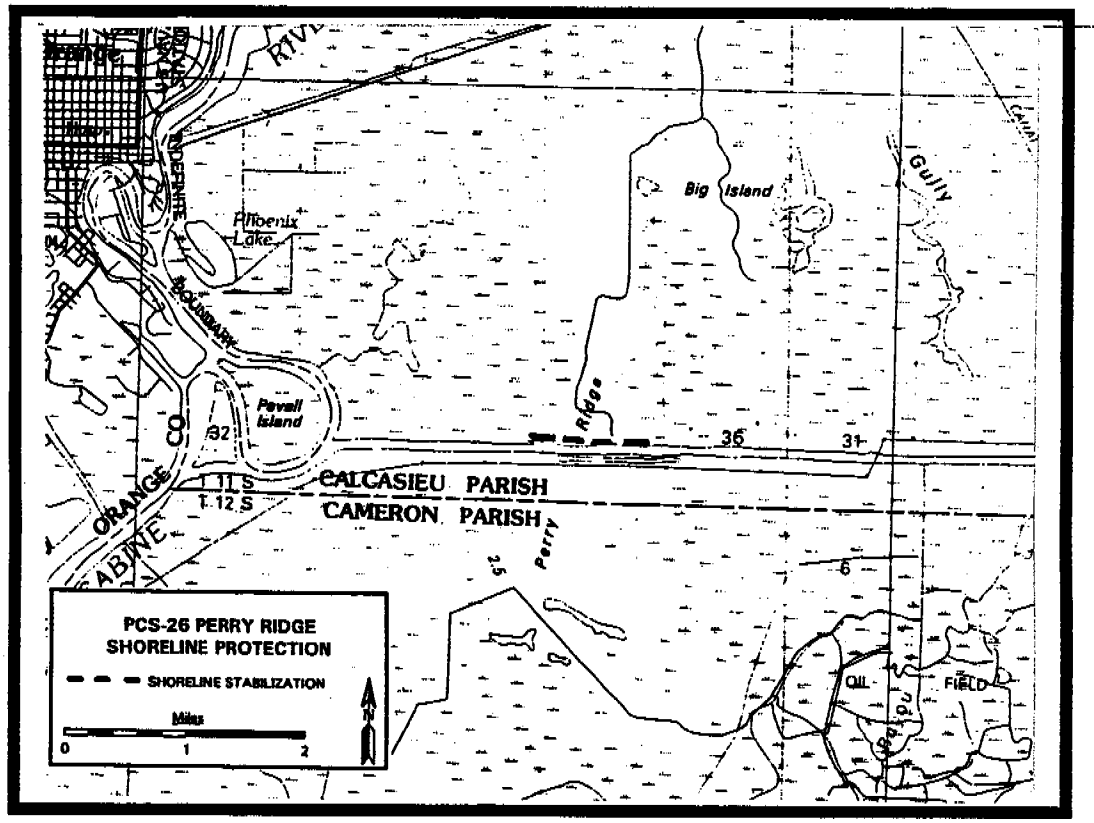

Figure 36. PCS-26 Perry Ridge Shoreline Protection

PCS-27 CLEAR MARAIS

Location

The project is located in Calcasieu Parish north of the GIWW about 10 miles northwest from Hackberry, La. The project is bounded by the Gulf Intracoastal Waterway to the south, Clear Marais to the north and a levee along Section 25 to the east (see Figures 6 and 37). The project may benefit a total of 2,966 acres of fresh marshes.

Problems and Opportunities

Marsh loss in the vicinity of Clear Marais has been caused by saltwater intrusion and tidal scour from the GIWW as the result of breaches in the northern spoil bank. Salinities and water currents in the GIWW have increased as the result of the construction of the Calcasieu Ship Channel and the removal of the bar at the mouth of the Calcasieu River. This has resulted in the destruction of fresh marshes in the area. Additional breaks along the GIWW northern shoreline will increase these marsh destruction processes. This shoreline protection project has the goal of reducing saltwater intrusion and tidal scour in the area by maintaining the GIWW spoil bank which forms the area's southern boundary. This project will benefit Clear Marais fresh marshes by restoring the spoil bank and preventing saltwater intrusion and increased tidal currents.

Description of Features.

The project features consist of the installation of four miles of rip-rap levee/spoil bank shoreline protection, using 38,500 tons of limestone, along the northern portion of the GIWW.

Benefits and Costs.

Approximately 1,067 acres of fresh marsh and 1,754 acres of submerged aquatic vegetation will be protected and another 145 acres will be benefited by the project for a total benefit to 2,966 acres of fresh marsh and aquatic vegetation. The estimated project cost is $1,521,000.

Effects and Issues.

This project will protect and benefit about 2,966 acres of fresh marsh and aquatic vegetation in the vicinity of Clear Marais north of the GIWW. Fresh marsh fish and wildlife, especially waterfowl, will benefit from the project by the reduction of saltwater intrusion and water level fluctuations caused by breaches in the GIWW spoil bank. The project should be designed so as to provide for any existing navigation and should not interfere with navigation in the GIWW.

Status.

This project was selected as Priority Project for the 1992 CWPPRA List submitted to Congress in November of 1992. The project is sponsored by the USDA Soil Conservation Service and the state of Louisiana and is presently in the preliminary design phase of development. The project is projected for construction in 1995.

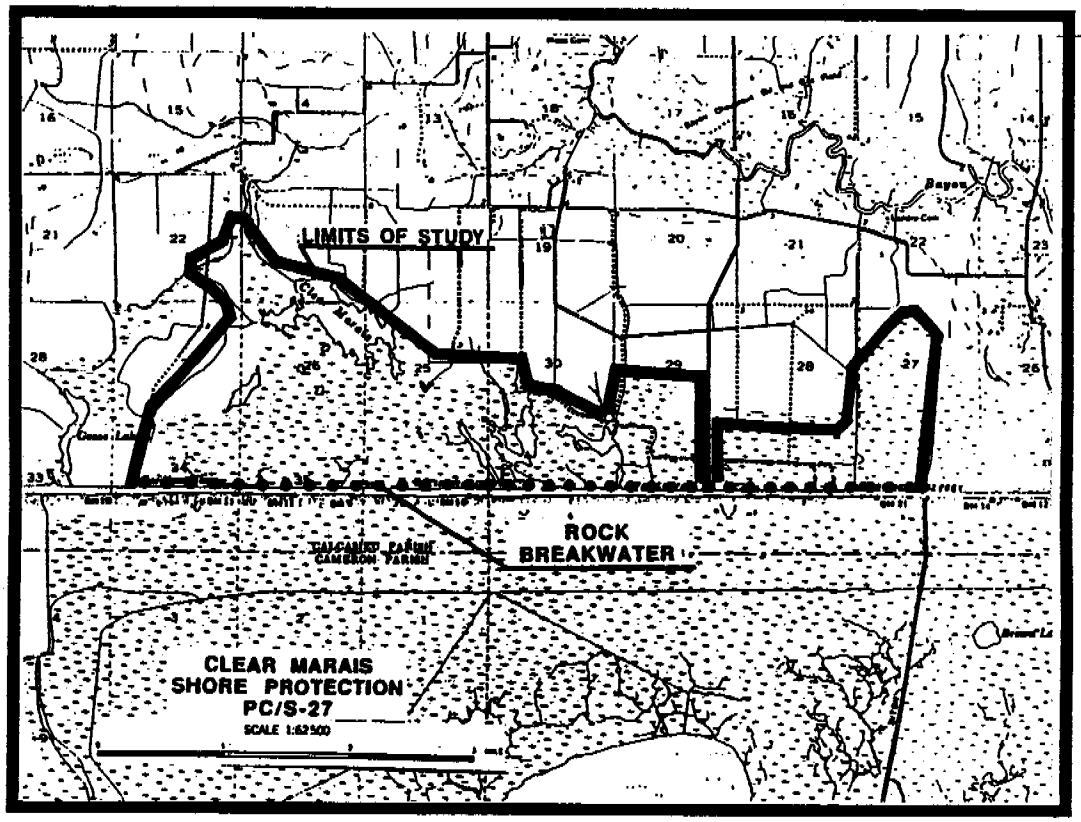

Figure 37. PCS-27 Clear Marais

XCS-42 GIWW SPOIL BANK MAINTENANCE

Location.

Cameron and Calcasieu Parishes north and south banks of the GIWW east of its intersection with the Calcasieu Ship Channel to La. Hwy. 27, between the Calcasieu River and Gibbstown, La. (see Figures 6 and 38). The project area consists of 2,442 acres of open water and fresh marsh.

Problems and Opportunities.

The northern and southern shorelines of the GIWW in this region has eroded into the adjacent fresh marshes in some areas in addition to Willow and Sweet Lakes. This erosion has caused marsh loss, submerged aquatic vegetation loss and turbidity in the lake areas. Water exchange, between the GIWW and adjacent marshes and lakes, will be reduced by re-establishing the hydrologic boundary; the shoreline, between these areas and the GIWW. Turbidity will be reduced in the lake waters, encouraging the re-growth of submerged aquatic plants. This vegetation will help reduce wind induced wave action, protecting the restored shoreline from further erosion from within the lakes.

Description of Features.

Repair eroding spoil banks east of Calcasieu Lake in the region between the Calcasieu River and Gibbstown and La. Hwy. 27. The project differs from the Sweet and Willow Lake shoreline stabilization projects (CS-11b, XCS-41) in that this project use spoil to repair smaller breaks in the GIWW spoil bank and not the rip-rap and spoil planned for the other projects.

Benefits and Costs.

The area contains 1,526 acres of fresh marsh and 916 acres of open water for a total of 2,442 acres. The GIWW shoreline protection project is expected to protect 814 acres of fresh marsh and stimulate the production of 623 acres of aquatic vegetation and enhance 80 acres of marsh for a total benefit to 1,517 acres. The rough estimated project cost is $294,500.

Effects and Issues.

The project will protect fresh water wetlands along the GIWW shoreline, from the Calcasieu River to Hwy. 27 at Gibbstown, for a total benefit to approximately 1,517 acres. The project should reduce shoreline erosion, marsh loss, lake turbidity and the export of organic material to the GIWW. The project will have to allow for existing navigation.

Status

This project is presently listed as a short term critical project in the Calcasieu-Sabine Basin Plan for the CWPPRA. It is an integral part of the preferred "Perimeter Plan" basin restoration strategy. The Sweet Lake/Willow Lake shoreline protection projects (CS-11, CS-11a, CS-11b, and XCS-41) are related to this project.

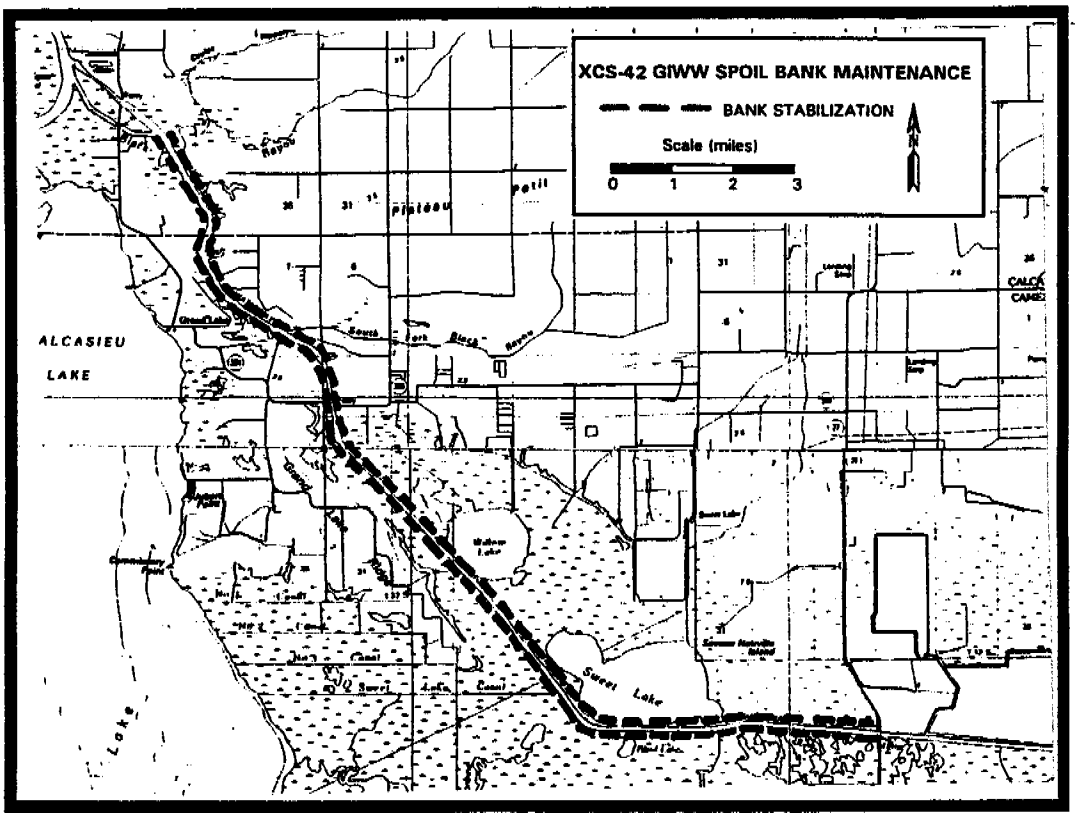

Figure 38. XCS-42 GIWW Spoil Bank Maintenance

XCS-48A REPAIR SPOIL BANK OF GIWW ACROSS FROM VINTON DRAINAGE CANAL

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 7) on the south shore of the GIWW adjacent to the Vinton Drainage Canal.

Problems and Opportunities

This area has suffered loss of most of the historic fresh marsh between 1968 and 1984. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be actively managed for intermediate emergent marsh. The project plans include closing breaches along the GIWW to reduce water exchange and salinity spikes.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will protect 7 acres and benefit another 66 acres. The estimated project cost is $357,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. It is a component of XCS-48 (NO-13) Northwest Gum Cove Active Management. A feasibility study is required and it may be a candidate for future priority lists.

SUPPORTING SHORT TERM PROJECTS

CS-4B CAMERON-CREOLE FRESHWATER INTRODUCTION AND OUTFALL MANAGEMENT

Location

The Cameron-Creole freshwater introduction project is located in 2,136 acre fresh marsh area in the northeastern section of the Cameron-Creole Watershed Project in Cameron Parish. It is located at the intersection of La. Hwy. 27 and the GIWW immediately southwest of the Gibbstown Bridge. The area is bounded bye the GIWW to the north, the Hebert-Precht Canal to the west, Boudreaux Lake tot he south and La. Hwy. 27 to the east (Figures 6 and 29).

Problems and Opportunities

The marshes in the Cameron-Creole Watershed have experienced land loss in the past especially from the period of 1956 to 1978 due to saltwater intrusion and tidal scour caused by the construction of the Calcasieu Ship Channel. The Cameron-Creole Watershed Project was completed in 1989 by the USDA Soil Conservation Service and Cameron Parish to stop this land loss. This freshwater diversion project is an opportunity to build on the existing marsh management project to provide for additional freshwater and nutrients and some light sediments to enter the area from the northeast. This freshwater should further reduce saltwater intrusion and stimulate the marshes by adding nutrients from the GIWW.

Description of Features

Freshwater will be diverted from the GIWW into the northeastern corner of the Cameron Creole Wetlands area through several water control structures, three of which have already been installed by the Miami Corp.

Project Components:

1. Clean out an existing channel along the west side of LA Hwy. 27 from the GIWW southward to final dimensions of 700 ft long x 14 ft wide x 4 ft deep.
2. Construct a 4 ft. high spoil bank with a base width of 30 ft and crown width of 10 ft along the west side and across the south end of the channel.
3. Install a hyacinth guard across the channel at the GIWW.
4. Install two 36 inch diameter culverts in the spoil bank across the south end of the proposed channel with flapgates on the marsh side and screwgates on the GIWW side of the culverts.

Benefits and Costs

The area contains 487 acres of fresh to intermediate marshes and 1,649 acres of open water for a total of 18,700 acres. The Cameron-Creole Freshwater Introduction project is expected to protect 132 acres of fresh to brackish marsh and stimulate the production of 214 acres of aquatic vegetation and enhance 54 acres of marsh for a total benefit to 400 acres. The rough estimated project cost is $1,018,000.

Effects and Issues

The project will help the Cameron-Creole Watershed marsh management project protect and enhance fresh an d intermediate marsh in the 2,136 acre project area and beyond to impact the entire 60,000 acre watershed. The project will add freshwater, nutrients and some sediment which will reduce saltwater intrusion and increase marsh plant productivity. The project as well as other freshwater diversions into the Cameron-Creole watershed area will have to be operated according to the watershed water control operation plan so that it doe not impede the operation of the plan nor increase water levels above the target levels of the plan.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project. The project is presently in feasibility and permitting with the state restoration program. The landowner, Miami Corp., has installed at least three freshwater diversion structures in the area.

CS-5A SABINE FRESHWATER INTRODUCTION FROM GIWW (ALTERNATIVE 2)

This project description is also found with CS-5a/12 described earlier.

Location

The project area comprises from 5,000 to 10,000 acres of fresh/intermediate to brackish marshes, riparian hardwood forests, and small intermixed prairie areas south of the GIWW between the Sabine River, Gum Cove Ridge, and Black Bayou, about 18 miles west-northwest of Hackberry in northwestern Cameron Parish (Figures 6 and 8).

Problems and Opportunities

Wetlands in the Black Bayou area have suffered a loss of approximately 33% of the project area from 1956 to 1990 resulting from hydrological changes. These changes included; reduced freshwater inflow, increased magnitude and duration of tidal fluctuations, increased salinities, higher water levels, excessive water exchange, and artificial water circulation patterns. The objectives of the project are to divert freshwater from the GIWW near its confluence with the Vinton Drainage Canal into the wetlands south of the GIWW.

Description of Features

Freshwater introduction structures to bring freshwater into the area from the GIWW are recommended for this project and no outfall management structures (see CS-5A/12 and CS-12 descriptions above and Alternative 5 in the DNR/CRD-Crowley feasibility report for Project C/S-5A). Various freshwater introduction and retention structures are proposed for CS-5a which would divert water from the GIWW to the marshes north of the Black Bayou Oil Field (See the description for CS-5a/12).

Related Projects.

The project differs from CS-5A/12 and CS-12 in that additional freshwater is diverted from the Sabine River and the Vinton Drainage Canal to the GIWW to the Black Bayou Cutoff Canal to marshes in units 11, 16 and 17 north of and surrounding the Black Bayou Oil Field and no outfall management within the Black Bayou watershed is planned. These project is an integral part of CS-5a/12 and CS-12. This project differs from CS-12 in that CS-12 is the outfall management plan for CS-5a. CS-5a differs from CS-5b in the source and route of freshwater introduction. In CS-5a the source of freshwater is the GIWW and in CS-5b the source is the Sabine River through the Sabine River Diversion Canal to the Vinton Drainage Ditch.

Benefits and Costs

The entire Bayou Black area contains 19,600 acres of fresh, intermediate and brackish marshes and 8,400 acres of open water for a total of 28,000 acres. The Sabine Freshwater Introduction from the GIWW project is expected to protect 376 acres of fresh to brackish marsh and stimulate the production of 2,688 acres of aquatic vegetation and enhance 1,247 acres of marsh for a total benefit to 4,311 acres. The rough estimated project cost is $2,228,000.

Effects and Issues

The project will conserve and protect wetlands in the northern Black Bayou area of the northwestern portion of the Calcasieu/Sabine basin for a total benefit to 4,311 acres. The project should reduce marsh loss due to saltwater intrusion caused by connections of Black Bayou to the GIWW to the north. The project structures will have to be designed to allow for navigation.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It presently is in the conceptual phase of development. A feasibility report has been prepared by the La. DNR Coastal Restoration Division for part of this project as it relates to CS-5a. This project is an integral part of CS-5a/12 and readers are referred to this project description. It is unlikely that any of the freshwater introduction components of CS-5a will be completed without the outfall management components of CS 5a/12 and/or CS-12.

CS-13 BACK RIDGE FRESHWATER INTRODUCTION

Location

Back Ridge Chenier is located about 2 miles north of La Hwy. 27 on the south edge of Cameron-Creole Watershed Project, about 3 miles south from Lambert's Lake, 3.5 miles due south from the mouth of Grand Bayou and its intersection with Calcasieu Lake, and about 8 miles east-northeast of Cameron, Louisiana in Cameron Parish (Figures 6 and 39)

Problems and Opportunities

Brackish marshes to the north of Back Ridge have been impacted by saltwater intrusion via Calcasieu Lake. The project objective is to introduce freshwater from Back Ridge Chenier into the Cameron-Creole Wetlands to reduce salinities in the high brackish marsh north of the ridge and to introduce nutrients and sediments through outfall management. This project provides the opportunity to use forced drainage water and nutrients to reduce saltwater intrusion and to stimulate marsh production while serving as a place to dispose of flood waters. Both the community in the northeastern section of Cameron and the marsh benefit.

Description of Features

Outfall from a planned pumping station will be directed into these marshes to build a freshwater head to help reduce saltwater intrusion and lower salinity levels.

Project Components:

1. Install a pumping station in a drainage canal with discharge pipes going into the marsh.
2. Construct a 10' x 10' x 4' catchment pond adjacent to the pumping station in the marsh to receive the outfall from the discharge pipes.

Benefits and Costs

The immediate project area contains 377 acres of fresh to intermediate marshes and 110 acres of open water for a total of 487 acres. The Back Ridge Freshwater Introduction project is expected to protect 2 acres of fresh to brackish marsh and stimulate the production of 11 acres of aquatic vegetation and enhance 14 acres of marsh for a total benefit to 27 acres. The rough estimated project cost is $1,425,000.

Effects and Issues

The project will help the Cameron-Creole Watershed marsh management project protect and enhance brackish and saline marsh in the 487 acre project area and beyond to impact portions of the entire 60,000 acre watershed. The project will add freshwater, nutrients and some sediment which will reduce saltwater intrusion and increase marsh plant productivity. The project as well as other freshwater diversions into the Cameron-Creole watershed area will have to be operated according to the watershed water control operation plans that it does not increase water levels above the target levels of the plan especially in the southern plan area.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

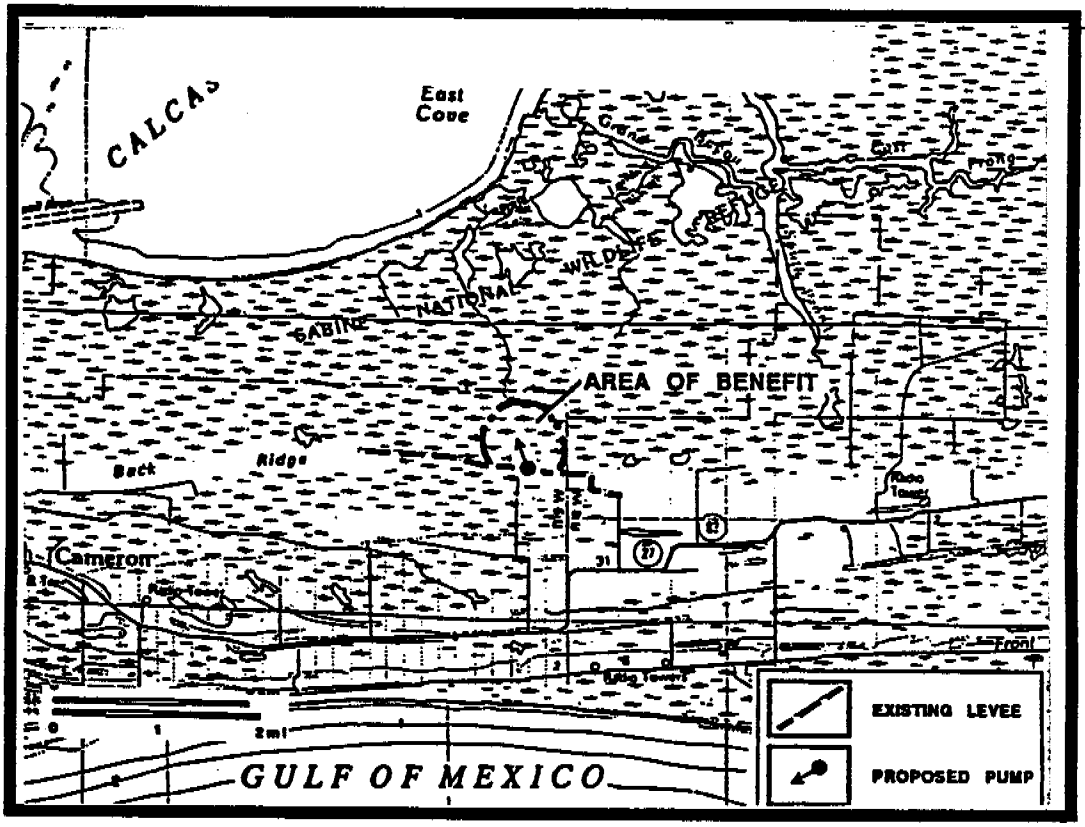

Figure 39. CS-13 Back Ridge Freshwater Introduction

XCS-48B INTRODUCE FRESHWATER FROM THE GIWW

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 22). It is bordered by Unit NO-17 on the north, Black Bayou on the south, and a natural ridge and cattle walkway on the west. The project area is comprised of 4,422 acres of prairie, intermediate and brackish marsh, and open water.

Problems and Opportunities

This area has suffered conversion of much of the historic intermediate marsh to open water between 1956 and 1978. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by introducing additional freshwater from the GIWW via the Black Bayou Cutoff Canal. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This project calls for the installation of a flapgated culvert type structure through an existing cattle walkway between Units NO-18 and NO-19 to allow freshwater into the hydrologic unit when tidal and salinity conditions permit.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $778,000.

Effects and Issues

Freshwater introduction into this area will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is interactive with project (CS-12) Black Bayou Hydrologic Restoration and a component of XCS-48 (NO-18) Southeast Black Bayou Area. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

PCS-12/18 OYSTER BAYOU AND MUD BAYOU STRUCTURES

Location

The project is located in Cameron Parish at the mouths of Oyster and Mud Bayous located about ten miles northeast from Holly Beach, La. The project area is bounded to the south by Oyster Lake, to the west by Mud Lake and Mud Pass, to the north by West Cove of Calcasieu Lake and to the east by the Calcasieu River and Hwy. 82 (see Figures 6 and 40). The project may benefit a total of 1,348 acres of brackish and saline marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations caused by the Calcasieu Ship Channel and the removal of the sand bar at the mouth of the Calcasieu River. This has resulted in the conversion of area brackish marshes to saline marshes and open water. Canals connecting existing marshes to the West Cove area of Calcasieu Lake have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of weirs at the mouths of Oyster and Mud Bayous.

Description of Features.

The project features consist of the placement of weirs at the mouths of Mud and Oyster Bayous south of West Cove of Calcasieu Lake. The purpose is to reduce saltwater intrusion and water level fluctuations into the brackish and saline marshes to the south and east surrounding Oyster Lake.

Benefits and Costs.

Approximately 631 acres of brackish and saline marshes and 390 acres of aquatic vegetation will be protected and another 327 acres will be enhanced by the project for a total benefit to 1,348 acres. The estimated project cost is $2,271,000.

Effects and Issues.

This project will protect and benefit about 1,348 acres of brackish and saline marshes by reducing saltwater intrusion and water level fluctuations. Brackish and saline marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for existing navigation and estuarine migratory fisheries access to the area.

Status.

This project is a short term supporting project in the Calcasieu-Sabine Basin Plan. It supports the preferred "Perimeter Plan."

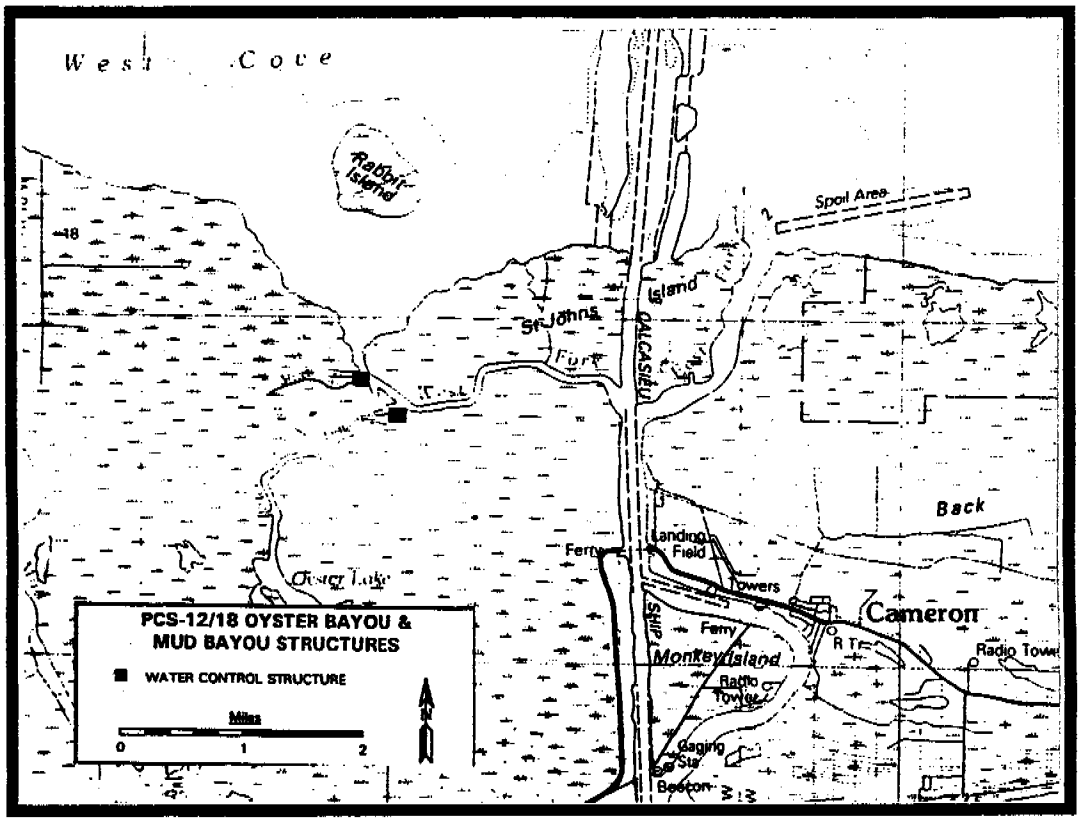

Figure 40. PCS-12/18 Oyster Bayou And Mud Bayou Structures

PCS-21 MOSS LAKE HYDROLOGIC RESTORATION

Location

The project is located in Calcasieu Parish along the west bank of the Calcasieu River about five miles south from Sulphur, La. and about 10 miles southwest from Lake Charles, La. in the vicinity of Moss Lake. The project is bounded by the Calcasieu River (and Calcasieu Ship Channel) to the east and the marshes west of the river to the west (see Figures 6 and 16). This shoreline erosion prevention project may benefit a total of 92 acres of brackish marshes.

Problems and Opportunities

The Calcasieu River Ship Channel (CSC) has caused major hydrologic changes to the area in the form of saltwater intrusion. water level fluctuations and tidal scour to the marshes surrounding Calcasieu Lake. This has caused a conversion of marshes to open water and a transformation of fresher marshes to more saline marsh types. Boat traffic along the CSC has caused additional erosion along the banks of the waterway. This project will provide for shoreline protection along nearly one mile of the west bank of the river in the vicinity of Moss Lake.

Description of Features.

This is a shoreline stabilization project which consists of placing limestone rock rip-rap along the western bank of the Calcasieu River in the vicinity of Moss Lake for a distance of about 4,800 ft.

Benefits and Costs.

The area contains 615 acres of brackish marshes and 205 acres of open water for a total of 820 acres along the western portion of the Calcasieu River at Moss Lake. The Moss Lake hydrologic restoration and shoreline protection project is projected to protect 19 acres of brackish marsh and stimulate the production of 35 acres of aquatic vegetation and enhance 38 acres of marsh for a total benefit to 92 acres. The estimated project cost is $1,245,000.

Effects and Issues.

This project will protect brackish marshes and submerged vegetation along the western portion of the Calcasieu River in the vicinity of Moss Lake for a total benefit to over 92 acres. The project should reduce Calcasieu River bank erosion and in turn protect marshes behind these banks from erosion. The project will have to allow for existing navigation and commercial and recreational fishing areas. Freshwater and estuarine resident fish species as well as wildlife will be benefited by the project through the preservation of marsh.

Status.

This project is presently listed in the Calcasieu-Sabine Basin plan as a short term sup porting project. The project supports the overall basin "Perimeter Plan" strategy.

XCS-48 (NO-5) SOUTH BROWN LAKE HYDROLOGIC RESTORATION

Location

The project is located in Cameron Parish, Louisiana in the northeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 41). It is bordered by the Calcasieu Ship Channel on the east, a management levee and Black Lake on the north, and management levees on the west and south. The project area is comprised of 11,700 acres of brackish marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland through hydrologic restoration by stabilizing salinity, rapid water level fluctuations to maintain and enhance emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project plans include using dredged material from the Alkali ditch and the Calcasieu Ship Channel to create new marsh, water control structures to reduce water exchange and lower salinity in the area, plugging abandoned oil field canals, spoil bank gapping of plugged canals, wave stilling devices, and vegetative plantings.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 500 acres, enhance 259 acres of emergent marsh and stimulate growth of aquatic vegetation by 628 acres for a net benefit of 1,387 acres. The estimated cost of the project is $3,683,000.

Effects and Issues

Stabilizing salinity and water level spikes will stimulate wetland productivity and beneficial use of dredged material coupled with vegetative plantings will create new habitat for the benefit of wetland dependent fish and wildlife populations. Fisheries access should not be significantly affected. Boat access to some parts of the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-9) Brown Lake Marsh Management which was funded on the CWPPRA 1992 priority list. A feasibility study is required and it may be a candidate for future priority lists.

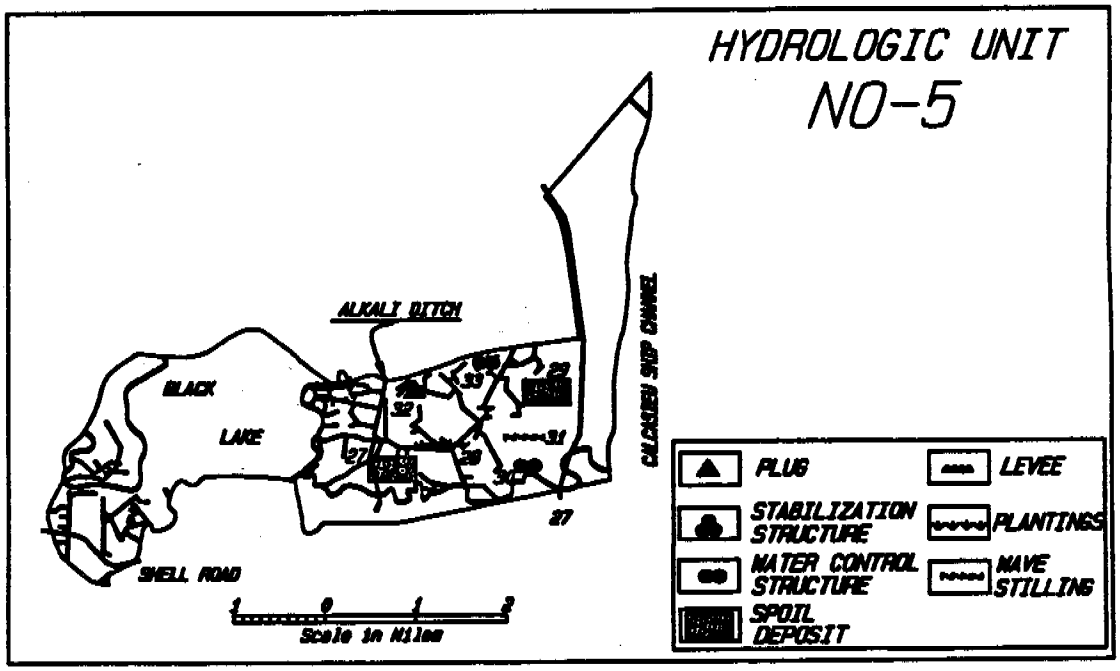

Figure 41. XCS-48 (NO-5) South Brown Lake Hydrologic Restoration

XCS-48 (NO-15) BLACK BAYOU CUTOFF CANAL MANAGEMENT AREA

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 42). It is bordered by the GIWW on the north, Black Bayou Cutoff Canal on the west, Shell Road on the south, and a management levee adjacent to Black Bayou on the east. The project area is comprised of 621 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

This area has suffered loss of much of the historic fresh marsh between 1968 and 1984. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and dampen wave energy to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate emergent marsh. The project plans include repairing the spoil bank along the Black Bayou Cutoff Canal and reducing or closing the Vinton drainage ditch and/or old Black Bayou at the GIWW to reduce water exchange and salinity spikes, installing wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 16 acres, enhance 26 acres of emergent marsh and stimulate growth of aquatic vegetation by 80 acres for a net benefit of 122 acres. The estimated cost of the project is $1,617,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-5b) Sabine Freshwater Introduction. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

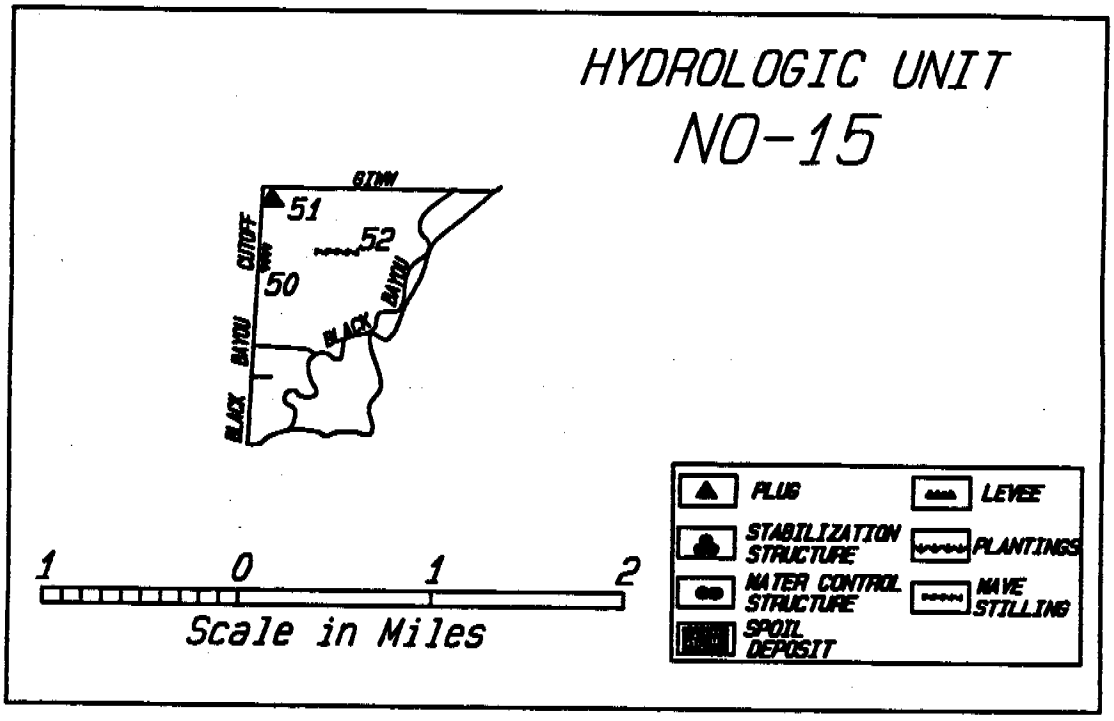

Figure 42. XCS-48 (NO-15) Black Bayou Cutoff Canal Management Area

XCS-48 (NO-20) WEST BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the northwest corner of the Calcasieu-Sabine River Basin Area within the Sabine National Wildlife Refuge (Figures 6 & 43). It is bordered by the southern boundary of NO-19 on the north, Black Bayou on the south, and a natural ridge and cattle walkway on the east, and Sabine River to the west. The project area is comprised of 1,700 acres of intermediate to brackish marsh, and open water.

Problems and Opportunities

This area is suffering loss of brackish marsh primarily in the south central portion. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, vegetative plantings and dampening wave energy to enhance the growth and expansion of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plan calls for installation of 5 rock weirs in openings along the Black Bayou.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 82 acres, enhance 80 acres of emergent marsh and stimulate growth of aquatic vegetation by 11 acres for a net benefit of 173 acres. The estimated cost of the project is $3,243,000.

Effects and Issues

Stabilizing salinity and water level spikes, and improved freshwater retention will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced slightly by rock weirs in Black Bayou although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be slightly reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-12) Black Bayou Hydrologic Restoration. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

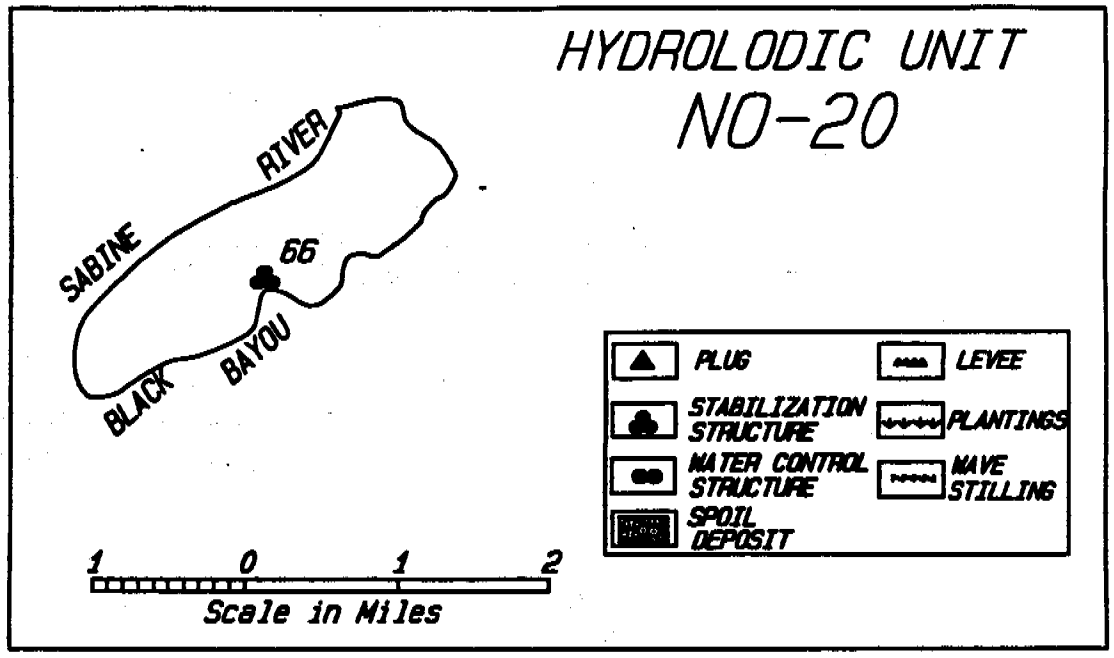

Figure 43. XCS-48 (NO-20) West Black Bayou Area

XCS-48 (NO-21) SOUTHWEST BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the northwest quadrant of the Calcasieu-Sabine River Basin Area within the Sabine National Wildlife Refuge (Figures 6 & 44). It is bordered by Black Bayou on the north, Sabine Lake on the west, and Greens Lake to the south. The project area is comprised of 6,225 acres of brackish marsh, and open water.

Problems and Opportunities

Marsh in this area is deteriorating as a result of saltwater intrusion, subsidence, sediment deprivation and excessive water levels. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, vegetative plantings and dampening wave energy to enhance the growth and expansion of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 1) installation of 12 rock weirs in openings along the Black Bayou and one in the opening between the marsh and Sabine Lake at the southern boundary, 2) a canal plug at the junction of Units NO-19 and NO-20 along the Sabine River, 3) installing 33,000 feet of wave stilling/sediment trapping devices in shallow open water environments to block wave fetch and encourage suspended sediment deposition and, 4) 33,000 linear feet of vegetative plantings to accelerate colonization of shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 276 acres, enhance 292 acres of emergent marsh and stimulate growth of aquatic vegetation by 119 acres for a net benefit of 687 acres. The estimated cost of the project is $1,411,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping and vegetative planting will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced slightly by rock weirs in Black Bayou although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be slightly reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

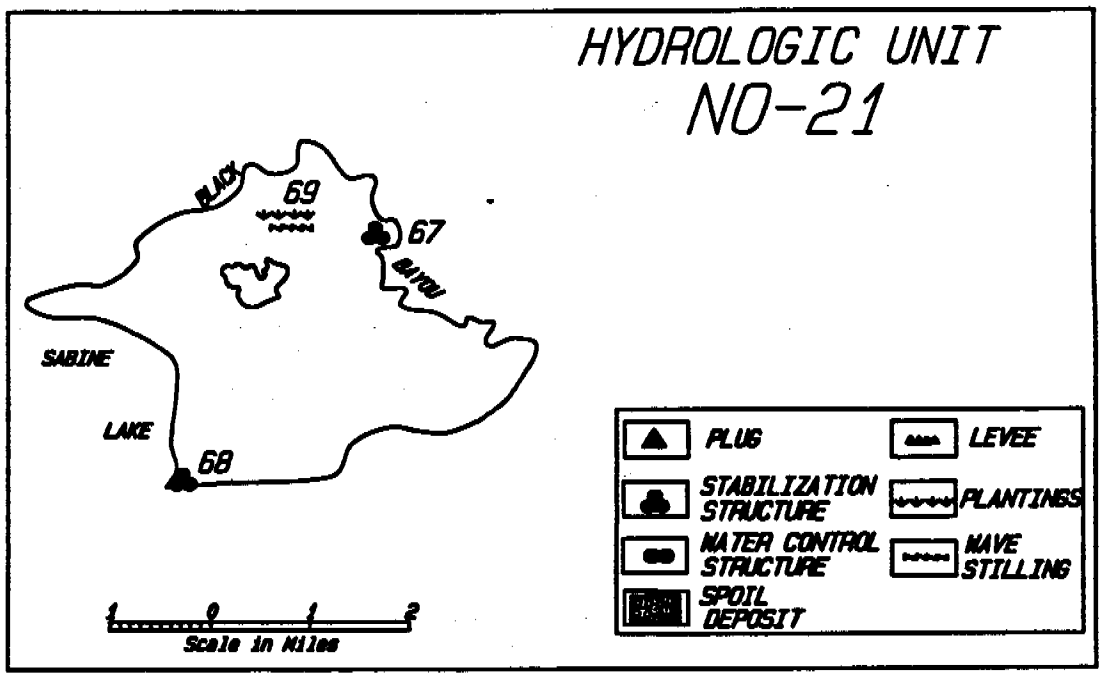

Figure 44. XCS-48 (NO-21) Southwest Black Bayou Area

XCS-48 (SA-5) GREENS LAKE UNIT

Location

The project is located in Cameron Parish, Louisiana in the west central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 45). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Black Bayou, on the south by Willow Bayou Canal, on the east by the Burton Sutton Canal, and on the west by the Sabine Lake. The project area is comprised of 23,100 acres of brackish marsh and open water.

Problems and Opportunities

The unit currently consists of brackish and intermediate marsh. A small area of relatively high prairie-like marsh known as the Marceaux Tract, is located along the lower west side of the unit. Near Sabine Lake, marshes are higher and underlain by soils having greater mineral content than compared to interior areas.

Historically, the unit consisted of fresh and intermediate marsh. According to 1953 aerial photography, marshes within the unit were very solid. Sawgrass and associated low-salinity vegetation adjacent to Greens Lake and throughout the interior marshes experienced rapid deterioration and loss during the mid 1950's through the 1960's. These changes occurred throughout the study area suggesting that a basin-wide salinity increase had occurred.

In recent years, the marsh has been relatively stable. However, numerous small isolated marsh islands have been lost to erosion over the past ten years. Recent aerial inspection suggests that in response to low salinities during 1990-1992, cattail has spread throughout much of the interior marsh. Preservation of marshes within the area will depend heavily upon the expansion of cattails and other aggressive low-salinity emergent marsh species. Preservation features must avoid causing increased water levels since that would likely promote accelerated rates of *Spartina* loss.

Description of Features

The plan objective of this unit is to enhance vegetative productivity and density. In order to facilitate the healing process, some of the proposed project elements would serve to reduce saltwater intrusion. A water control structure on Greens Bayou, could be operated to reduce or prevent high salinity water from entering Unit SA-5. Passive salinity reduction would be achieved by plugging Three Bayous at the Grays Ditch cattlewalk embankment. This would increase the length of Three Bayous and make it a tributary of Willow Bayou. The plan calls to plug a small bayou which connects Grays Ditch with Sabine Lake. The remaining elements would address issues other than salinity. Rip-rap would be used to prevent additional enlargement of spoil bank breaches along Burton Canal. Wave stilling/sediment trapping devices would be installed in large open water areas to reduce wind-induced erosion of adjacent marshes. Plugs would block off an abandoned access canals and re-establish hydrologic connections between it and adjacent marsh.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 216 acres, enhance 1,046 acres of emergent marsh and stimulate growth of aquatic

vegetation by 1,964 acres for a net benefit of 3,226 acres. The estimated cost of the project is $2,456,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

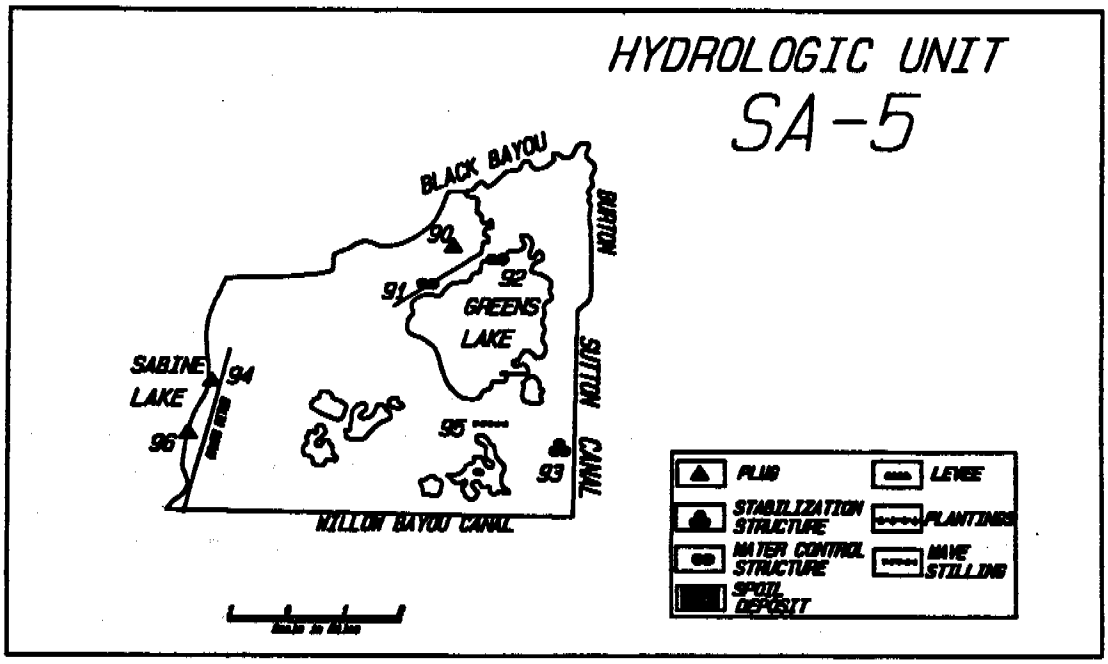

Figure 45. XCS-48 (SA-5) Greens Lake Unit

XCS-48 (SA-7) SOUTH WILLOW BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the west central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 46). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Willow Bayou Canal, on the south by South Starks Canal, on the east by the Deep Bayou Canal, and on the west by Sabine Lake. The project area is comprised of 5,610 acres of brackish and intermediate marsh and open water.

Problems and Opportunities

The unit was historically mapped as an intermediate to brackish marsh according to the 1931 vegetative map. Sawgrass and associated low-salinity vegetation located in the deep fresh marsh area experienced rapid deterioration and loss during the mid 1950's through the 1960's. These changes occurred throughout the study area suggesting that a basin-wide salinity increase had occurred. Examination of 1981 and 1989 color infrared aerial photography reveals that within the large open water area, clusters of nearby islands welded together to form larger islands. In marshes adjacent to the open water areas, some ponds and small lakes closed in. Throughout most to the interior marsh there was little net change.

Currently the area consists of brackish and intermediate marsh. The brackish areas are located near Sabine Lake. The former deep fresh marsh is now mostly turbid open water. A large break in the southern Willow Bayou Canal spoil bank currently allows very rapid water exchange between the large open water area and Willow Bayou. By providing a shorter more direct water exchange route, Willow Bayou Canal has captured the flow of the middle and upper reaches of Willow Bayou. Recent aerial inspection revealed that deterioration of *Spartina patens* is occurring in the Double Island Gully watershed. As elsewhere throughout the study area, waterlogging appears to be the primary cause of this deterioration. Consequently, proposed project elements have been planned to avoid increases in water level and associated waterlogging stresses. This project is compatible with treating critical areas of wetland loss within the basin's interior.

Description of Features

The plan objective of this hydrologic unit is to enhance vegetation. Many proposed project elements serve to reduce or mitigate adverse affects of canals. Project components include installation of five plugs in Willow Bayou Canal. Those plugs would restore flow through Willow Bayou and its tributaries. Water control structures would maintain the desired amount of water exchange between Grays Ditch and marshes along the southern portion of the unit. The Sabine Lake shore would be armored at a point where further retreat threatens to connect the lake with an upstream section of Willow Bayou. Wave stilling/sediment trapping devices will be installed along with planting of vegetation in the large open water areas and along unit shorelines.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 45

acres, enhance 254 acres of emergent marsh and stimulate growth of aquatic vegetation by 477 acres for a net benefit of 777 acres. The estimated cost of the project is $1,707,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

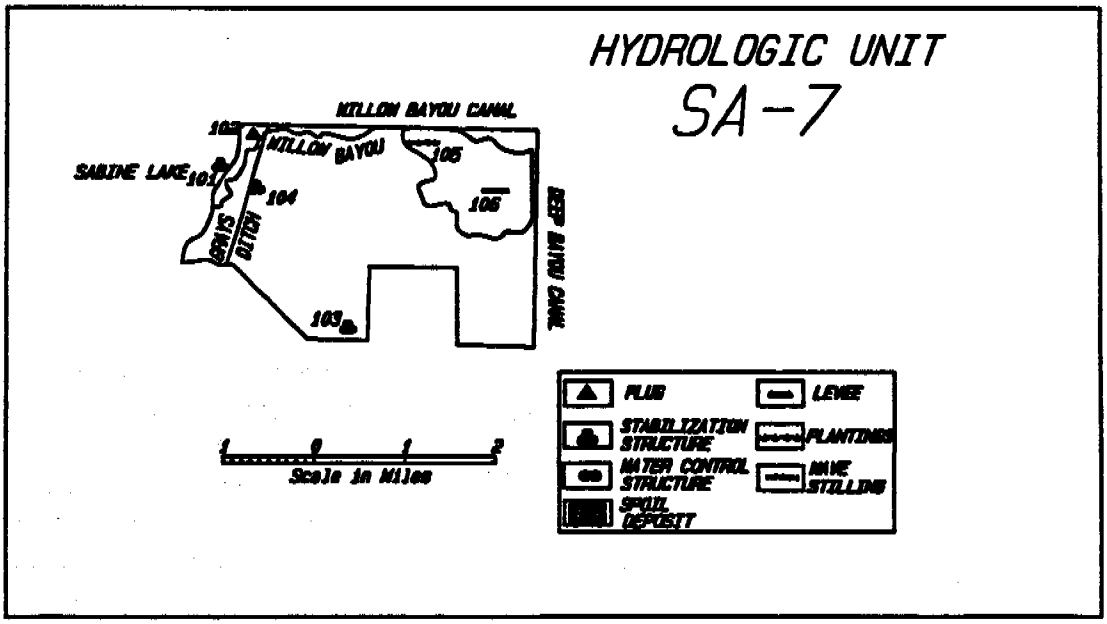

Figure 46. XCS-48 (SA-7) South Willow Bayou Unit

XCS-48 (SA-8) NORTHWEST COVE UNIT

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 47). It is part of the Sabine National Wildlife Refuge and is bordered on the northwest by marshes fringing the west side of LA 27, on the southeast by Calcasieu Lake, on the south by the Central Starks Canal. The project area is comprised of 220 acres of saline marsh and open water.

Problems and Opportunities

The western half of the unit drains through several spoil bank breaks into the extension of Central Canal (section connecting West Cove and Roadside Canal). Historically this area was brackish marsh, however, it now is a saline marsh.

Lakeshore retreat constitutes the greatest threat for marshes within this unit. Interior marshes within the western portion of the unit are very stable. Examination of 1983 and 1988 color infrared photography indicated that interior marshes experienced no net change. During high water periods, lake water tops the lakeshore rim and enters the broken marsh area. Once there, it flows into Headquarters Canal and thence, to Roadside Canal. This flow circumvents the water control structures at Hog Island Gully, Headquarters Canal, and West Cove. Continued lakeshore retreat will only make this problem worse and uncontrolled saltwater intrusion might become a problem. The objective for this hydrologic unit is to maintain and enhance the current vegetative community. This project is compatible with treating critical areas of wetland loss within the basin's interior.

Description of Features

Units SO-7 and SA-8 boundaries, will be rebuilt to maintain greater hydrologic control between each unit. Breaks in the Headquarters Canal spoil bank would be plugged. A new water exchange point would be established by constructing a water control structure along the western spoil bank of Shell Canal. An existing structure in the northwest corner of the Unit would be modified in order improve flow regulation and reduce saltwater intrusion.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will enhance 10 acres of emergent marsh and stimulate growth of aquatic vegetation by 15 acres for a net benefit of 25 acres. The estimated cost of the project is $332,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

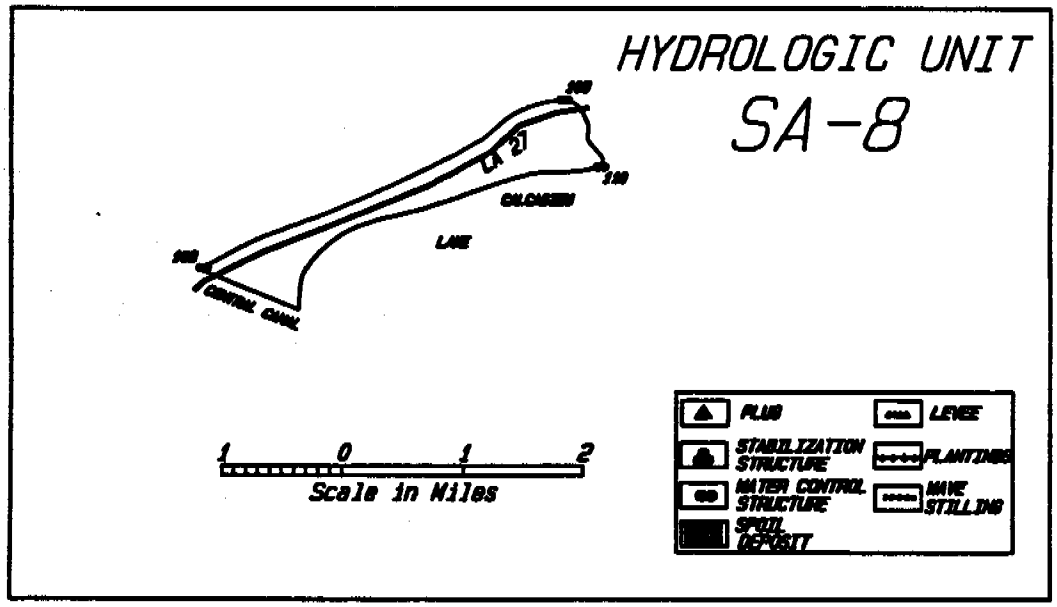

Figure 47. XCS-48 (SA-8) Northwest Cove Unit

XCS-48 (SO-1) JOHNSON'S BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the southwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 48). It is bordered by South Starks Canal on the north, Sabine Lake on the west, Magnolia Vacuum Canal on the east and LA 82 on the south. The project area is comprised of 30,585 acres of intermediate to brackish marsh, and open water.

Problems and Opportunities

Marsh in this area is deteriorating as a result of saltwater intrusion, and excessive water exchange. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, vegetative plantings and dampening wave energy to enhance the growth and expansion of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate marsh. The project plans include 1) installation of 16 rock weirs in openings along Johnson's, Greens, B. Borge, Madame Johnson's Bayous, 2) 14 plugs to close man-made openings in the bayous, 3) 2 plugs on Sabine Lake to close two shell dredging sites and re-establish the historic shoreline. 4) A channel was constructed from Sabine Lake to Greens Bayou. This channel will be plugged in order to prevent water circulation problems in the Greens Bayou system and to retain freshwater.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 1,147 acres, enhance 1,407 acres of emergent marsh and stimulate growth of aquatic vegetation by 1,300 acres for a net benefit of 3,854 acres. The estimated cost of the project is $2,430,000.

Effects and Issues

Stabilizing salinity and water level spikes and improved freshwater retention will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced slightly by rock weirs although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be slightly reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

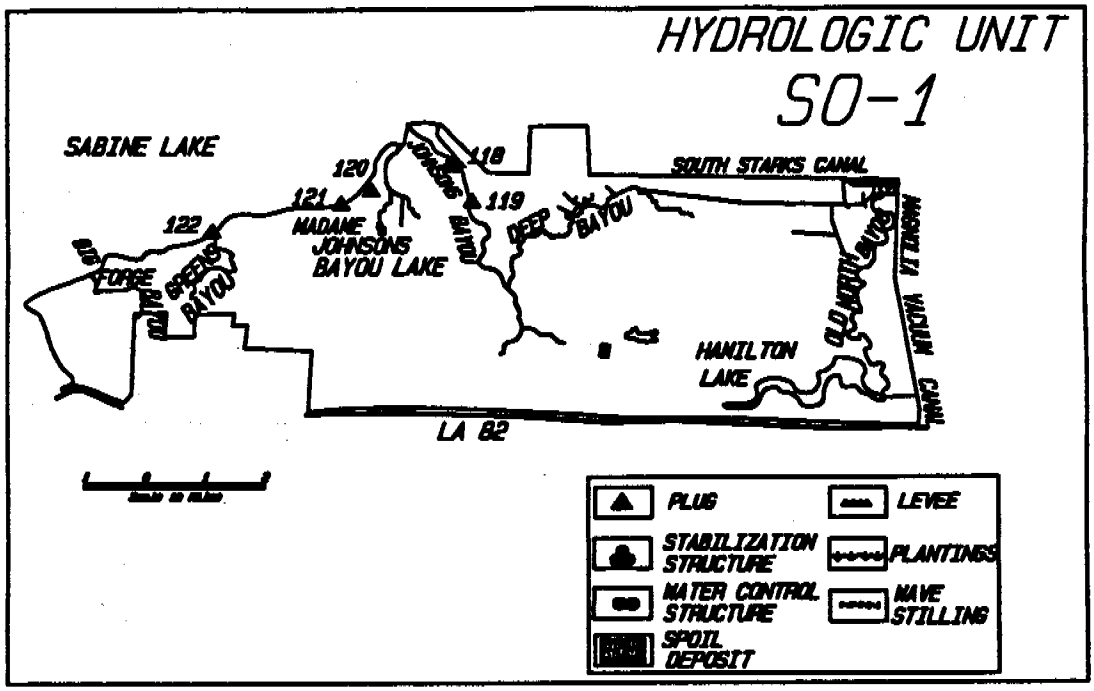

Figure 48. XCS-48 (SO-1) Johnson's Bayou Unit

XCS-48 (SO-5) WEST MUD LAKE AREA

Location

The project is located in Cameron Parish, Louisiana in the south central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 49). It is bordered by LA 82 on the south, Beech Canal on the west, LA 82 on the south and LA 27 on the east. The project area is comprised of 12,007 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

In the past, this area was a relatively stable intermediate marsh. Presently the marsh is beginning to deteriorate in the west central and southeastern portions of the unit due to excessive water levels. There is an opportunity to improve productivity of this wetland through passive marsh management that will improve water exchange in the area. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

Project features include lowering of some of the existing culverts to improve circulation, addition of a variable crest weir header to an existing culvert under LA 27, and installation of additional of additional culverts under oil field roads.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 300 acres, enhance 565 acres of emergent marsh and stimulate growth of aquatic vegetation by 416 acres for a net benefit of 1,281 acres. The estimated cost of the project is $1,017,000.

Effects and Issues

Water control structures will improve water circulation in this marsh and thus promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife. Fisheries access will continue to be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

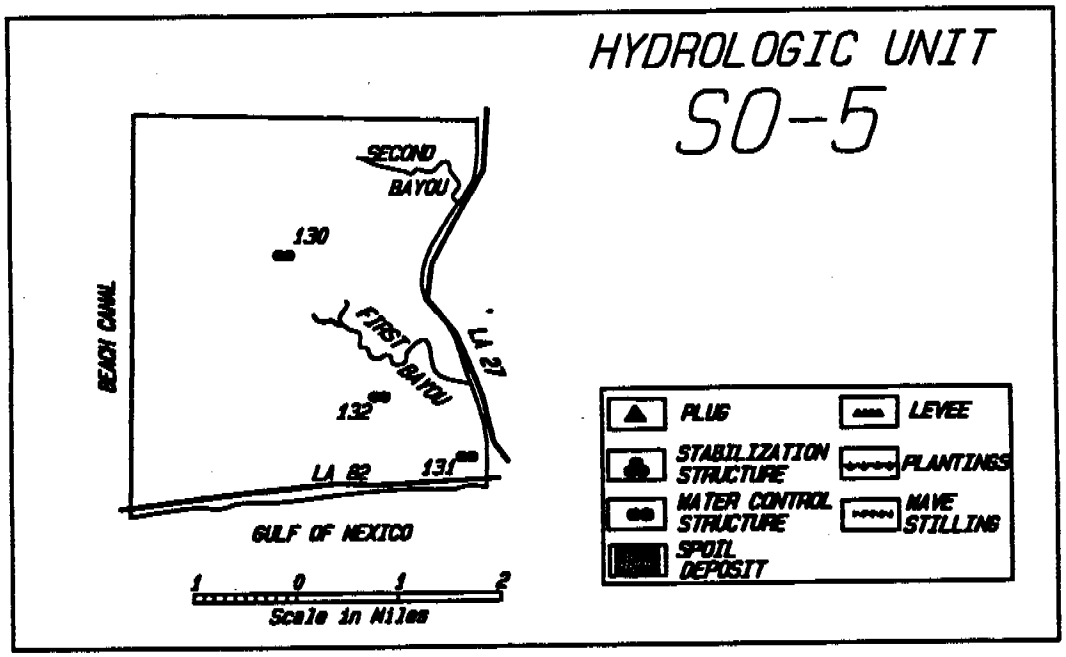

Figure 49. XCS-48 (SO-5) West Mud Lake Area

XCS-48 (SO-8) OYSTER BAYOU/LAKE UNIT

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 50). It is bordered by Calcasieu Ship Channel on the east, LA 82 on the south and a management levee on the north and west. The project area is comprised of 12,600 acres of brackish marsh and open water.

Problems and Opportunities

The area historically contained wiregrass, bulrush, and sawgrass according to the 1931 vegetative map. Currently the area is brackish marsh. Approximately 50 percent of the emergent marsh on the organic soils has eroded to shallow open water areas. The area is experiencing very severe marsh breakup on the organic soil types due to high salinities and excessive water level fluctuations and high water levels.

The area has two openings directly into the West Fork of the old Calcasieu River. The openings provide access for tidal scouring, Gulf strength water salinities and tidal fluctuations without any source of freshwater dilution other than rainfall. Any freshwater head that could be achieved by rainfall is quickly removed due to the tidal fluctuations.

There is an opportunity to reduce land loss by reducing water exchange between the Calcasieu Ship Channel and interior marshes and using material dredged from the ship channel to build marsh in shallow pond bottoms. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The objective of the hydrologic unit is to reduce water level fluctuations. This will be accomplished with the installation of rock liners and addition of dredged spoil for marsh creation. The proposal calls for rock lining Mud Bayou to maintain the present size of the opening going into West Fork. This alternative requires the installation of a large structure (Table 53a). A large water control structure will be installed in Oyster Bayou near the opening into West Fork. The structure needs to be designed for fisheries access because the marshes are a very important nursery area for nursery depended marine organisms. Dredge spoil from the Gulf and the Calcasieu Ship Channel would benefit the building of pond bottoms and help restore emergent marsh vegetation.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $4,989,000.

Effects and Issues

Water control structures will improve water circulation in this marsh and thus promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife. Fisheries access will be slightly reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

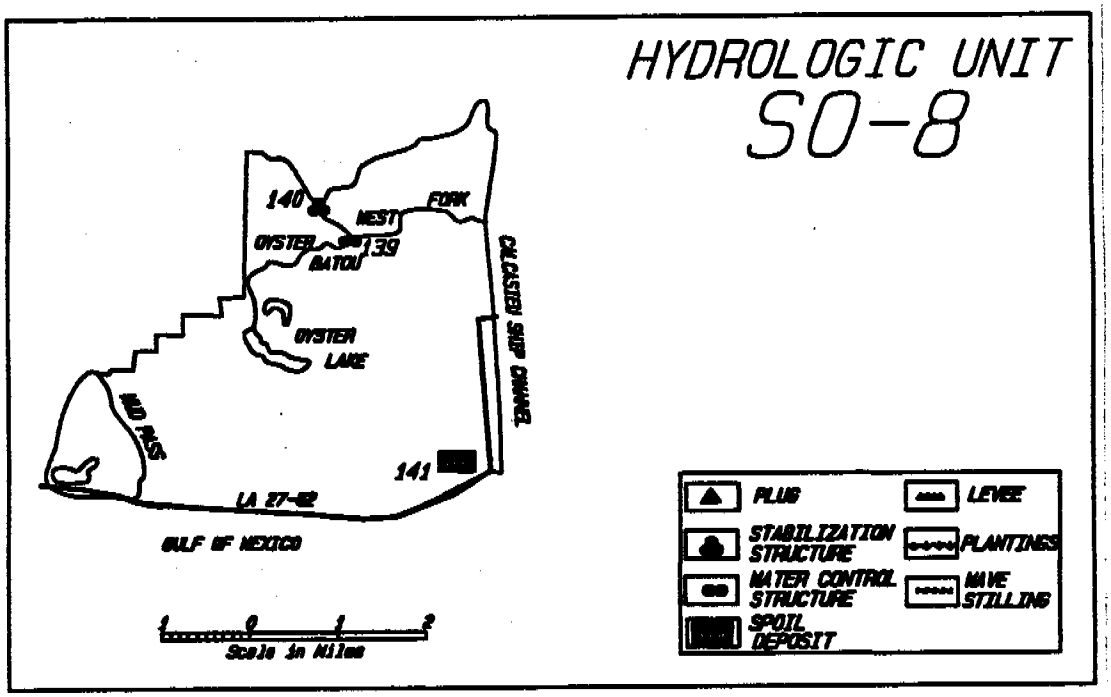

Figure 50. XCS-48 (SO-8) Oyster Bayou/Lake Unit

XCS-48C GIWW CANAL CLOSURES

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 42). It is bordered by the GIWW on the north, Black Bayou Cutoff Canal on the west, Shell Road on the south, and a management levee adjacent to Black Bayou and the Vinton Drainage Canal on the east. The project area is comprised of 119 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

This area has suffered loss of much of the historic fresh marsh between 1968 and 1984. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and dampen wave energy to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate emergent marsh. The project plans include call for closure of the Black Bayou Cutoff and Vinton Drainage Canals near their juncture with the GIWW.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $918,500.

Effects and Issues

Stabilizing salinity and water level spikes will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. This project conflicts projects (CS-5b) Sabine Freshwater Introduction and XCS-48b Introduce Freshwater From the GIWW. Fisheries access will be reduced by plugs. Boat access to the project area will be reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is a component of XCS-48 (NO-15). A feasibility study is required and it may be a candidate for future priority lists.

XCS-48O ROCK LINER IN CANAL AT SOUTHWEST PORTION OF WEST COVE

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 &88). It is bordered by Calcasieu Lake on the north and east, LA 27 on the west and an oil field road on the south and LA 27 on the east. The project area is comprised of 2,400 acres of brackish marsh and open water.

Problems and Opportunities

Marshes adjacent to West Cove are relatively high and stable. The center of the unit is an area of deeper organic marshes. Construction of the canal between the western tip of West Cove and Roadside Canal, and the subsequent breaks in its southern spoil bank breached the hydrologic barrier of the high lake rim marshes and allowed water exchange to occur between West Cove and the interior deep organic marshes. The eastern boundary of the unit consists of a canal which also cuts through the high like rim marsh and connects West Cove with interior marshes. Interior marshes in the vicinity of that canal have experienced some deterioration and loss but not as much as in the area of deep organic marsh.

Construction and enlargement of the Calcasieu Ship Channel increased salinities and tidal exchange and promoted the deterioration and loss of marshes in the deep marsh area. Adjacent to the canal spoil bank breaks and southward for approximately one-half mile, the central deep marsh area appears to be in transition from a deteriorating brackish marsh to a building/expanding saline marsh. Open water area and mud flats here are being closed in by Spartina alterniflora.

There is an opportunity to reduce land loss by reducing water exchange between the lake and interior marshes. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The objective of the hydrologic unit is to maintain the unit as a brackish marsh by reducing canal-induced water exchange between the lake and interior marshes by installing a a rock weir in the canal that leads into West Cove would protect the existing channel cross section from further erosion.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $147,000.

Effects and Issues

Water control structures, sediment trapping devices and spoil bank maintenance will improve water circulation in this marsh and thus promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study Area and is a component of project XCS-48 (SO-7) Southwest West Cove Unit. A feasibility study is required and it may be a candidate for future priority lists.

XCS-48M UTILIZE DREDGE MATERIAL FOR BEACH NOURISHMENT

Location

The project is located in Cameron Parish, Louisiana in the southwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 64). It is bordered by LA 82 on the north, Sabine Pass on the west, and the Gulf of Mexico on the south.

Problems and Opportunities

In the past, this area was a relatively stable brackish and saline marsh. Presently the marsh is beginning to deteriorate in the central and west central portion of the unit. There is an opportunity to improve productivity of this wetland by using material dredged from Sabine Pass to create wetland and renourish the beach. This project is compatible with the basin strategies of treating critical areas of wetland loss within the basin's interior and protecting the shoreline of the Gulf of Mexico.

Description of Features

This project calls for the beneficial use of material dredged from Sabine Pass to create marsh and reclaim beach lost to erosion and to recreate a beach rim along the Gulf of Mexico east of Sabine Pass.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will create 70 acres and benefit another 18 acres. The estimated project cost is $1,647,000.

Effects and Issues

Rock breakwaters will reverse erosion along this stretch of gulf shoreline by promoting sediment deposition landward of the breakwaters. Water control structures will reduce saltwater intrusion and channel constrictions will reduce excessive water exchange in this marsh for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. This project is a component of XCS-48 (SO-2) Southwest Johnsons Bayou Unit. A feasibility study is required and it may be a candidate for future priority lists.

XCS-48 (SA-9) HOG ISLAND GULLY AREA

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 51) along the west side of LA 27 approximately . It is part of the Sabine National Wildlife Refuge and is bordered on the north by West Cove Canal, on the south by Calcasieu Lake and on the west by LA 27. The project area is comprised of 1,647 acres of saline marsh and open water.

Problems and Opportunities

Hog Island Gully Bayou historically drained area marshes into West Cove. West Cove Canal and Shell Canal were dredged around 1917. Saltwater flooding over a marsh burn contributed to some of the marsh break-up adjacent to West Cove Canal. Interior marshes have converted to brackish and saline marshes. Those areas have also experienced moderate to severe deterioration. West Cove Canal appears to have captured the flow of the old Hog Island Gully Bayou. Consequently, the bayou has filled in considerably. As a result, the natural sediment delivery and deposition mechanisms to a large portion of interior marshes have been reduced and altered. Examination of 1983 and 1988 color infrared aerial photography reveals that there has been no net change in marsh area. Recent field observations reveal that some areas of marshhay cordgrass and saltgrass adjacent to old Hog Island Gully Bayou appear to be dying. In 1990, the Louisiana Coastal Restoration Division constructed a terracing project in the southern part of the unit. That project appears to be successful in creating new marshes and promoting accretion of nearby natural marshes. The plan objective of the hydrologic unit is to maintain and enhance existing vegetation through the use of wave dampening/sediment trapping devices and beneficial use of dredged material.

Description of Features

Project component include installation of similar wave stilling/sediment trapping devices to create marsh and restore marsh functions in large open water areas. Material dredged from the Calcasieu Ship Channel would be used to create marsh in areas of shallow open water. Construction of a plug across West Cove Canal (element 113 in Unit SA-10) would revive flow through Hog Island Gully Bayou, increase accretion rates of marshes in the western portion of the unit, and reduce excessive canal-induced water exchange and salinity fluxes. This element might also provide benefits to Unit SA-1 by reducing salinities entering via the Hog Island Gully water control structure.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will create 2 acres, protect 14 acres, enhance 283 acres of emergent marsh and stimulate growth of aquatic vegetation by 345 acres for a net benefit of 644 acres. The estimated cost of the project is $1,329,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

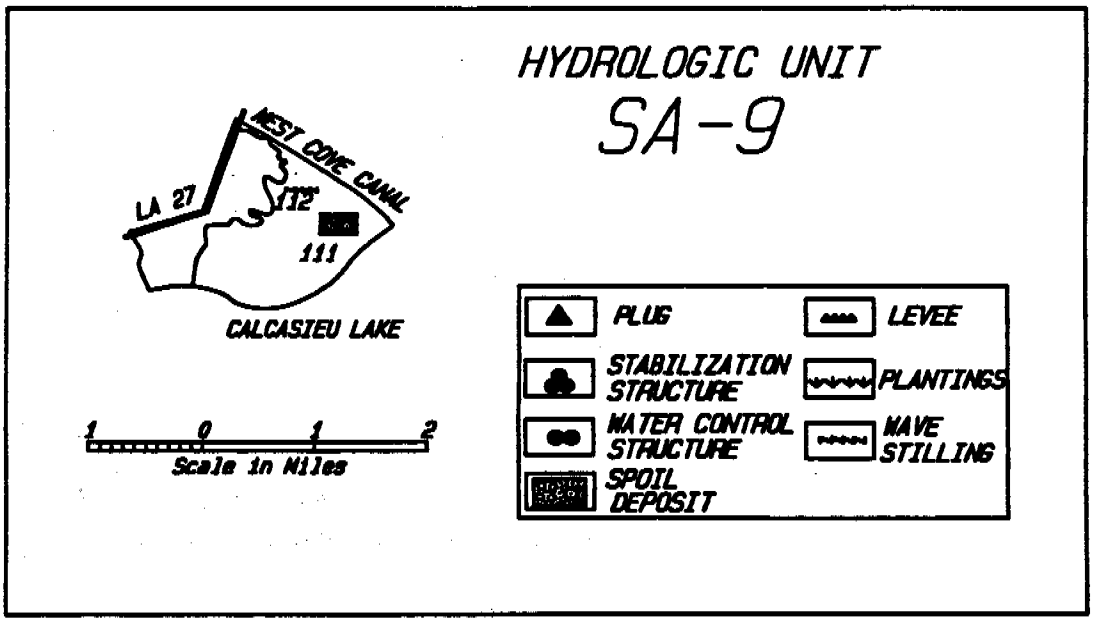

Figure 51. XCS-48 (SA-9) Hog Island Gully Area

XCS-50 RESTORATION OF ST. JOHN'S ISLAND

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area in the West Cove portion of Calcasieu Lake (Figures 6 & 52). The project area, known as St. Johns Island, is comprised of 1,000 acres of brackish marsh and open water.

Problems and Opportunities

This marsh island is suffering from shoreline erosion. There is an opportunity to rebuild parts of the island's north shore using material dredged from the Calcasieu Ship Channel. This project is compatible with the basin strategy of protecting shorelines of lakes.

Description of Features

The objective is create emergent marsh where the marsh has eroded into shallow water areas. The project calls for the used of dredged material from the Calcasieu Ship Channel which would be used to restore open water areas to emergent marsh.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $1,934,000.

Effects and Issues

This project would offset marsh loss on St. John's Island. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

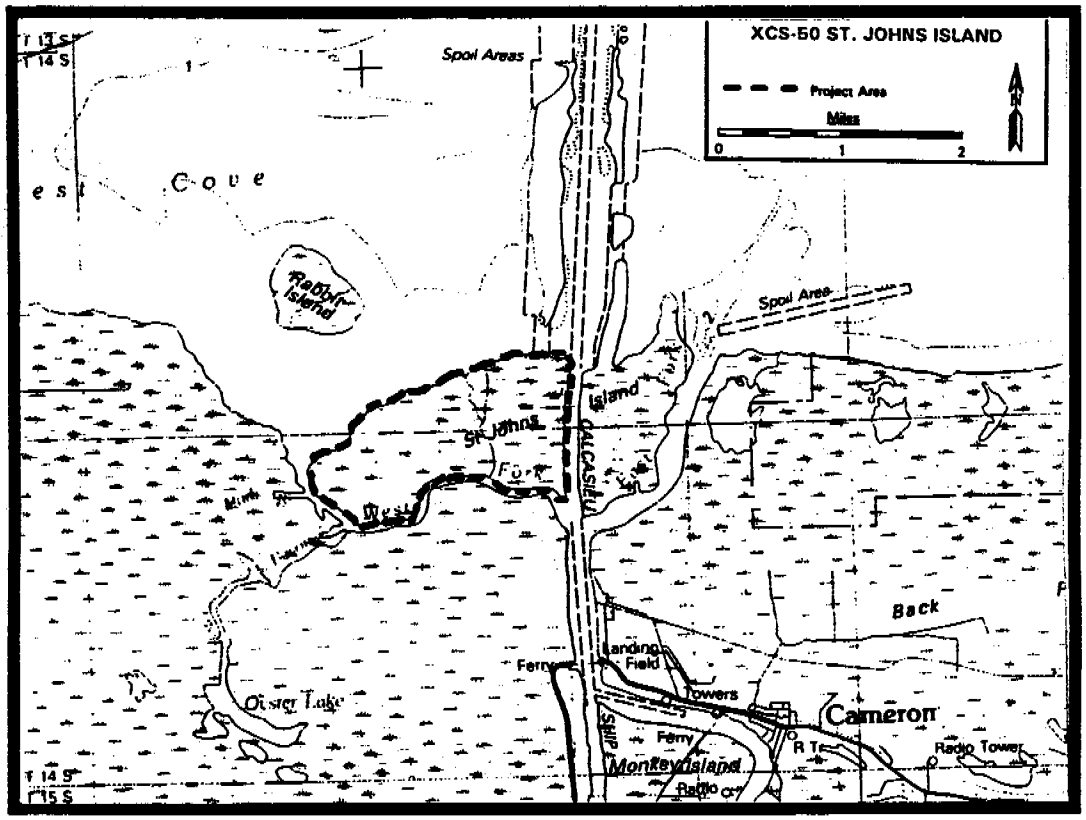

Figure 52. XCS-50 Restoration Of St. John's Island

CS-8/XCS-48 (NO-2A) NORTH BLACK LAKE MANAGEMENT AREA

Location

The project is located immediately north of Black Lake approximately 3.0 miles north northwest from Hackberry, La. in Cameron Parish. It is bounded on the east by the Jeff Murphy management levee, on the south by the northern Black Lake shoreline, on the west by the West Black Lake management levee and to the north by an impoundment levee (Figures 6 and 53).

Problems and Opportunities

Marshland between the GIWW and Black Lake in north-central Cameron Parish has been lost as a result of saltwater intrusion, tidal scouring, subsidence, and deterioration of a management unit levee. Today, only 59 acres of marsh remain in this management unit of 979 acres. This project will restore water management capability within the project area, protecting the existing emergent marsh, and promoting re colonization of open water areas by emergent marsh and submersed aquatic plant species.

Description of Features

Project Components:

1. Rebuild a management levee along the northern shoreline of Black Lake (7,500' long, 10' crown width, 5' finished height, 3:1 slope).
2. Cover the south bank of the proposed levee with rock (rip rap) revetment.
3.. Install two 36" culverts in the proposed levee, each with a flapgate on the Black Lake (south) side and a 10' wide variable-crest slotted weir on the impoundment (north) side of the levee.
4. Plant approximately 3,000 gallon plugs of smooth cordgrass (*Spartina alterniflora*) on the proposed levee.
5. Seed the levee slopes with Bermuda grass (*Cynodon dactylon*) or planted with plugs of Gulf cordgrass (*Spartina spartinae*).
6. Plant approximately 7,200 ft. (2,400 plugs) of Smooth cordgrass (*Spartina alterniflora*) around each of 6 small islands of marsh and along southwestern corner of the project area
7. Develop a management plan and an operational schedule for the proposed water control structures.

Benefits and Costs

The immediate project area contains 59 acres of fresh marshes and 916 acres of open water for a total of 975 acres. The Boudreaux Lake Project is expected to protect 14 acres of brackish marsh and produce 234 acres of aquatic vegetation and enhance 51 acres of marsh for a total benefit to 298 acres. The rough estimated project cost is $1,144,000.

Effects and Issues

At present the 94% of the north Black Lake area consists of open water. The area's value to fish and wildlife is diminished due to this large percentage of open water. The project will protect the existing 14 acres within the North Black Lake management area and produce at least 234 acres of aquatic vegetation. The project will also help to restore

some of the existing 916 acres of open water to emergent marsh by water level lowering events. The result will be the restoration of a large open water area to emergent marsh and aquatic vegetation with increased fish and wildlife value. The structures will have to be designed, implemented and operated to minimize effects to access of the area to estuarine organisms.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

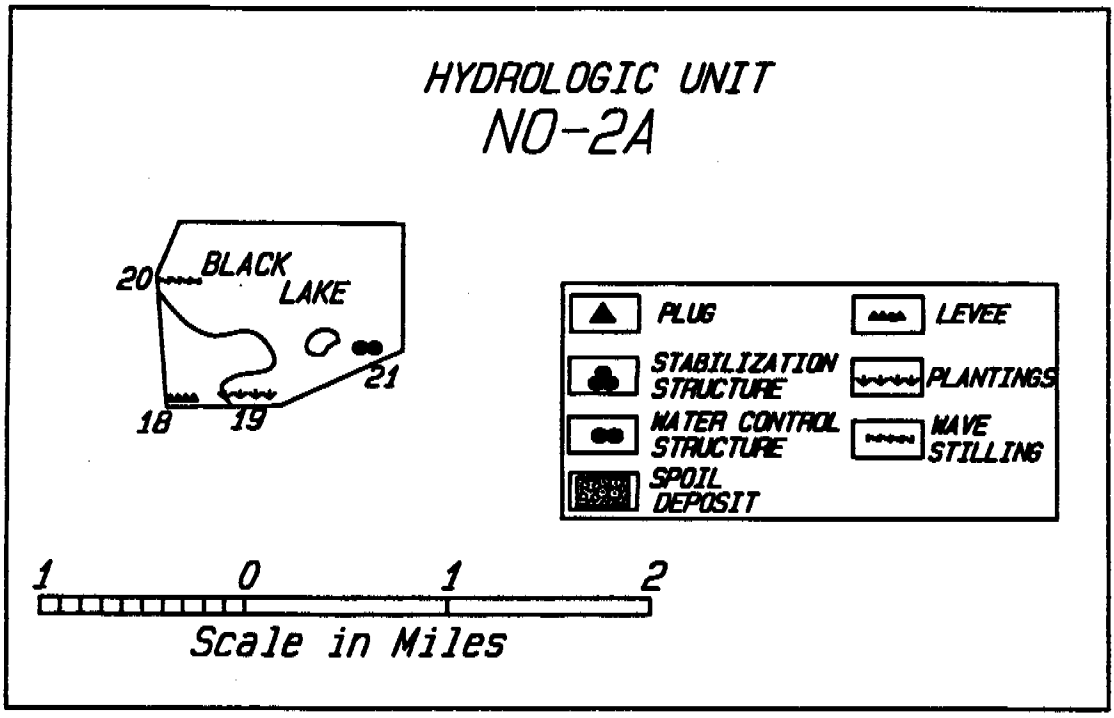

Figure 53. CS-8 XCS-48 (NO-2A) North Black Lake Management Area

CS-10 GRAND LAKE RIDGE AREA

Location

Grand Lake Ridge marsh is a 1,462 acre tract of brackish marsh and open water located on the east side of Calcasieu Lake between the lake and LA Hwy. 384 about 2 miles south of Grand Lake, between the communities of Grand Lake and Jubert Point, Louisiana in Cameron Parish (Figures 6 and 54).

Problems and Opportunities

The brackish marshes in the area have experienced marsh loss due to saltwater intrusion and subsidence. The marsh is 2-03 miles north of the Cameron-Creole Watershed Project and thus will not derive any benefits from this project. Problems in the area were aggravated from the removal of the Calcasieu River Oyster reef (1876), the construction of the Calcasieu Ship Channel (1941) and other hydrologic alterations in the area including the construction of canals, roads and levees (since 1940). Recent 1983 to 1990 land loss in the area was recorded as 0.38%/yr. (Dunbar et al. 1992). The area consists of 67% marsh and 33% water. Marsh management will hope to convert some of the open water to marsh and reduce present and future saltwater impacts on the existing brackish marshes.

Description of Features

The Grand Lake Ridge marsh has been steadily converting from marsh to open water since the 1940's. Two management units will be created to restore the area to a brackish marsh with the goal of achieving a 70:30 ratio of emergent marsh to open water.

Project Components:

North Management Unit:

1. Install an approx. 75' wide rock weir across a small bayou leading into the marsh.
2. Cut 50' wide gaps in an existing 6,700' long spoil bank every 500' to allow for north-south sheet flow.

South Management Unit:

1. Rebuild 1,800 linear feet of existing levee to a crown height of 3' MSL.
2. Install two 32' long 42" diameter flapgated culverts with 10' variable crest weirs and 4" vertical slots under the proposed levee where it will cross a small bayou leading into the marsh, each culvert with

Note that these components subject to feasibility study, management plan, and regulatory approval.

Benefits and Costs

The immediate project area contains 980 acres of brackish marsh and 482 acres of open water for a total of 1,462 acres. The Grand Lake Ridge Marsh Management Project is expected to protect 662 acres of brackish marsh and stimulate the production of 123 acres of aquatic vegetation and enhance 47 acres of marsh for a total benefit to 832 acres. The rough estimated project cost is $1,117,500.

Effects and Issues

The project will help protect and enhance brackish marsh in the 1,462 acre project area by reducing saltwater intrusion and controlling water levels during part of the growing season to stimulate brackish marsh revegetation in shallow open water areas. The result will be increased marsh and fisheries productivity. The Grand Land Ridge marsh management structures will have to be operated according to a water control operation plan so that it does not increase or decrease water levels over target levels. The structures will also have to be designed so that estuarine fisheries organisms and navigational interests are allowed access.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

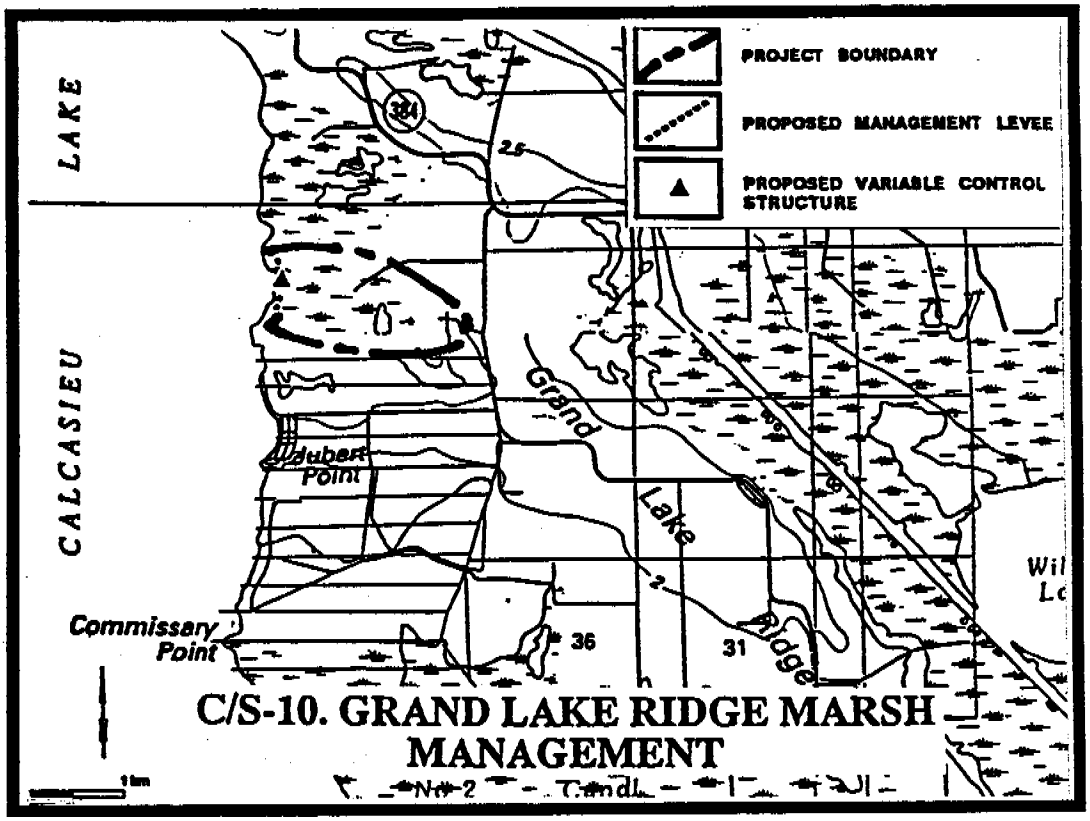

Figure 54. CS-10 Grand Lake Ridge Area

CS-14 TRIPOD BAYOU CONTROL STRUCTURE

Location

Tripod Bayou is located in the Cameron-Creole Watershed near the southeast side of Calcasieu Lake about 2 miles north of Cameron, Louisiana in Cameron Parish. The project will be located at the intersection of Tripod Bayou and Calcasieu Lake (Figures 6 and 55).

Problems and Opportunities

Vegetation in the southern portion of the Cameron-Creole Watershed area may be stressed as a result of prolonged ponding above marsh level during the growing season. Prior to the completion of the Cameron-Creole Watershed marsh management project by the SCS and Cameron Parish in 1989, brackish marshes to the north of Back Ridge were impacted by saltwater intrusion and tidal scour via Calcasieu Lake from the Calcasieu Ship Channel. Since the watershed project was completed some ponding during the growing season due to high water levels has been noticed in the area. The project objective is to restore the connection of Tripod Bayou to Calcasieu Lake to allow excess water to be removed by gravity drainage, as part of the Cameron-Creole Watershed Project. This project will enable the watershed project to be more efficient in removing water from the area south of Calcasieu Lake. The project will have the added benefit and opportunity of allowing more estuarine fisheries organisms (i. e. brown and white shrimp) to enter and leave the watershed.

Description of Features

Project Components:

1. Install two 300' long x 48" diameter culverts with flapgates on the Calcasieu "lake end" and 15' wide variable crest slotted weirs on the "marsh end" of each culvert.
2. Channelize the section of Tripod Bayou between the Calcasieu Lake and the levee by dredging a 300' long x 25' wide x 6' deep channel.
3. Develop an operation schedule for the structure consistent with the goals of the Cameron Creole Watershed Project in cooperation with the local drainage districts and state/federal regulatory agencies.

Benefits and Costs

The immediate project area contains 675 acres of brackish and saline marshes and 511 acres of open water for a total of 1,186 acres. The Tripod Bayou Control Structure project is expected to protect 51 acres of saline and brackish marsh and stimulate the production of 87 acres of aquatic vegetation and enhance 52 acres of marsh for a total benefit to 190 acres. The rough estimated project cost is $1,127,000.

Effects and Issues

The project will help the Cameron-Creole Watershed marsh management project protect and enhance brackish and saline marsh in the 1,186 acre project area. Some project benefits will extend to the 7,000 acre southern portion of the watershed. The project will provide additional water level lowering capacity, allow more estuarine fisheries organisms to enter and leave the watershed. The end result will be increased

marsh and fisheries productivity. The Tripod Bayou Control Structures will have to be operated according to the watershed water control operation plan that it does not decrease water levels below the plan target levels in the southern plan area.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

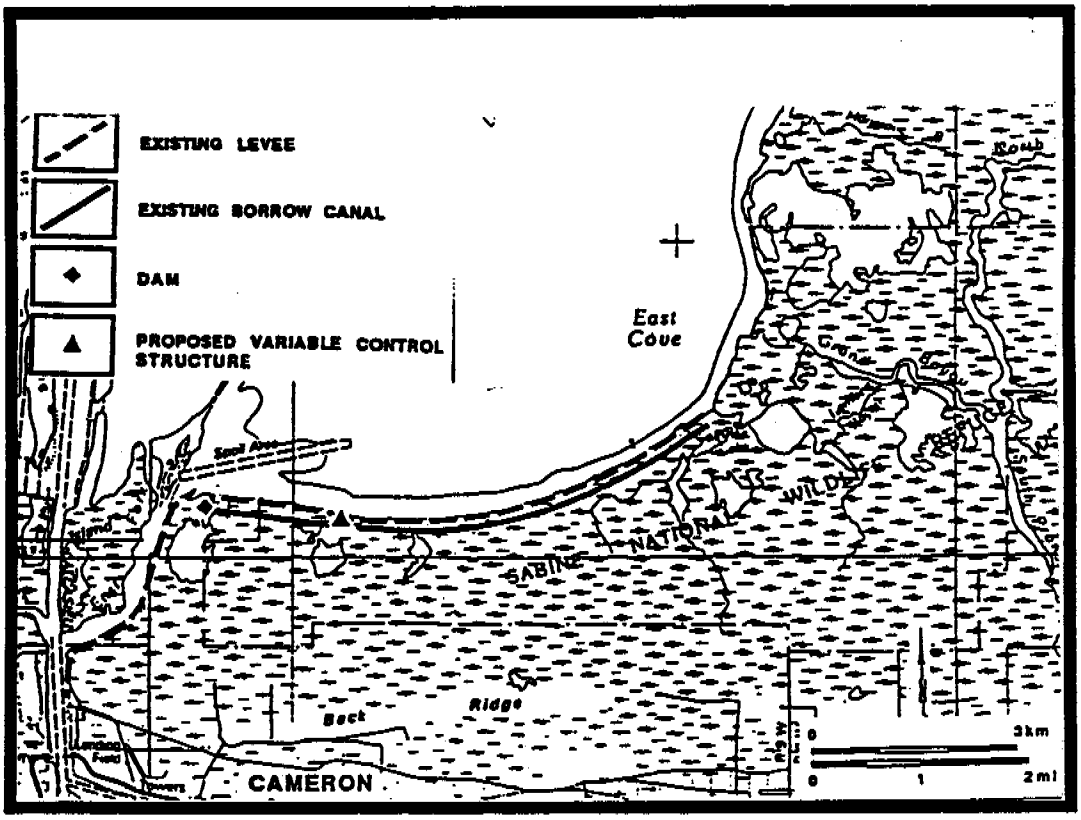

Figure 55. CS-14 Tripod Bayou Control Structure

PCS-24 EAST MUD LAKE MARSH MANAGEMENT

Location

The project is located in Cameron Parish surrounding Mud Lake immediately north of Hwy. 82 and the community of Holly Beach, LA. The project is bounded by LA Hwy. 82 to the south, LA Hwy. 27 to the west, the Magnolia Road to the north and an existing levee and property line near Oyster Bayou to the east (Figures 6 and 56). The project may benefit a total of 3,121 acres of brackish marsh.

Problems and Opportunities

Marsh loss in the vicinity of the Mud Lake has been caused by saltwater intrusion, increased water fluctuations and tidal scour moving into the marshes from the West Cove area of Calcasieu Lake. This has resulted in the conversion of brackish marshes to open water. Canals have increased these marsh destruction processed. Additional wetland loss results from shoreline erosion around Mud Lake. This hydrologic restoration and marsh management project has the goals of reducing saltwater intrusion and tidal scour in the area and restoring some of the brackish marshes through draw-down management. This project will benefit brackish marshes in the areas by restoring the area's former hydrology.

Description of Features

The project features consists of the installation of 150,000 ft. of vegetative plantings along the Mud Lake shoreline, the installation of 850 ft. of flapgated culverts (about ten 48" diameter structures) with variable crest weirs and vertical slots (for fisheries access), the removal of six existing culverts, installation of three earthen plugs and the repairing of 4,850 ft. of existing levee.

Benefits and Costs

Approximately 1,520 acres of brackish marsh and 1,299 acres of aquatic vegetation will be restored and protected and another 371 acres will be benefited by the project for a total benefit to 3,121 acres. The estimated project cost is $2,268,000.

Effects and Issues

The project will restore, protect and benefit about 3,121 acres of brackish marshes in the vicinity of Mud Lake north of Holly Beach. Intermediate and brackish marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for any existing navigation and estuarine migratory fisheries access to the degree allowable in keeping with the goals of the project.

Status

This project was selected as a Priority Project for the 1992 CWPPRA List submitted to Congress in November of 1992. The project is sponsored by the USDA Soil Conservation Service and the State of Louisiana and is presently in the preliminary design phase of development. Fifty percent (50%) design review was completed in November 1993. The project is projected for construction in 1995.

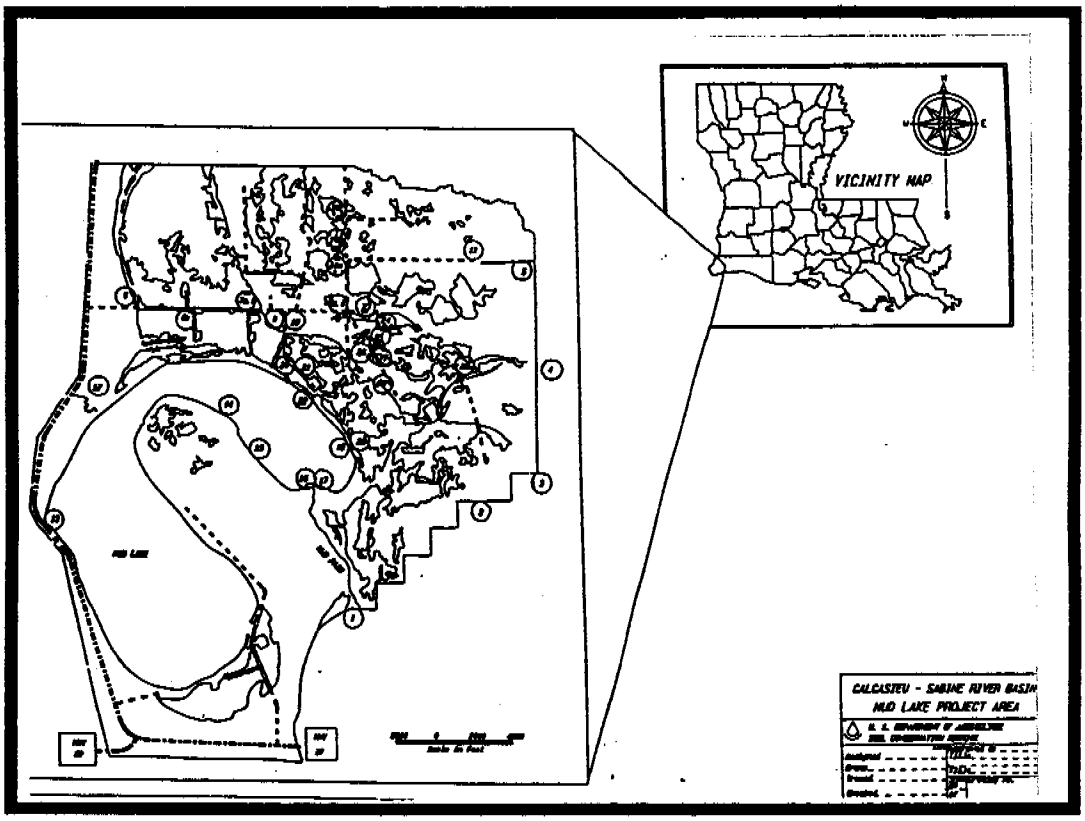

Figure 56. PCS-24 East Mud Lake Marsh Management

XCS-48N STRUCTURE AT LA HWY. 27 WEST OF HOLLY BEACH

Location

The project is located in Cameron Parish, Louisiana in the south central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 49). It is bordered by LA 82 on the south, Beech Canal on the west, LA 82 on the south and LA 27 on the east. The project area is comprised of 12,007 acres of fresh to intermediate marsh and open water.

Problems and Opportunities

In the past, this area was a relatively stable intermediate marsh. Presently the marsh is beginning to deteriorate in the west central and southeastern portion of the unit due to excessive water levels. There is an opportunity to improve productivity of this wetland through passive marsh management that will improve water exchange in the area. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This project calls for the addition of a variable crest weir header to an existing culvert under LA 27.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $224,000.

Effects and Issues

This water control structure will improve water circulation in this marsh and thus promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife. Fisheries access will continue to be reduced by the water control structure although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. It is a component of XCS-48 (SO-5) West Mud Lake Area. A feasibility study is required and it may be a candidate for future priority lists.

XCS-48 (NO-2) NORTHEAST BLACK LAKE MARSH MANAGEMENT

Location

The project is located in Cameron Parish, Louisiana in the northeast corner of the Calcasieu-Sabine River Basin Area (Figures 6 & 57). It is bordered by the GIWW on the north, Alkali Ditch on the east and Black Lake on the south. The project area is comprised of 1,359 acres of brackish and intermediate marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. In 1940, the project area was almost solid marsh that by 1983 had deteriorated to a large open water pond. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The project plans includes maintaining the existing perimeter levee system, installing a freshwater introduction structure in the northern boundary and replacing two water control structures on the south boundary with variable crest, flapgated structures and installing an 18" flapgated culvert for fisheries access. Vegetative plantings will be used for shoreline protection and to improve the vegetative productivity of the shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 10 acres, enhance 73 acres of emergent marsh and stimulate growth of aquatic vegetation by 303 acres for a net benefit of 386 acres. The estimated cost of the project is $1,954,000.

Effects and Issues

Stabilizing salinity and water level spikes, introducing freshwater, periodic draw-downs and vegetative plantings will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures and during periods of draw-down, however, productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

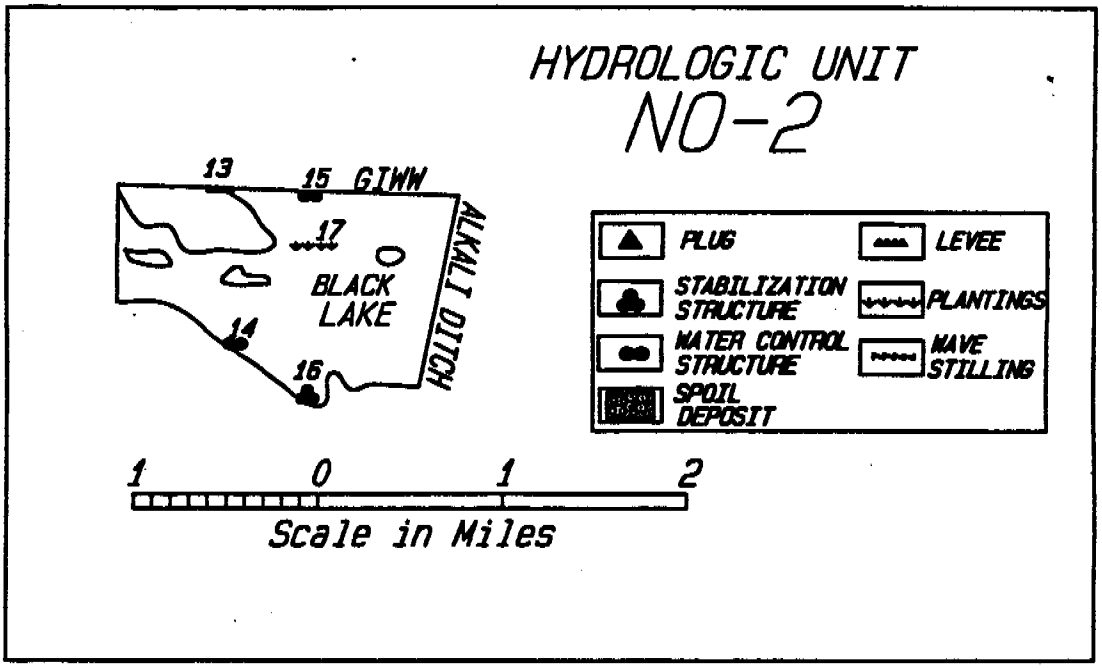

Figure 57. XCS-48 (NO-2) Northeast Black Lake Marsh Management

CS-1B HOLLY BEACH TO CALCASIEU PASS SHORELINE PROTECTION

Location

The project area extends along a 6.6 mile (35,000 ft) area of Gulf of Mexico shoreline from Holly Beach to Calcasieu Pass in Cameron Parish. The project area is bounded to the west by Holly Beach, to the east by Calcasieu Pass , to the north by La. Hwy. 82, and to the south by the Gulf of Mexico. It is 1,614 acres in size (Figures 6 and 58).

Problems and Opportunities

This section of Cameron Parish chenier beach ridge shoreline has been eroding at an average of 4.0 m/yr. Much of the beach fronting this project area has been eroded except for the eastern end near Calcasieu Pass which is influenced by a jetty. La. Highway 82 is the only remaining barrier protecting brackish and intermediate marshes to the north from direct wave attack and rapid destruction by intrusion of Gulf waters. This project presents the opportunity of halting beach erosion in this area which will prevent saltwater intrusion and tidal scour from the Gulf from causing marsh loss in the immediate project area between the Gulf and Hwy. 82 and to the marshes immediately north of the project. The project should also stimulate the accretion of sand on the beach which will add further protection from erosion in the future. The project is not as critical as the CS-1a or CS-1c and should be completed after these.

Description of Features

The project features is the construction of approximately 6.6 miles (35,000 ft) of segmented rock breakwaters of same design as had been installed for projects CS-1a and CS-1c. The breakwaters should be 150' in length, 10' wide at the crown, with 3:1 side slopes. The breakwaters will be placed 300 to 500' offshore in 4' of water on 300' centers. This project will complete the shoreline protection from Calcasieu Pass to Johnson's Bayou in the west, a distance of approximately 18 miles.

Benefits and Costs

The area contains 1,184 acres of brackish marshes and beach and 430 acres of open water for a total of 1,614 acres. The Holly Beach to Calcasieu Pass Shoreline Protection project is expected to create or restore 41 acres of beach and saline marsh, protect 49 acres of saline and brackish marsh, stimulate the production of 97 acres of aquatic vegetation and enhance 114 acres of marsh for a total benefit to 301 acres. The rough estimated project cost is $5,734,000.

Effects and Issues

The project will protect wetlands in a 1,614 acre project area between the Gulf and Hwy. 27. It will also stimulate the building of additional barrier beach between

Holly Beach and Calcasieu Pass. This project will have the added benefits to the protection of property infrastructure in the area namely the communities of Holly Beach and La. Hwy. 27. The segmented breakwaters provide for enhanced recreational and commercial fisheries opportunities in the area by creating artificial reefs. The breakwaters will have to be built so that they do not pose a hazard to navigation.

Status

This is a State Coastal Wetlands Conservation and Restoration Program project which is presently in the feasibility phase. The state is presently evaluating the success of CS-1a and CS-1c and the need for additional shoreline protection work in this area.

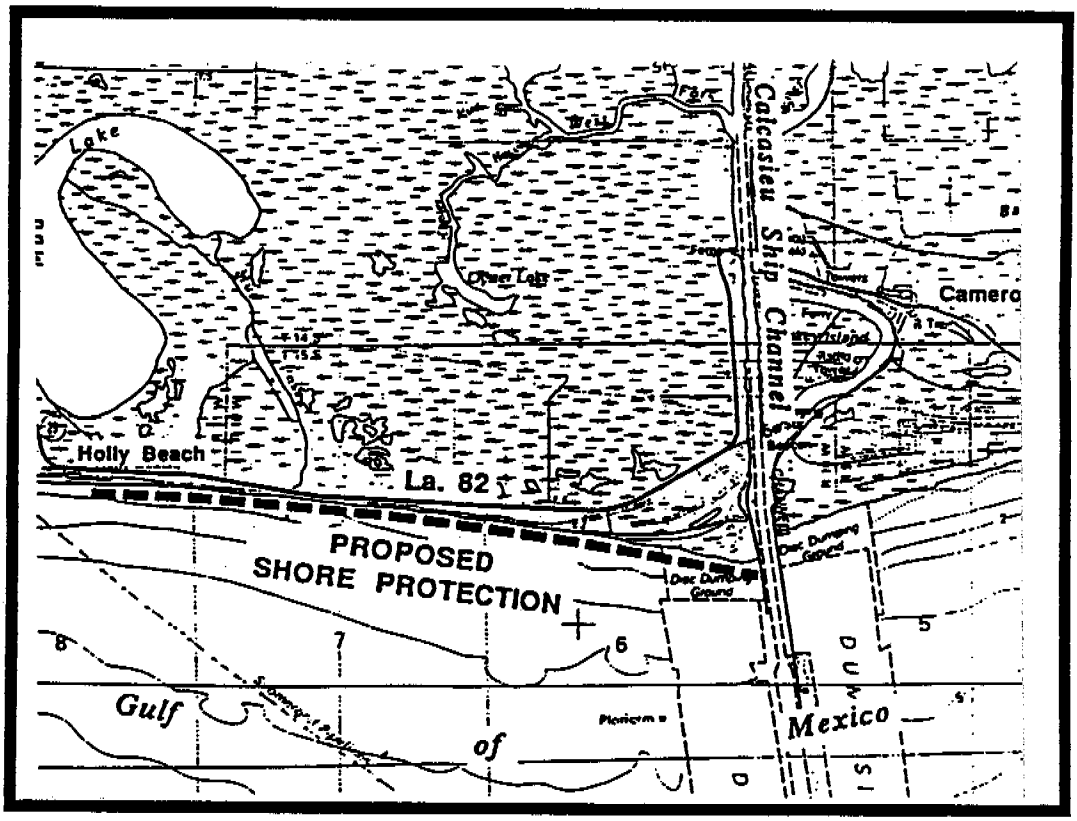

Figure 58. CS-1B Holly Beach To Calcasieu Pass Shoreline Protection

CS-7 WEST BLACK LAKE SHORE PROTECTION

Location

The project is located along the western shoreline of Black Lake adjacent to the east side of a Amoco Production Company's 6,600 acre West Black Lake Management Area, approximately 2.5 miles northwest from Hackberry, La in Cameron Parish (Figures 6 and 59).

Problems and Opportunities

The West Black Lake management area is maintained as a freshwater impoundment by a system of levees that must remain intact for continued management success. The west shoreline of the lake is currently experiencing a high rate of erosion from wave energy across Black Lake. The objective of this project is to protect the management levee from wave erosion by re-enforcing an existing wave-break levee. The project provides an opportunity to maintain the integrity of the eastern levee of the management area. If this levee is breached, saltwater intrusion from Black Lake will destroy the fresh marsh vegetation within the management area and the area will return to open water. Marsh gains have been made in this management are over the past 5 to 7 years due to management.

Description of Features

The project components consist of armoring approximately 4,300 ft of existing wave-break levee along the western shoreline of Black Lake with R-5 graded rip-rap stone. Revetment dimensions will be approx. 30'W x 4,300'L x 2'D

Benefits and Costs

The immediate project area contains 120 acres of fresh marshes and 6,500 acres of open water for a total of 6,620 acres. The Boudreaux Lake Project is expected to protect 120 acres of brackish marsh and the existing aquatic vegetation within the management area and enhance 520 acres of marsh for a total benefit to 640 acres. The rough estimated project cost is $743,000.

Effects and Issues

The project will help to maintain the eastern levee of the AMOCO West Black Lake marsh management project. The management area covers over 12,000 acres of fresh marsh. If the levee were to be eroded, the integrity of the entire management plan would be in danger. The result will be the maintenance of the existing protected marsh within the managed area.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

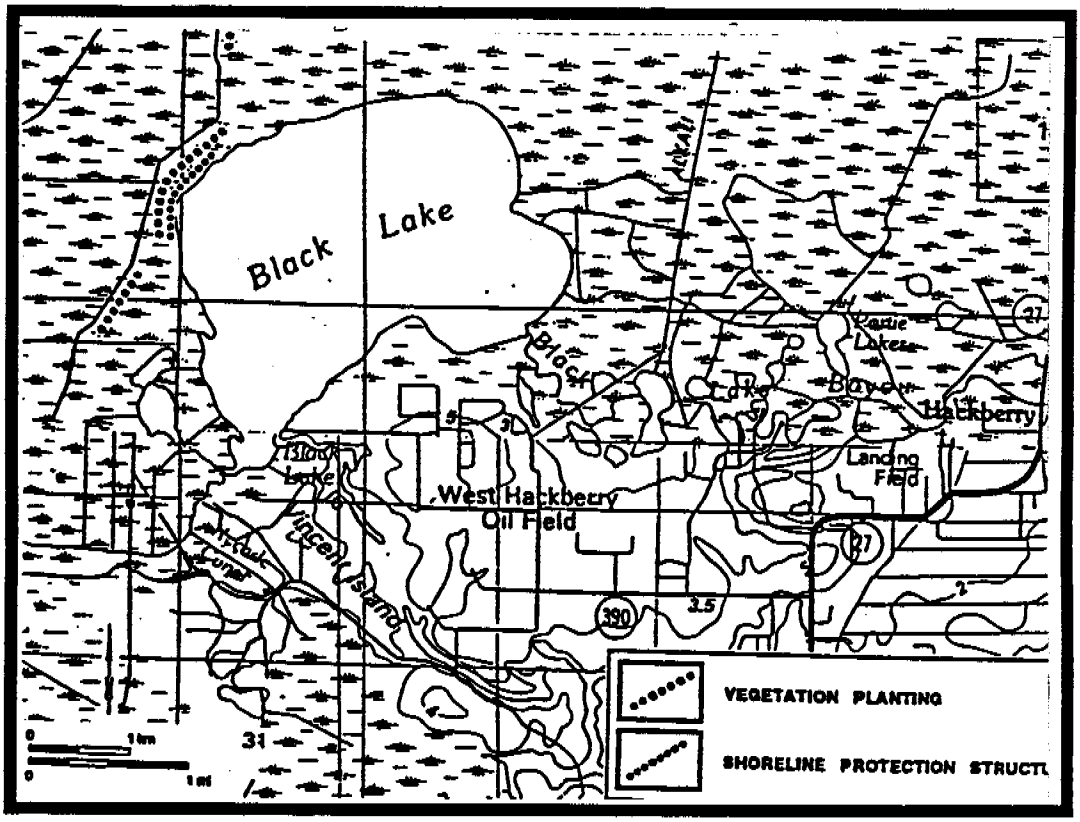

Figure 59. CS-7 West Black Lake Shore Protection

PCS-2 (SO-2) BREAKWATER AT LOUISIANA POINT

Location

The project is located in Cameron Parish east of the jetty at Louisiana Point east of the mouth of the Sabine River and the Gulf of Mexico. The project is bounded by the mouth of the Sabine River to the west, the Gulf of Mexico to the south, and the Gulf shoreline to the north. It is located about 10 miles southwest from Johnsons Bayou, La. at Sabine Pass (see Figures 6 and 92). The project may benefit a total of 93 acres of saline marshes and Gulf beach shoreline.

Problems and Opportunities

Shoreline erosion is occurring along this stretch of the La. Gulf coast possibly caused by the jetties at the mouth of the Sabine River trapping sediment before it can get to the shoreline. This project will provide for shoreline protection along three (3) miles of gulf shoreline east of Louisiana Point. Existing saline marshes located behind the beach will be protected from erosion from encroaching gulf wave action.

Description of Features.

This is a shoreline stabilization project which consists of placing rip- rap segmented breakwaters of similar design as those described in CS-1a, CS-1b, and CS-1c extending three miles to the east of Louisiana Point. The breakwaters should be 150' in length, 10' wide at the crown, with 3:1 side slopes. The breakwaters will be placed 300 to 500' offshore in 4' of water on 300' centers.

Benefits and Costs.

The area contains 73 acres of saline marshes and 250 acres of open water for a total of 323 acres. The Louisiana Point Breakwater project is projected to protect 73 acres and enhance another 20 acres of saline marsh for a total benefit to 93 acres. The estimated project cost is $2,227,000.

Effects and Issues.

This project will benefit about 93 acres of saline marshes and beach habitat in the vicinity of Louisiana Point near the Louisiana's southwestern border with Texas. The project should reduce Gulf of Mexico shoreline erosion and accelerate the deposition of sand to help accretionary processes in this area. Salt marsh and beach dune fish and wildlife species will be benefited by the project. There has been some discussion as to exactly how much erosion has occurred at Louisiana Point.

Status.

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin plan.

PCS-4 SHORELINE PROTECTION AT LONG POINT LAKE

Location

The project is located in Cameron Parish at Long Point west of the Calcasieu Ship Channel. The project is bounded by the Calcasieu Ship Channel to the east and Long Point Bayou to the west. It is located about six miles south from Hackberry, La (see Figures 6 and 60). The project may benefit a total of 25 acres of saline marshes.

Problems and Opportunities

Shoreline erosion is occurring along this stretch along the mouth of Long Point Bayou and the Calcasieu Ship Channel. Ship channel boat wakes and increased tidal amplitude may be the prime causes of this erosion. This project will provide for shoreline protection for 25 acres at the mouth of Long Point Bayou. Existing saline marshes located adjacent to the bayou will be protected from further erosion.

Description of Features.

This is a shoreline stabilization project which consists of placing vegetative plantings and waver stilling devices at the mouth of Long Point Bayou.

Benefits and Costs.

The area contains 25 acres of saline marshes. The Long Point Bayou shoreline protection project is projected to protect 25 acres of saline marsh. The estimated project cost is $710,500.

Effects and Issues.

This project will protect about 25 acres of saline marshes in the vicinity of the mouth of Long Point. The project should reduce Calcasieu Ship Channel shoreline erosion and accelerate the deposition of sediment in this area. Salt marsh fish and wildlife species will be benefited by the project. Structures will have to be implemented not to interfere with navigation.

Status.

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin plan.

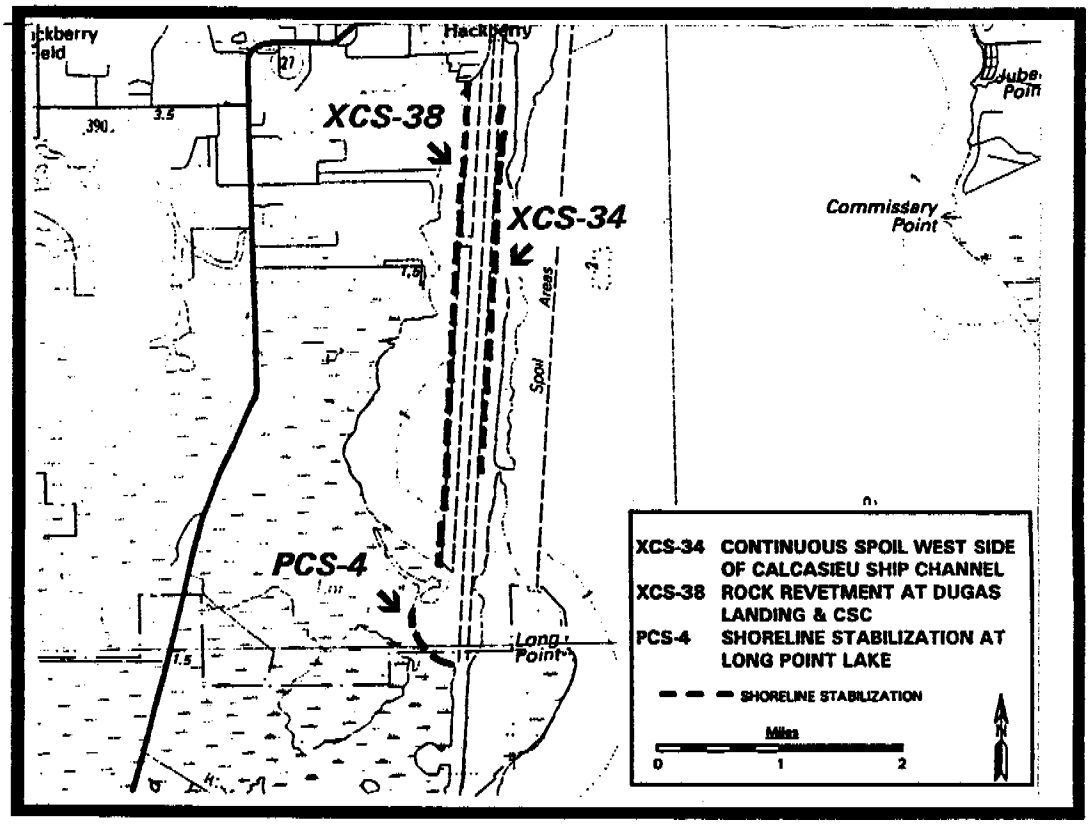

Figure 60. PCS-4 Shoreline Protection At Long Point Lake

PCS-29 RIP-RAP STRUCTURE AT HEBERT-PRECHT CANAL & WELFARE RIDGE

Location.

The Hebert-Precht freshwater introduction structures are located in the northeastern section of the Cameron-Creole Watershed Project approximately three miles west of Gibbstown Bridge south of the GIWW. The Welfare Bridge control structures are located approximately one mile north of the Little Chenier ridge immediately east of La. Hwy. 27 (see Figures 6 and 61). The Welfare Bridge structures and the Big Burn are technically within the Mermentau Basin. The Herbert-Precht diversion structures are part of the Cameron-Creole Watershed management project and the Welfare Bridge structures are part of the Big Burn management area. The project will benefit about 250 acres of fresh marsh within the management areas.

Problems and Opportunities.

The Calcasieu Ship Channel has caused an increase of salt water and water level fluctuations and tidal amplitudes within the entire Calcasieu Lake system. This has caused increased marsh loss in the areas surrounding the lake, especially in the Cameron-Creole Watershed east of Calcasieu Lake. The Cameron-Creole Watershed Management Project consists of control structures and a 19 mile levee along the eastern rim of Calcasieu Lake to attempt to reduce this saltwater intrusion and increased water level fluctuations. The Hebert-Precht canal freshwater diversion structures divert freshwater from the GIWW into the Cameron-Creole Watershed area. Erosion is occurring near the structures. The Welfare-Bridge structures help to prevent saltwater intrusion into the Big Burn area north of Little Chenier. They are also experiencing erosion. Protecting these structures from shoreline erosion will help to maintain them. Project CS-4a/PCS-7 allows for the maintenance of the Cameron Creole Project for at least another 20 years. This project therefore contains the Hebert-Precht portion but not the Welfare Bridge structure maintenance.

Description of Features.

This project involves protecting the Hebert-Precht and Welfare Bridge control structures from shoreline erosion by placing limestone rip-rap or similar material along the spoil banks adjacent to the structures.

Benefits and Costs.

The maintenance project may protect about 75 acres and benefit a total of 250 acres of fresh marsh in the Cameron-Creole and Big Burn management areas. The project benefits were not verified by the WVA Working Group. The estimated project cost is $126,000.

Effects and Issues.

This project will protect these freshwater diversion and management structures from shoreline erosion which may in turn benefit 250 acres of fresh marsh. The project will help to maintain the existing Cameron-Creole and Big Burn projects which include the goal of restoring area hydrology and preventing saltwater intrusion. Freshwater and

estuarine resident fish species as well as wildlife, especially waterfowl, will continue to be benefited by the maintenance project.

Status.

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin plan. The Hebert-Precht structure rip-rapping is wholly contained within the Cameron-Creole Maintenance Project (CS-4a/PCS-7) which was selected as a 1993 Priority List CWPPRA project. Presently, the structures are operated by Maimi Corporation personnel in coordination with the Cameron-Creole Watershed Project structure operational plan.

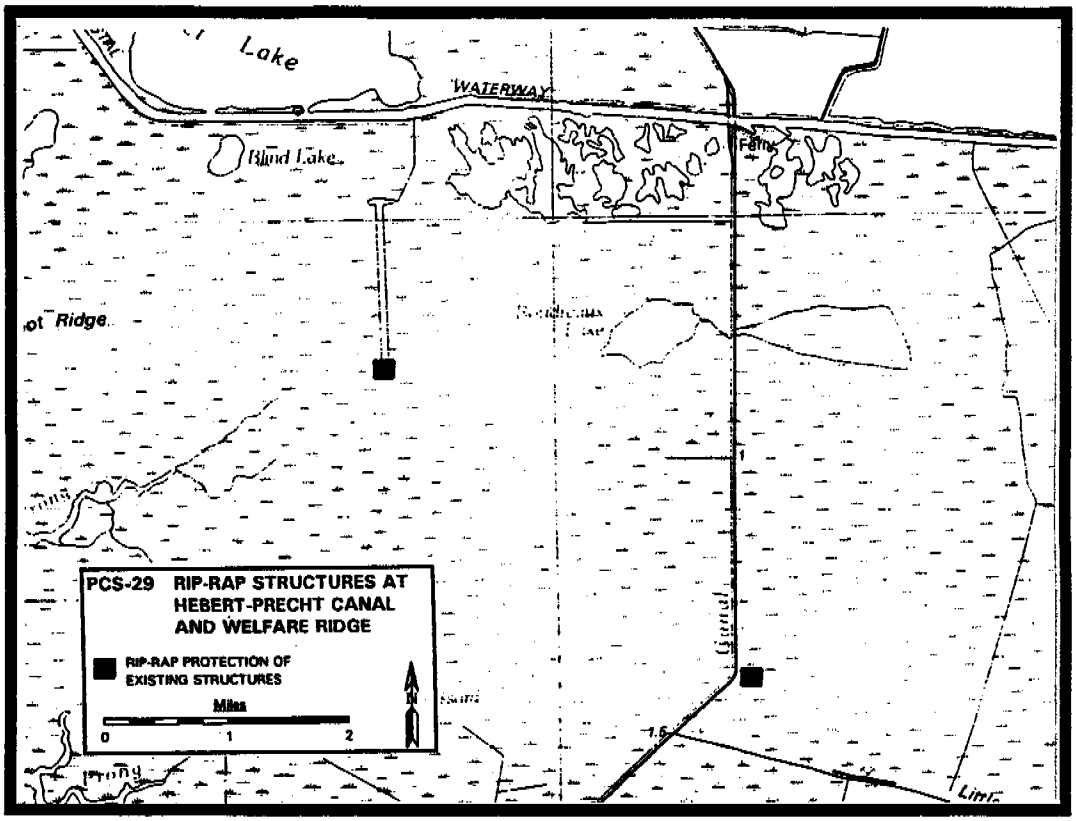

Figure 61 . PCS-29 Rip-Rap Structure At Hebert-Precht Canal & Welfare Ridge

PCS-32 BAYOU CHOUPIQUE BANK STABILIZATION

Location

The project is located in Calcasieu Parish north of the GIWW about 5 miles north of Hackberry, La., one mile west from the Calcasieu Ship Channel and about one mile east from the Ellender Bridge and La. Hwy. 27. The project is bounded by the Gulf Intracoastal Waterway to the south and the banks of Bayou Choupique to the east and west (see Figures 6 and 16). The project may benefit a total of 30 acres of brackish and saline marshes.

Problems and Opportunities

Shoreline erosion in the vicinity of Bayou Choupique has been caused by boat wakes and wave action from the GIWW in addition to water level fluctuations caused by the Calcasieu Ship Channel and the GIWW. This shoreline protection project will reduce shoreline erosion along Bayou Choupique through vegetative plantings and wave stilling devices.

Description of Features.

The project features consist of the installation of vegetative plantings and wave stilling devices near the mouth of Bayou Choupique and the GIWW.

Benefits and Costs.

Approximately 30 acres of brackish and saline marsh will be protected by the project. The estimated project cost is $667,000.

Effects and Issues.

This project will protect and benefit about 30 acres of brackish marsh in the vicinity of Bayou Choupique north of the GIWW. Brackish marsh fish and wildlife will benefit from the project by the reduction of shoreline marsh losses. The project should be designed so as to provide for any existing navigation.

Status.

This project is presently listed as a short term supporting project on the Calcasieu-Sabine Basin Plan for the CWPPRA. It supports the preferred "Perimeter Plan" basin-wide restoration strategy.

XCS-34 CONTINUOUS SPOIL ALONG THE WEST SIDE OF CALCASIEU SHIP CHANNEL

Location

The project is located in Cameron Parish between Long Point Bayou and Hackberry along the Calcasieu Lake western shoreline west of the Calcasieu Ship Channel. The center of the area is about 2.5 miles south from Hackberry, La. The project is bounded by the Calcasieu Ship Channel to the east, Long Point Bayou to the south, the western shoreline of Calcasieu Lake to the west and Hackberry, La. to the north (see Figures 6 and 60). The project may benefit an undetermined amount of saline marshes.

Problems and Opportunities

Shoreline erosion and marsh loss is occurring along this stretch of Calcasieu Lake shoreline caused by the saltwater intrusion and water fluctuations of the Calcasieu Ship Channel. Ship channel boat wakes, saltwater intrusion and increased tidal amplitude may be the prime causes of this erosion. This project will provide for shoreline protection for marshes along the Calcasieu Lake shoreline from Long Point Bayou to the community of Hackberry to the north.

Description of Features.

This is a shoreline stabilization project which consists of placing continuous dredged spoil along the western side of the Calcasieu Ship Channel in this area from Long Point Bayou to Hackberry. This is a length of approximately 4 miles (21,120 ft.).

Benefits and Costs.

The area contains about 4,000 acres of saline marshes. The amount of marsh protected and benefited by this project is unknown. It's benefits were not reviewed by the WVA Working Group. The estimated project cost has not been determined. The maintenance dredging program of the U. S. Army Corps of Engineers for the Calcasieu Ship Channel may participate in portions of the costs if the project is approved for funding.

Effects and Issues.

This project will protect an undetermined amount of saline marshes from Long Point Bayou to Hackberry. The project should reduce Calcasieu Ship Channel shoreline erosion and perhaps accelerate the deposition of sediment in this area. Salt marsh fish and wildlife species will be benefited by the project. The spoil bank will have to be constructed so as not to interfere with navigation nor the access of the area by estuarine migratory fisheries organisms.

Status

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin plan. It supports the overall "Perimeter Plan" basin restoration strategy. The Long Point Lake Shoreline Protection Project (PCS-4) is related to this project.

XCS-37 ROCK DIKE EAST SIDE OF CALCASIEU SHIP CHANNEL

Location

The project is located in Cameron Parish at West Cove on the eastern side of the Calcasieu Ship Channel between miles 5.0 and 9.5. The project is bounded by the Calcasieu Lake shoreline to the south, the Calcasieu Ship Channel to the west and the West Cove Canal to the north. It is located about four miles north from Cameron, La. (see Figures 6 and 62). The project may benefit a total of 58 acres of saline marshes.

Problems and Opportunities

Shoreline erosion is occurring along this stretch along this portion of the east bank of the Calcasieu Ship Channel north of Cameron, La. Ship channel boat wakes and increased tidal amplitude may be the prime causes of this erosion. This project will provide for shoreline protection for 58 acres of saline marshes.

Description of Features.

This is a shoreline stabilization project which consists of placing rip-rap or other devices along washout areas in the eastern spoil bank of the Calcasieu Ship Channel from miles 5.0 to 9.5.

Benefits and Costs.

The area contains 50 acres of saline marshes and 25 acres of open water for a total project area of 75 acres. This Calcasieu Ship Channel shoreline protection project may protect approximately 50 acres and enhance another 7 acres of saline marsh for a total benefit to 58 acres. The estimated project cost is $2,087,000.

Effects and Issues.

This project will protect or enhance about 58 acres of saline marshes near West Cove in Calcasieu Lake. The project should reduce Calcasieu Ship Channel shoreline erosion to the marshes adjacent to the spoil banks from miles 5 to 9.5 along the CSC. Salt marsh fish and wildlife species will be benefited by the project. The rip-rap or other structures will have to be implemented so as not to interfere with navigation or the migration of estuarine fisheries organisms into and out of Calcasieu Lake.

Status.

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin plan. It supports the basin "Perimeter Plan" restoration strategy.

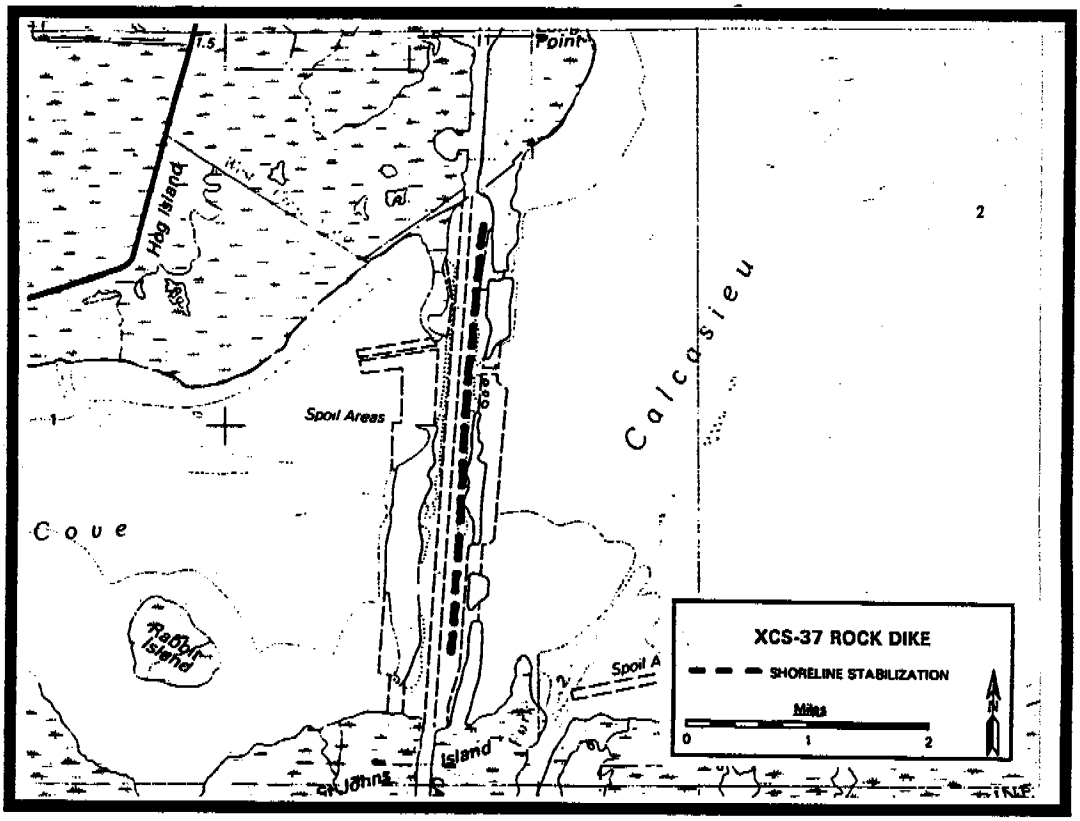

Figure 62 . XCS-37 Rock Dike East Side Of Calcasieu Ship Channel

XCS-39 TURNERS BAY ROCK REVETMENT

Location

The project is located in Calcasieu Parish at Turner's Bay in the northern portion of Calcasieu Lake, south of the GIWW about 5 miles north of Hackberry, La. The project is bounded by the Calcasieu River and Ship Channel to the west and north and Calcasieu Lake to the south (see Figures 6 and 16). The project may benefit a total of 61 acres of saline marsh.

Problems and Opportunities

Shoreline erosion and hydrologic alterations caused from the Calcasieu Ship Channel have caused marsh loss in the vicinity of Turner's Bay in the northern portion of Calcasieu Lake. This shoreline protection project will reduce shoreline erosion along the southern shoreline of Turner's Bay by the installation of a rock revetment.

Description of Features.

The project features consist of the installation of a limestone rip-rap revetment along the southern portion of Turner's Bay at its intersection with Calcasieu Lake.

Benefits and Costs.

The area contains about 30 acres of saline marsh and 100 acres of open water for a total of 130 acres. Approximately 30 acres of saline marsh and 25 acres of submerged vegetation will be protected by the project and 6 acres will be enhanced for a total benefit to 61 acres . The estimated project cost is $1,087,000.

Effects and Issues.

This project will protect and benefit about 61 acres of marsh at Turner's Bay. Saline marsh fish and wildlife will benefit from the project by the reduction of shoreline marsh losses. The project should be designed so as to provide for any existing navigation and the migration of estuarine fisheries organisms into the area.

Status.

This project is presently listed as a short term supporting project on the Calcasieu-Sabine Basin Plan for the CWPPRA. It supports the preferred "Perimeter Plan" basin-wide restoration strategy.

XCS-48 (NO-4) WEST BLACK LAKE MARSH MANAGEMENT

Location

The project is located in Cameron Parish, Louisiana in the northeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 63). It is bordered by Black Lake on the east, and management levees on the north, west, and Shell Road on the south. The project area is comprised of 5,342 acres of intermediate marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. In 1953, aerial photography shows the project area as almost solid marsh that by 1985 had deteriorated to a large open water pond. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations, and lower water levels periodically to stimulate the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be actively managed for intermediate emergent marsh. The project plans include maintaining the existing perimeter levee system, management using the existing water control structures to control salinity and water levels, shoreline protection measures on the eastern boundary adjacent to Black Lake, and vegetative plantings will be used for shoreline protection and to improve the vegetative productivity of the shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 242 acres, enhance 269 acres of emergent marsh and stimulate growth of aquatic vegetation by 1,251 acres for a net benefit of 1,763 acres. The estimated cost of the project is $1,282,000.

Effects and Issues

Stabilizing salinity and water level spikes, periodic draw-downs and vegetative plantings will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures and during periods of draw-down, however, productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-7) West Black Lake Shore Protection. A feasibility study is required and it may be a candidate for future priority lists.

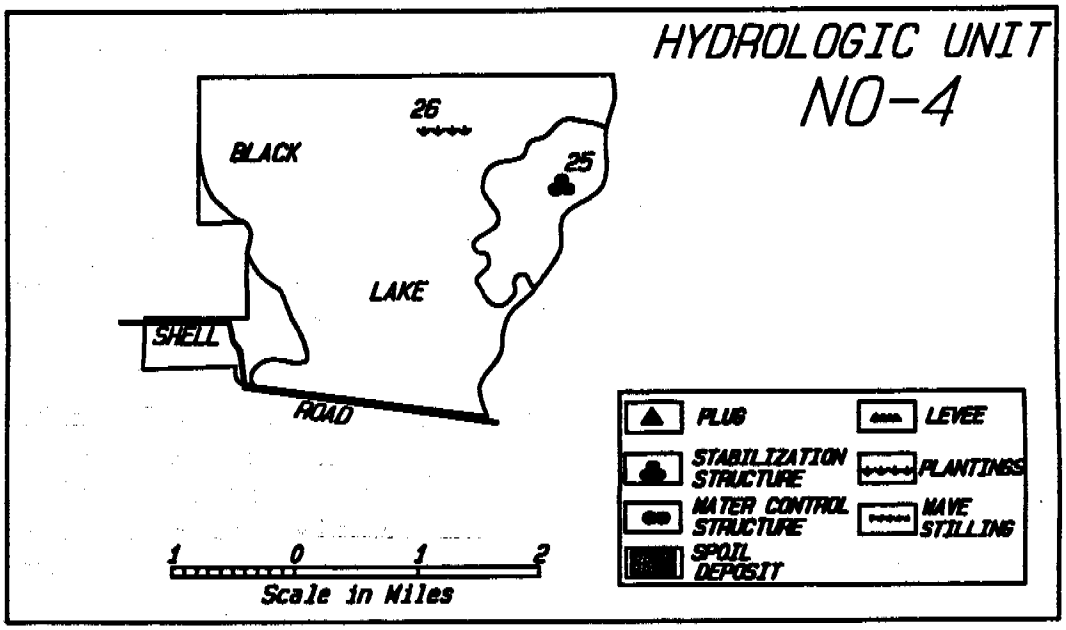

Figure 63. XCS-48 (NO-4) West Black Lake Marsh Management

XCS-48 (SO-2) SOUTHWEST JOHNSON'S BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the southwest quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 64). It is bordered by LA 82 on the north, Sabine Pass on the west, and the Gulf of Mexico on the south. The project area is comprised of 30,585 acres of intermediate to brackish marsh and open water.

Problems and Opportunities

In the past, this area was a relatively stable brackish and saline marsh. Presently the marsh is beginning to deteriorate in the central and west central portions of the unit. There is an opportunity to improve productivity of this wetland through a combination of shoreline stabilization and hydrologic restoration. This project is compatible with the basin strategies of treating critical areas of wetland loss within the basin's interior and protecting the shoreline of the Gulf of Mexico.

Description of Features

Project features include approximately 3 miles of segmented rock breakwaters of similar design to those at Holly Beach to begin at Sabine Pass and extend eastward. A rock weir will be installed at Lighthouse Bayou at Sabine Pass. Dredged material from Sabine Pass will be used beneficially to restore land lost to erosion and to create and maintain a beach rim. Two water control structures will be placed at the North-South Canal near the terminus of Lighthouse Bayou to protect the intermediate marsh from saltwater intrusion.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 891 acres, enhance 1,093 acres of emergent marsh and stimulate growth of aquatic vegetation by 1,010 acres for a net benefit of 2,994 acres. The estimated cost of the project is $4,719,000.

Effects and Issues

Rock breakwaters will reverse erosion along this stretch of gulf shoreline by promoting sediment deposition landward of the breakwaters. Water control structures will reduce saltwater intrusion and channel constrictions will reduce excessive water exchange in this marsh for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

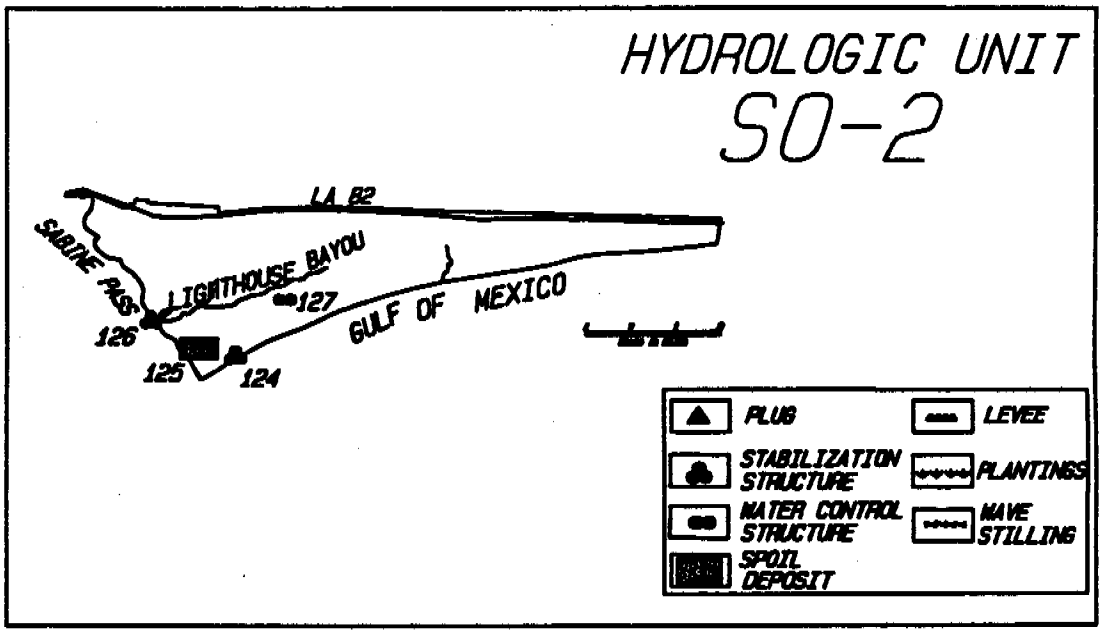

Figure 64. XCS-48 (SO-2) Southwest Johnson's Bayou Unit

XCS-36 COMPOST DEMONSTRATION PROJECT

Location

The project is located in Cameron Parish south of Browns Lake and north of Black (Kelso) Bayou about 1.5 miles north from Hackberry, La. The project area is bounded to the south by Black or Kelso Bayou, to the west by the Alkali Ditch, to the north by Browns Lake and to the east by La. Hwy. 27 (see Figures 6 and 65). The project may benefit a total of 10 acres of brackish and saline marshes.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Calcasieu Ship Channel, the Alkali Ditch to the west, the GIWW, the oil and gas canals north of Hackberry, and the removal of the sand bar at the mouth of the Calcasieu River. This compost demonstration project has the goals of increasing elevations in shallow water areas to stimulate marsh revegetation.

Description of Features.

The project features consist of the placement of compost in shallow open water areas to stimulate marsh revegetation.

Benefits and Costs.

Approximately 10 acres of brackish and saline marshes may be restored and protected by the project. The rough estimated project cost is $250,000. The benefits nor the costs have been verified by the WVA or Engineering Working Groups.

Effects and Issues.

This project may protect and benefit about 10 acres of brackish and saline marshes by adding organic material, in the form of compost, to shallow water areas and stimulating marsh revegetation. Brackish and saline marsh fish and wildlife will benefit from the project.

Status.

This project is a short term supporting project in the Calcasieu-Sabine Basin Plan. It is supportive of the preferred "Perimeter Plan" for the basin. The Browns Lake south management project [XCS-48 (NO-5] and the Kelso Bayou project (PCS-14) will also benefit this area.

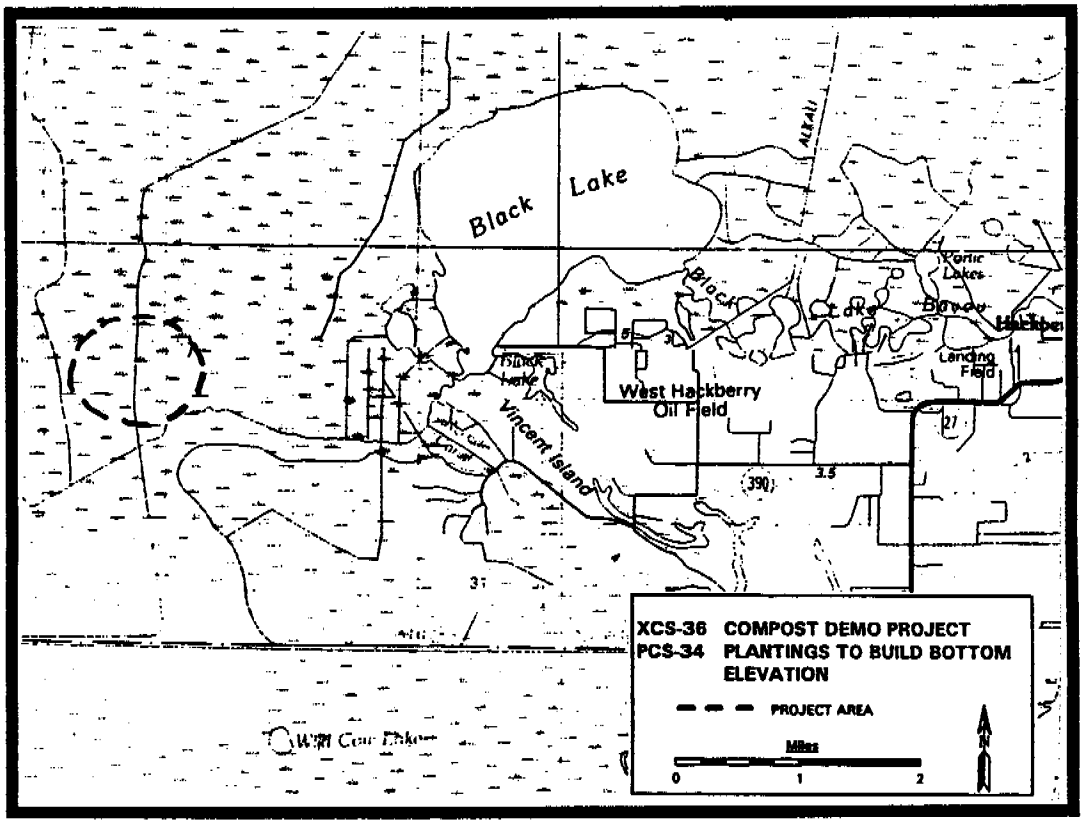

Figure 65. XCS-36 Compost Demo Project

XCS-48 (NO-8) SOUTHWEST BLACK LAKE MANAGEMENT AREA

Location

The project is located in Cameron Parish, Louisiana in the northeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 66). It is bordered by Shell Road on the north, Starks North Canal on the south. The project area is comprised of 11,700 acres of brackish marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. This area converted from marsh to open water between 1956 and 1978. A few small areas of marsh remain in the southeast section of the area. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland through passive management by stabilizing salinity, rapid water level fluctuations to maintain and enhance emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for intermediate emergent marsh. The project plans include maintaining the existing perimeter levee system, management using the passive water control structures such as variable crest weirs to control salinity and water levels, wave stilling/sediment trapping devices, and vegetative plantings for shoreline protection and to improve the vegetative productivity of the shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 29 acres, enhance 408 acres of emergent marsh and stimulate growth of aquatic vegetation by 1,146 acres for a net benefit of 1,583 acres. The estimated cost of the project is $2,474,000.

Effects and Issues

Stabilizing salinity and water level spikes will stimulate wetland productivity and wave stilling/sediment trapping devices coupled with vegetative plantings will create new habitat for the benefit of wetland dependent fish and wildlife populations. Fisheries access may be reduced by water control structures although resident fisheries may be enhanced by the project. Boat access to some parts of the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

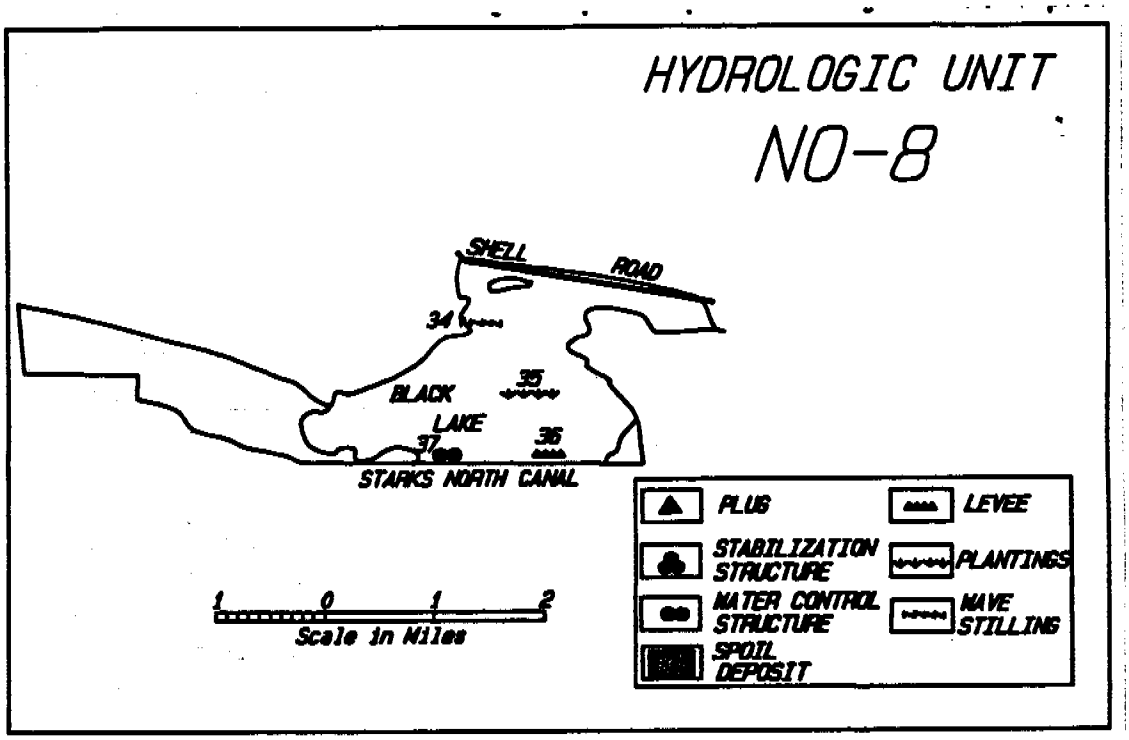

Figure 66. XCS-48 (NO-8) Southwest Black Lake Management Area

XCS-48 (NO-8A) SOUTH GUM COVE PASSIVE MANAGEMENT

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 67). It is bordered by Starks North Canal on the south and management levees on the north and west. The project area is comprised of 1,133 acres of broken intermediate marsh and open water.

Problems and Opportunities

The marshes in the vicinity of Black Lake have suffered some of the most dramatic losses in the state. This area was historically fresh marsh and has converted to open water and highly broken intermediate marsh.. Construction of the Calcasieu Ship Channel, the Alkali Ditch and the GIWW increased the number of water exchange points for Black Lake leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland through passive management through the use of wave stilling/sediment trapping devices. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for intermediate emergent marsh. The project plans are to install 20,000 linear feet of wave stilling/sediment trapping devices in shallow open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 101 acres, enhance 46 acres of emergent marsh and stimulate growth of aquatic vegetation by 117 acres for a net benefit of 264 acres. The estimated cost of the project is $230,000.

Effects and Issues

Installing wave stilling/sediment trapping devices coupled protect and enhance habitat for the benefit of wetland dependent fish and wildlife populations. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

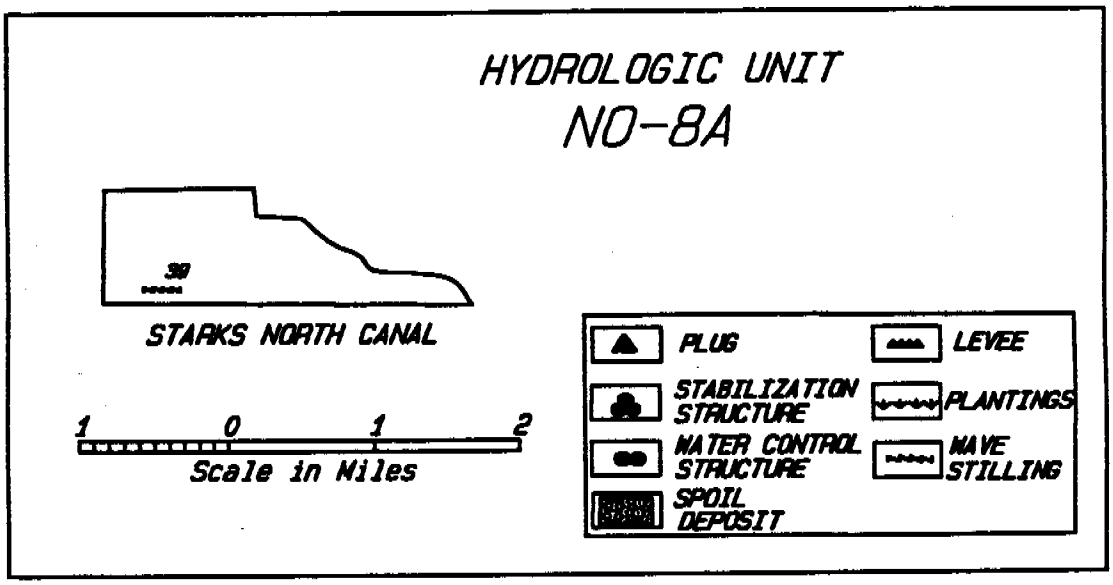

Figure 67. XCS-48 (NO-8A) South Gum Cove Passive Management

XCS-48 (SA-1) BROWNS LAKE STARKS CANAL AREA

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 68). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Starks North Canal, on the west by the Beach Canal, on the south by Starks Central Canal and Back Ridge Canal, and on the east by LA 27. The project area is comprised of 14,500 acres of low salinity brackish marsh and open water.

Problems and Opportunities

The land was mapped in 1931 and was found to be a fresh and intermediate wetland. The 1949 vegetative map shows the central eastern part of the unit to be sawgrass marsh, and the remaining area is an intermixing of fresh and intermediate marsh. The 1968, 1978, and 1988 vegetative maps document a slow conversion from an intermediate to brackish marsh environment. By 1978 about one-third to one-half of the unit had converted from marsh to open water. Examination of 1983 and 1988/89 color infrared aerial photography indicates that broken marsh throughout the northern and eastern (adjacent to Backridge Canal) portions of SA-1 experienced a marsh gain. Those gains occurred primarily as clusters of small islands welded together. This appears to be a reversal of the previous deterioration trend. Despite this trend erosion of marsh edges continues in some areas. The remainder of the unit appeared to be relatively unchanged over the same period of time.

This reversal of marsh deterioration might be due to the construction of the water control structure at Hog Island Gully in 1981, the construction of board road (approximately 1985) extending westward from Louisiana Highway 27 then northward from near the western side of Brown's Lake, and to the accelerating colonization of shallow water areas by smooth cordgrass, Spartina alterniflora. The Hog Island Gully structure and the board road reduced saltwater intrusion and tidal exchange. Lower salinities allowed seashore, Paspalum vaginatum, to colonize pond edges and encroach outward as it trapped suspended organic material. Adjacent to Backridge Canal, marsh expansion is attributed primarily to reduced tidal scour and expansion of smooth cordgrass into shallow water areas.

The primary threat to marshes within the area is the waterlogging and break-up of interior brackish marsh. This coupled with salinities that preclude vigorous growth of cattail, bullwhip, sawgrass, and other intermediate marsh plants would result in accelerated marsh deterioration and loss. Proposed elements address these problems by establishing more effective salinity control capabilities and by providing for additional water discharge capabilities to avoid ponding of excess water following floods or storm tidal surges. Wave stilling and sediment trapping devices are proposed in large open water areas to reduce wind-induced erosion of marshes. Other features serve to correct small scale hydrologic problems within Unit SA-1. This project is compatible with the basin strategy of treating critical areas of wetland loss within the interior of the basin.

Description of Features

The objective for the hydrologic unit is to reduce excess water ponding by improving water discharge capacity and controlling salinity. Project components include replacement or modifications to the existing water control structures at Hog Island Gully and West Cove. Additional elements include a water control structure adjacent to LA 27, plugging of the West Cove Canal near the Calcasieu Ship Channel, a water control structure on North Line Canal, water control structures at Headquarters Canal and Long Point Bayou. Canal plugs adjacent to Back Ridge Canal would reduce sloshing of water through Back Ridge Canal, conserve freshwater discharged from Units SA-1a and SA-1b reducing the loss of eroded and resuspended sediment. A rock weir adjacent to Starks Central Canal would reduce salt water intrusion via the oil field ditch. Spoil bank restoration and installation of wave dampening/sediment trapping devices is called for is called for in some areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 87 acres, enhance 2,233 acres of emergent marsh and stimulate growth of aquatic vegetation by 4,263 acres for a net benefit of 6,583 acres. The estimated cost of the project is $1,619,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study. Replacement or modifications to the existing water control structures at Hog Island Gully and West Cove (XCS-47, 48i, 48j, and 48p) was a selected project on the 1993 CWPPRA third priority list. A feasibility study is required and it may be a candidate for future priority lists.

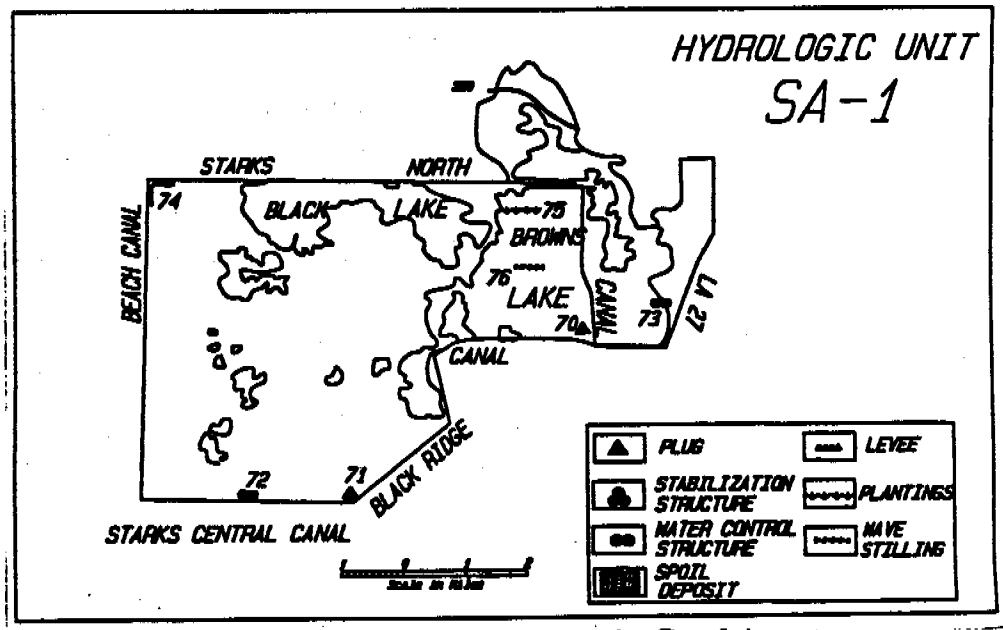

Figure 68. XCS-48 (SA-1) Browns Lake Starks Canal Area

XCS-48 (SA-6) DEEP LAKE BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the west central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 69). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Willow Bayou Canal, on the south by South Starks Canal, on the east by the Burton Sutton Canal, and on the west by the Deep Bayou Canal. The project area is comprised of 2,000 acres of intermediate marsh and open water.

Problems and Opportunities

During the mid 1950's, the northwest portion of the unit consisted of a deep fresh marsh characterized by sawgrass and bullwhip. Sawgrass and associated low-salinity vegetation located in the deep fresh marsh area experienced rapid deterioration and loss during the mid 1950's through the 1960's. These changes occurred throughout the study area suggesting that a basin-wide salinity increase had occurred. Examination of 1981 and 1989 color infrared aerial photography reveals that substantial marsh recovery has occurred along of the southern shore of the large open water area. In 1983, that shoreline was very broken and appeared to be a deteriorating condition. The 1988 photo shows that the shoreline had become much more uniform (less broken) and had encroached outward across the mouths of small bays and indentations. Additionally, many island clusters welded together to form one or more larger islands. Many small isolated islands did disappear, presumably due to erosion. Most interior areas showed little change over that period.

Currently the area consists primarily of intermediate marsh. The former deep fresh marsh area in now mostly turbid open water with a few deteriorating marsh islands. Marshes in the southern half of the area are relatively isolated from tidal influences, characterized by fresh marsh vegetation, and appear to have experienced minimal change.

Recent aerial inspection revealed that cattail occurs with fair to moderate frequency throughout much of the interior broken marsh. If salinities remain favorable, these and other low-salinity plant species might be able to colonize shallow open water areas and heal broken marsh areas. Despite the colonization by cattails, Spartina patens appears to be stressed and dying in some areas. Consequently, preservation of marshes within the area will depend heavily upon the expansion of cattails and other aggressive low-salinity emergent marsh species. Preservation features must avoid causing increased water levels since that would likely promote accelerated rates of Spartina loss.

The major factor causing marsh loss within Unit SA-6 is wind-induced erosion of marshes adjacent to large open water areas and continued loss of broken marsh areas. Eroded and suspended marsh soils are being exported out of the unit through several breaks in the Willow Bayou Canal spoil bank. The plan objective of this hydrologic unit is to enhance the present vegetation. Measures proposed to reduce saltwater intrusion into surrounding units are anticipated to provide protection against intrusion of saltwater into Unit SA-6. This project is compatible with the basin strategy of treating critical areas of marsh loss within the basin's interior.

Description of Features

The plan objective of this hydrologic unit is to enhance the present vegetation. Measures proposed to reduce saltwater intrusion into surrounding units are anticipated to provide protection against intrusion of saltwater into Unit SA-6. This may stimulate increased colonization of intermediate marsh species resulting in restoration of broken marsh areas. Wave stilling devices and vegetation in the open water areas would reduce erosion of marsh edges, reduce turbidity, and increase the abundance of submergent vegetation. Rock weirs would serve to maintain the desired amount of water exchange between area marshes and Willow Bayou and Burton Canals.

Benefits and Costs

Rapid protocol Wetland Value Assessment indicates that the project will protect 5 acres, enhance 342 acres of emergent marsh and stimulate growth of aquatic vegetation by 442 acres for a net benefit of 789 acres. The estimated cost of the project is $1,185,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

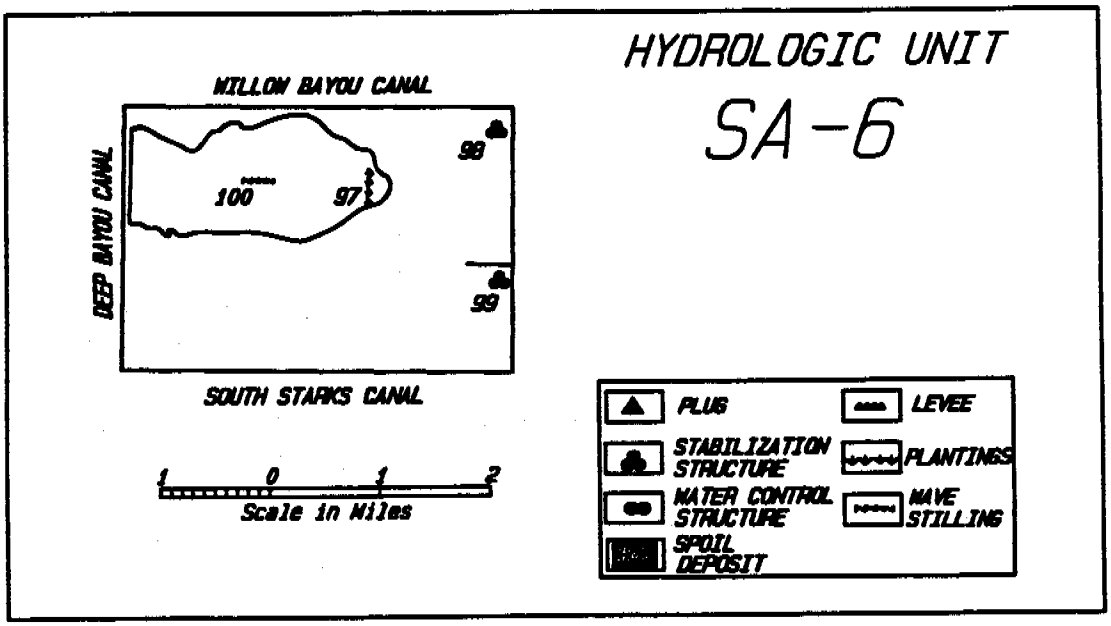

Figure 69. XCS-48 (SA-6) Deep Lake Bayou Unit

CS-15 BOUDREAUX-BROUSSARD MARSH PROTECTION

Location

The 812 acre project area is located between at Boudreaux Lake west of LA Hwy. 27 in the east central Cameron-Creole Watershed Project area, about 3.5 miles north-northwest of Creole, La. in Cameron Parish. Broussard Lake is located west of LA Hwy. 27 near its junction with Cottonwell Road (Figures 6 & 70). .

Problems and Opportunities

The intense marsh degradation that occurred prior to initiation of the Cameron-Creole Watershed Project in 1989 resulted in the formation of extensive areas of open water and broken marsh around Broussard Lake. Although implementation of the Cameron-Creole Watershed Project has lead to decreased salinities, re-growth of emergent marsh, and increased plant, wildlife, and fisheries diversity in the watershed as a whole, wind-induced erosion across the long fetches of open water and broken marsh in the project area continues to be a major problem (Delaney et al. 1991). The objective of this project is to demonstrate the use terracing as a means of converting shallow, open water areas into emergent marsh and small, open water ponds. This should result in increased productivity of submerged aquatic vegetation and protect adjacent marsh by reducing shoreline erosion.

Major factors that have influenced the area's hydrology include:
(1.) Removal of the Calcasieu Pass oyster reef (1876), (2.) Construction of the Calcasieu Ship Channel (1941), (3.) Construction of trenasses for trapping access (1940's), (4.) Construction of access canals, board roads, pipelines, and drill sites for oil/gas exploration and production (1940's to present).

The immediate project area lost marsh at an average rate of 6.0%/yr. from 1978 to 1984 (USFWS/DNR GIS data 1992).
This project provides an opportunity to reduce internal wave erosion and possibly trap some sediment in these large open water areas which may not be able to be restored fully to their former condition with the watershed project.

Description of Features

Installation of sediment trapping/wave stilling devices and terraces. Sediments excavated on-site will be used to construct approximately 95,200 feet of earthen terraces to form 120 cells 400 feet square with open corners, each side of terracing being 350 feet long. Approx. 38,080 plugs of emergent marsh plants of suitable species gathered from adjacent areas will be planted on five foot centers in a single row along each side of the terraces for stabilization and to create emergent marsh. The resulting small square ponds will promote increased submersed aquatic plant growth.

Benefits and Costs

The immediate project area contains 121 acres of brackish marshes and 691 acres of open water for a total of 812 acres. The Boudreaux Lake Project is expected to create or restore 15 acres, protect 53 acres of brackish marsh and stimulate the production of 176 acres of aquatic vegetation and enhance 125 acres of marsh for a total benefit to 369

acres. The rough estimated project cost is $1,127,000.

Effects and Issues

The project will help the Cameron-Creole Watershed marsh management project restore, protect and enhance brackish marsh and aquatic vegetation in the 812 acre project area. The result will be increased marsh and fisheries productivity. The Boudreux Lake terracing project will have to be designed and implemented so that hazards to navigation are reduced.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

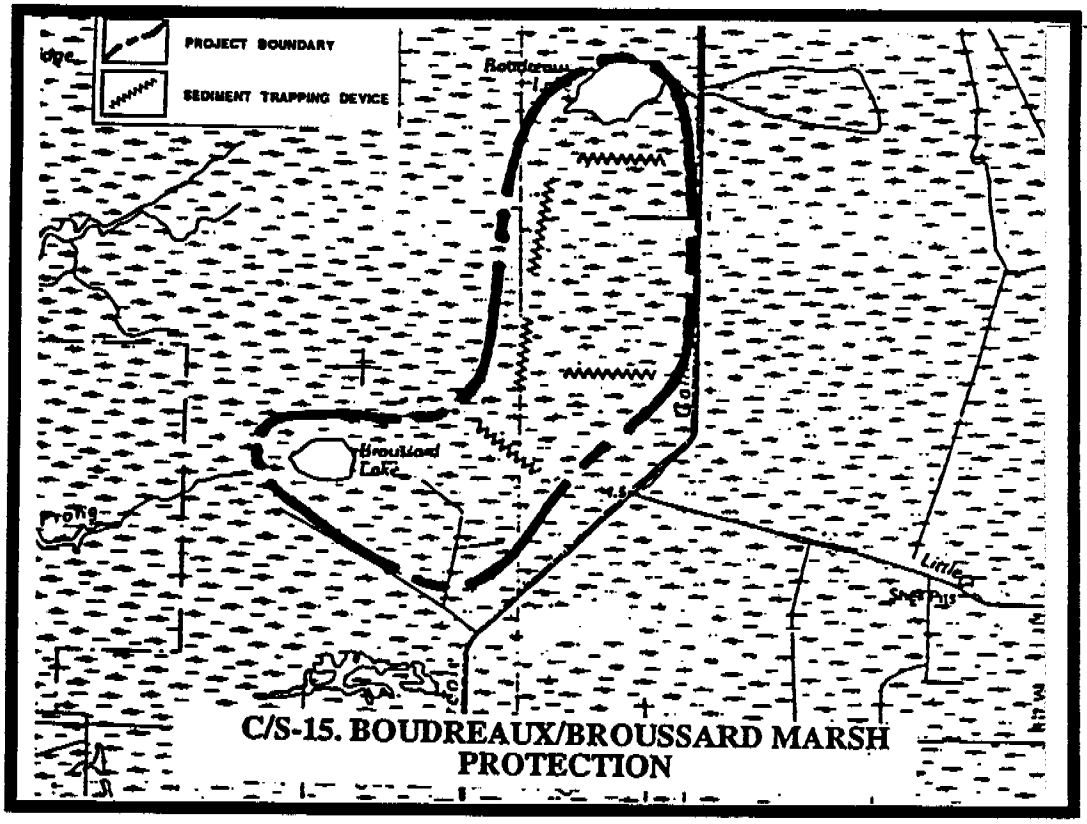

Figure 70. CS-15 Boudreaux-Broussard Marsh Protection

FCS-19 WEST HACKBERRY PLANTINGS

Location

The project is located in Cameron Parish about 2 miles southwest from Hackberry, La., Vincents Island and the West Hackberry Oil and Gas Field. The project is bounded by the Starks North Canal to the north, the Starks Canal to the east, and Browns Lake to the south (see Figures 6 and 71). The project is in the northeastern portion of the Sabine National Wildlife Refuge. The project may benefit a total of 96 acres of brackish marsh.

Problems and Opportunities

This is a vegetative planting project with the goals of reducing erosion and restoring marsh. Vegetation in this area has died as a result of rapid water level fluctuations, ponding and saltwater intrusion. These hydrologic changes were caused by the Calcasieu Ship Channel, the GIWW, the Alkali Ditch and the Rycade Canal which brought increased tidal fluctuations and saltwater intrusion into the project area. This project will benefit brackish marsh in the area by direct vegetative plantings.

Description of Features.

This is a vegetative planting project which consists of planting oyster grass (Spartina alterniflora) to assist in the re-establishment of 96 acres of brackish marshes south of Vincent's Island.

Benefits and Costs.

Approximately 96 acres of brackish marsh will be restored and protected by the project. The estimated project cost is $100,000.

Effects and Issues.

This project will restore and protect about 96 acres of brackish marsh within the Browns Lake area of the Sabine National Wildlife Refuge. Brackish marsh fish and wildlife will benefit from the project. The project will also serve as demonstration of the efficacy of vegetative plantings in this area to protect and restore marsh.

Status.

This project was selected as Priority Project for the 1991 CWPPRA List submitted to Congress in November of 1991. The project is sponsored by the USDA Soil Conservation Service and the state of Louisiana and is presently in the design phase of development. The project may be constructed in the spring of 1994.

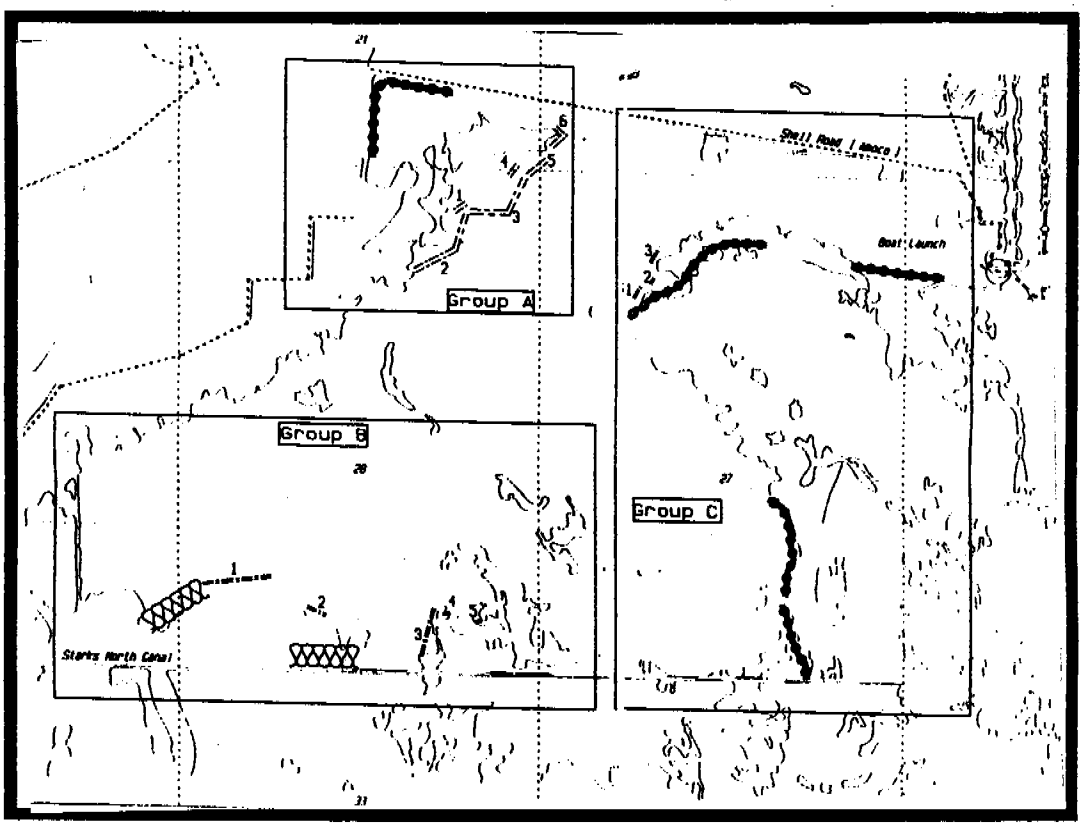

Figure 71. FCS-19 West Hackberry Plantings

PCS-34 PLANTINGS TO BUILD BOTTOM ELEVATION

Location

The project is located in the northeastern portion of the Sabine National Wildlife Refuge (SNWR) in the vicinity of Browns Lake near the Starks North Canal. It is located about four miles southwest from Hackberry, La. It is bounded by Browns Lake to the south and west and the Starks North Canal to the north. This demonstration project may benefit about 5 acres of brackish marsh (Figure 6 and 65).

Problems and Opportunities

Marsh loss in the Browns Lake area of Sabine National Wildlife Refuge has been caused by saltwater intrusion and increased impoundment. These factors have been caused by increased water fluctuations and tidal scour moving into the marshes from the Black Lake to the north and West Cove to the south after the construction of the Calcasieu Ship Channel. This has resulted in the conversion of intermediate marshes to brackish marshes and open water. Canals, such as the Rycade Canal, have increased these marsh destruction processes. This demonstration project may restore and protect and brackish marshes in the area by vegetative plantings.

Description of Features.

The project features consist of planting brackish or saline vegetation (i.e. oystergrass, Spartina alterniflora) in order to raise the bottom elevation in shallow water areas through organic accretion.

Benefits and Costs.

Approximately 1.5 acres of brackish marsh will be protected for a total of 5 acres benefited by the project. These benefits were not verified by the WVA Working Group. The estimated project cost is $128,000.

Effects and Issues.

This project may restore, protect and benefit a total of about 5 acres. Brackish marsh fish and wildlife will benefit from the project. The project will serve as a demonstration of the ability of restoring marsh in this area by raising bottom elevations through vegetative plantings.

Status.

This project is presently listed as a short term supporting project in the Calcasieu-Sabine Basin Plan for the CWPPRA. It supports the preferred basin restoration plan.

XCS-49 VEGETATIVE PLANTINGS ON THE NORTH SHORE OF TURNERS BAY

Location

The project is located in Cameron Parish, Louisiana on the north shore of Turners Bay in northern Calcasieu Lake (Figures 6 & 72).

Problems and Opportunities

Shoreline erosion along Turners Bay is resulting in loss of wetland habitat. There is an opportunity to halt erosion and rebuild the marsh using vegetative plantings coupled with wave dampening/sediment trapping devises. This project is compatible with the basin strategy of protecting shorelines of lakes and the Gulf of Mexico.

Description of Features

This project calls for the vegetative plantings coupled with wave dampening/sediment trapping devices along 2,500 linear feet of north Turners Bay shoreline.

Benefits and Costs

The rapid Wetland Value Assessment indicates that the project will restore 6 acres and protect 12 acres. The estimated project cost is $287,000.

Effects and Issues

Vegetative plantings and sediment trapping will halt shoreline erosion and promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife.

Status

This project is conceptual. A feasibility study is required and it may be a candidate for future priority lists.

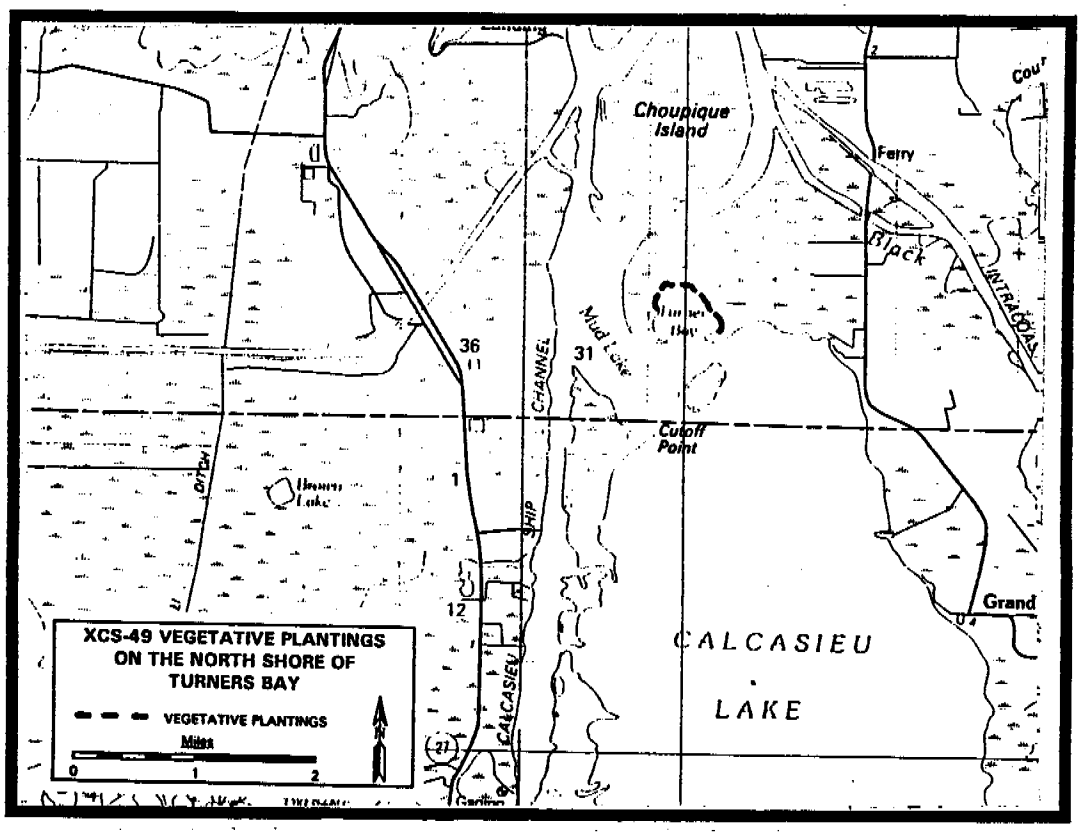

Figure 72. XCS-49 Vegetative Plantings on the North Shore of Turners Bay

SUPPORTING LONG TERM PROJECTS

XCS-33 TOLEDO BEND-SABINE RIVER WATER MANAGEMENT

Location

The project is located in Cameron and Calcasieu Parishes in the area of the Sabine River-GIWW intersection about 3 miles southeast of Orange, Texas. Marshes surrounding Sabine Lake are in the project area (see Figures 6 and). The project may benefit a total of 10,770 acres of intermediate to brackish marshes in a total project area of 81,348 acres surrounding Sabine Lake.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations caused by the Sabine Pass channel and the operation of the Toledo Bend Reservoir. This has resulted in the conversion of fresh and intermediate marshes to brackish marshes and open water. Canals connecting to the Sabine River and the GIWW have increased these marsh destruction processes. This freshwater diversion project goal of reducing saltwater intrusion in the area through the management of freshwater released from the Toledo Bend and Sam Rayburn reservoirs.

Description of Features.

The project features consist of managing the Toledo Bend and Sam Rayburn freshwater releases so that fresh water is available for the Sabine River in the fall and winter periods when salinities in Sabine Lake increase.

Benefits and Costs.

The project area contains about 40,675 acres of marsh and 40,675 acres of open water for a total of 81,348 acres. Approximately 144 acres of intermediate and brackish marsh, 6,914 acres of aquatic vegetation will be protected and another 3,714 acres will be enhanced by the project for a total benefit to 10,773 acres. The estimated project cost is unknown as it involves a modification in the operation of reservoir water releases.

Effects and Issues.

This project will protect and benefit about 10,773 acres of intermediate to brackish marshes. Intermediate and brackish marsh fish and wildlife will benefit from the project by a reduction in saltwater intrusion from increased or more timely releases of freshwater into the Sabine River from the reservoirs. One issue is whether the freshwater releases can be correlated with power generation at Toledo Bend Dam.

Status.

This project is a short term critical project in the Calcasieu-Sabine Basin Plan. It is therefore an integral part of the preferred "Perimeter Plan." Successful completion of this project will reduce the need for other saltwater intrusion reduction projects planned for the perimeter of Sabine Lake [i. e. parts of CS-5a/12, XCS-48 (NO-21), (SA-5), SA-7) and (SO-1].

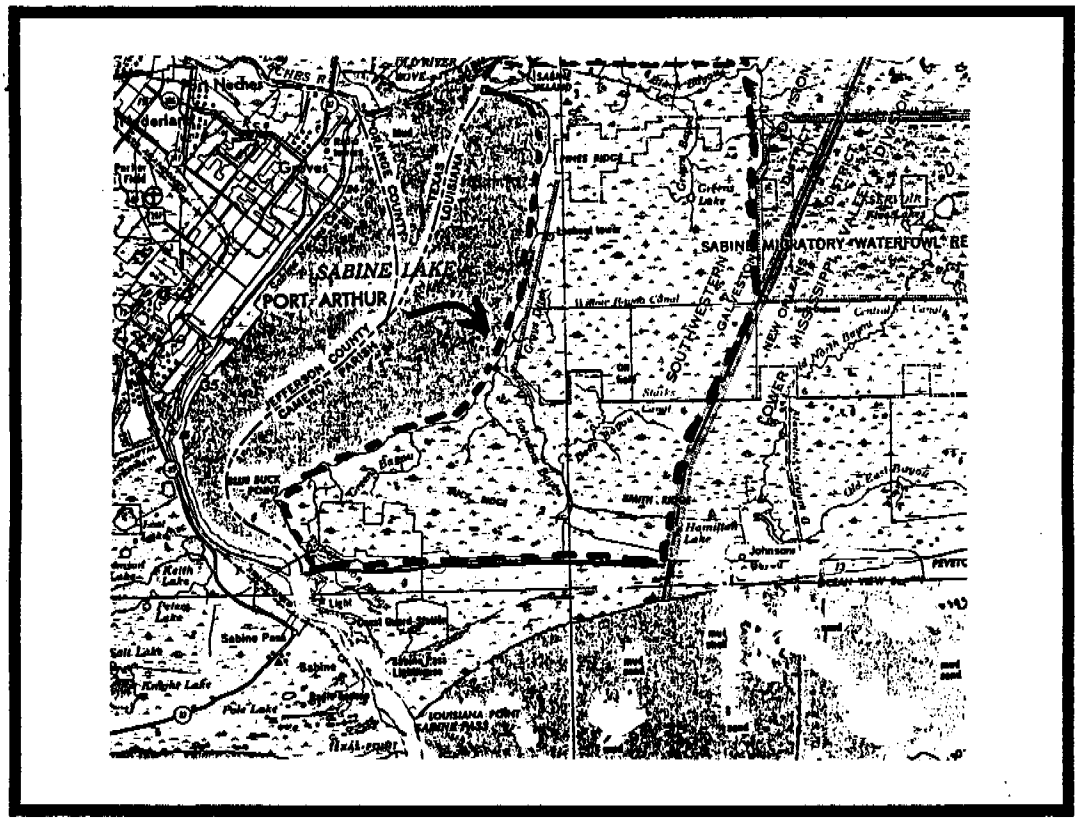

Figure 73. XCS-33 Toledo Bend-Sabine River Water Management

CS-5B/12 SABINE FRESHWATER INTRODUCTION FROM THE SABINE RIVER AND BLACK BAYOU MARSH MANAGEMENT

Location

The project area comprises approximately 28,000 acres of fresh/intermediate to brackish marshes about 18 miles west-northwest of Hackberry, Louisiana in northwestern Cameron Parish (Figures 6 and 74). See CS-5A/12 description.

Problems and Opportunities

Wetlands in the Black Bayou area have suffered a loss of approximately 10,000 acres or 33% of the project area from 1956 to 1990 resulting from hydrological changes. The objectives of the project are to divert freshwater from the Sabine River to the area of the Vinton Drainage Canal to the vicinity of the GIWW and the Black Bayou marshes to reduce and moderate salinity levels and restore emergent marsh.

Project Components

Outfall management and freshwater introduction structures recommended under Alternative 5 in the DNR/CRD-Crowley feasibility report for Project C/S-5A (see CS-5A/12 and CS-12 descriptions). The project differs from CS-5A/12 and CS-12 in that additional freshwater is diverted from the Sabine River to the Vinton Drainage Canal.

Benefits and Costs

The area contains 19,600 acres of fresh intermediate and brackish marshes and 8,400 acres of open water for a total of 28,000 acres. The Black Bayou Freshwater Introduction and Hydrologic Restoration project is expected to protect 376 acres of fresh to brackish marsh and stimulate the production of 2,688 acres of aquatic vegetation and enhance 1,247 acres of marsh for a total benefit to 4,311 acres. The rough estimated project cost is $8,119,030.

Effects and Issues

The project will conserve and protect wetlands along in the Black Bayou area of the northwestern portion of the basin for a total benefit to 4,311 acres. The project should reduce marsh loss due to saltwater intrusion and increased hydrology caused by connections of Black Bayou to the GIWW to the north. The project structures will have to be designed to allow for the limited navigation that presently exists in the small tributaries adjacent to Black Bayou and provide for the continued access of fisheries into and out of the marshes north of Black Bayou. The project will have to be designed so as not to decrease the drainage capacity of the Vinton Drainage Canal.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It presently is in the conceptual phase of development. A feasibility report has been prepared by the La. DNR Coastal Restoration Division for part of this project as it relates to CS-5A. This report indicated that it may not be feasible to route water from the Sabine River to the Vinton Drainage Canal and

still maintain the drainage capacity of the canal. CS-5A/12 which involves routing GIWW freshwater into the project area is preferred.

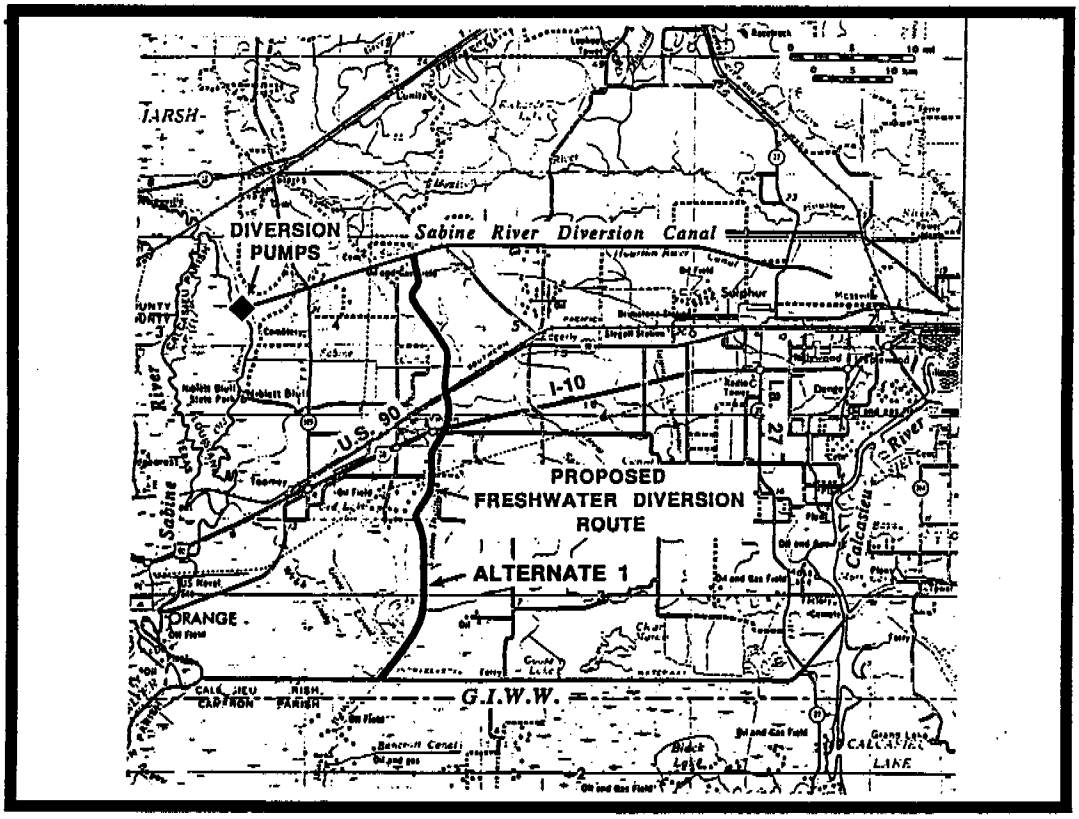

Figure 74. CS-5B/12 Sabine Freshwater Introduction From The Sabine River And Black Bayou Marsh Management

XCS-48 (NO-14A) STARKS BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 75). It is bordered by Starks North Canal on the south, Canal Right Prong and Black Bayou on the west and management levees on the north and east. The project area is comprised of 3,500 acres of fresh to intermediate to brackish marsh and open water.

Problems and Opportunities

This unit historical included fresh marsh and some timber land. Today in comprises fresh and brackish marsh that appears to be deteriorating from the central portion out. The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour via Black Bayou. There is an opportunity to improve productivity of this wetland by stabilizing salinity, rapid water level fluctuations to enhance the growth of emergent marsh vegetation. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh and intermediate emergent marsh. The project plans include installing rock weirs along Black Bayou to reduce water exchange and salinity spikes, and approximately 13,000 linear feet of levee repair.

Benefits and Costs

No rapid Wetland Value Assessment was performed on the project. However, it is anticipated the project will protect 16 acres and benefit a total of 122 acres at a cost of $1,617,000.

Effects and Issues

Stabilizing salinity and water level spikes, coupled with wave dampening/sediment trapping will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by structures although productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-5b) Sabine Freshwater Introduction. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

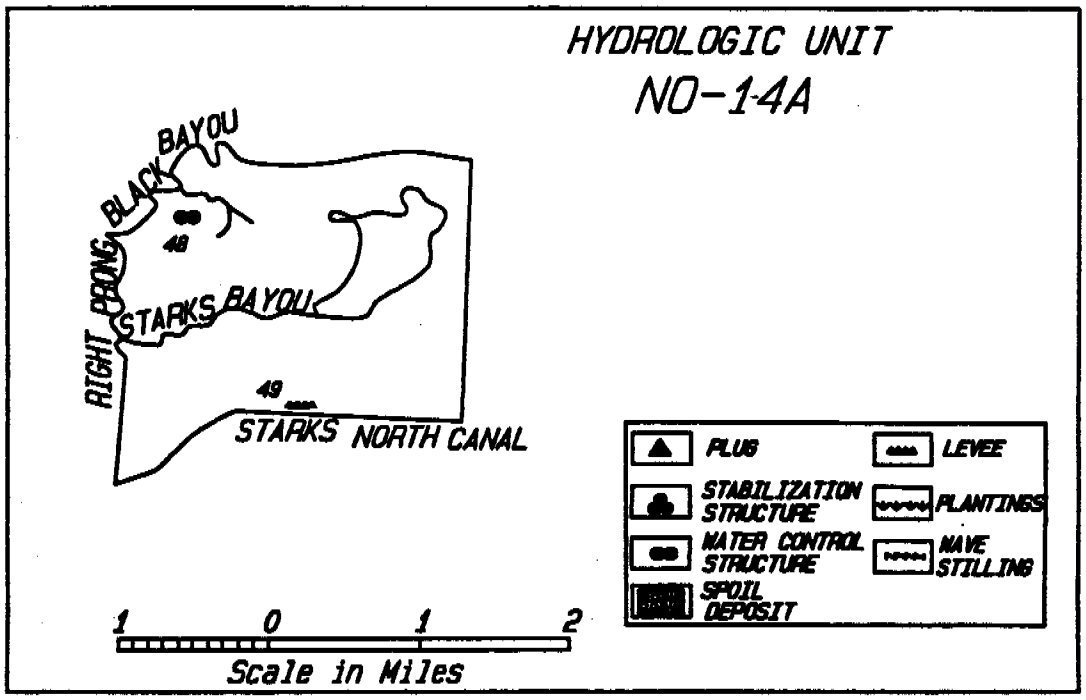

Figure 75. XCS-48 (NO-14A) Starks Bayou Unit

XCS-48 (SA-1A) SOUTH BROWNS LAKE - EAST HOG ISLAND GULLY

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 76). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Browns Lake, on the west by Back Ridge Canal, and on the south and east by LA 27. The project area is comprised of 5,138 acres of low salinity brackish marsh and open water.

Problems and Opportunities

The unit was historically vegetated by fresh and intermediate marsh plant. The unit was in transition from predominantly brackish marsh to intermediate marsh between 1949 and 1988. By 1978 the northern half of the unit had converted from marsh to open water. The 1984 classified data showed that the northern one-third of the unit was open water and the remainder of the unit was marsh and broken marsh.

The impoundment was constructed during the late 1950's in fresh and intermediate marshes. Water levels within the unit are maintained using a large variable-crest weir located in the southeast corner. Aerial photography dated 1953 shows that the area consisted of solid marsh. Hurricanes Audrey and Carla flooded the unit with saltwater. Extensive stands of sawgrass located in the northern portion of the unit subsequently died. Those areas have converted to relatively deep open water. A pumping station was recently constructed to augment water level control within the unit.

Currently, marshes adjacent to those large open water areas experience wind-induced erosion. High water levels stress vegetation and may also contribute to marsh loss. Comparison of 1983 and 1989 aerial photography indicated that there has been net loss of marsh within the unit. Additionally, the northern levee is threatened by wind-induced erosion. A levee breach in that location would expose much of the enclosed marshes to severe saltwater intrusion impacts. The primary threat to marshes within the area is the waterlogging and break-up of interior brackish marsh. This coupled with salinities that preclude vigorous growth of cattail, bullwhip, sawgrass, and other intermediate marsh plants would result in accelerated marsh deterioration and loss. Proposed elements address these problems by establishing more effective salinity control capabilities and by providing for additional water discharge capabilities to avoid ponding of excess water following floods or storm tidal surges. Vegetative plantings coupled with wave stilling and sediment trapping devices are proposed in large open water areas to reduce wind-induced erosion of marshes. This project is compatible with the basin strategy of treating critical areas of wetland loss within the interior of the basin.

Description of Features

Project components include vegetative plantings along the eroding northern levee. Plantings would protect against levee breaching, saltwater intrusion, and subsequent marsh loss. The construction of an additional drainage structure at Browns Lake would improve water level control, especially the ability to reduce water levels and encourage the colonization of shallow open water areas by emergent species. The structure would also benefit brackish marshes within Unit SA-1 by redirecting freshwater discharge into

those marshes. The unit needs some canal and levee maintenance work in order to ensure the unit can be maintained in its current impounded condition.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $994,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

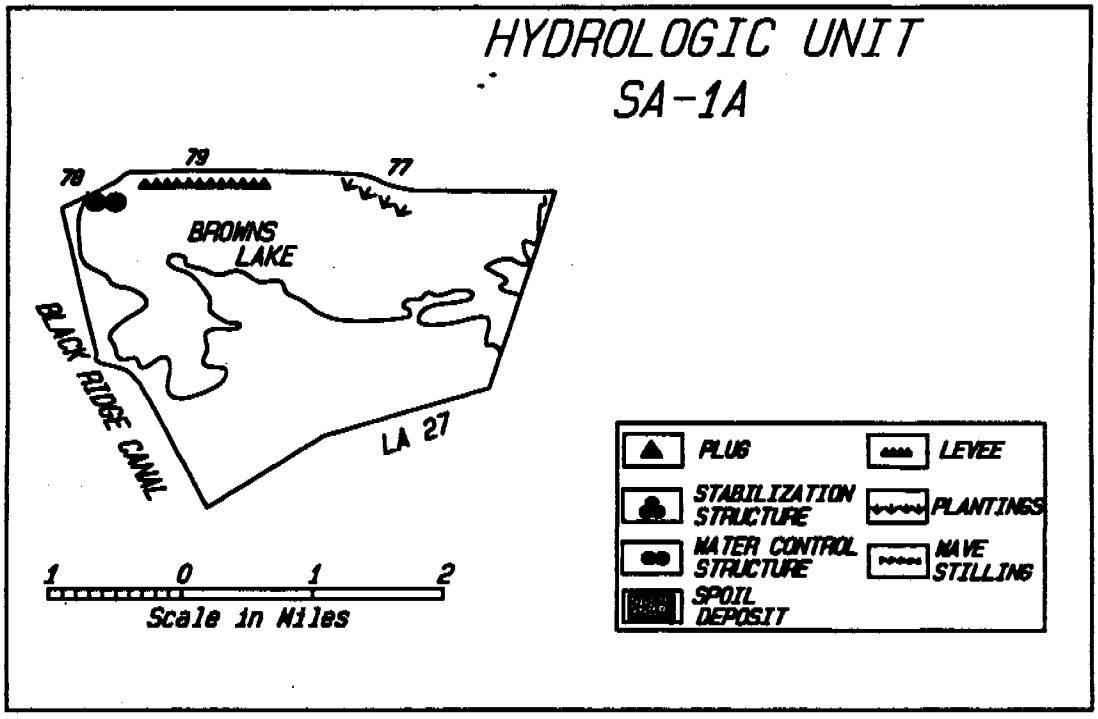

Figure 76. XCS-48 (SA-1A) South Browns Lake - East Hog Island Gully

XCS-48 (SA-1B) EAST BACK RIDGE CANAL AREA

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 77). It is part of the Sabine National Wildlife Refuge and is bordered on the northeast by an oil field road, on the southwest by Starks Central Canal, and on the southeast by LA 27, and on the northwest by the Back Ridge Canal. The project area is comprised of 1,961 acres of intermediate marsh and open water.

Problems and Opportunities

The unit was historically a fresh to intermediate marsh. The 1949, 1968, 1978, and 1988 vegetative maps show a slow conversion from brackish marsh to fresh marsh. Aerial photography dated 1953 shows that the area consisted of solid marsh. The impoundment was constructed during the late 1950's and contained fresh and intermediate marshes. Water levels within the unit are maintained using a large variable-crest weir located in the eastern corner. Following construction, high water levels have been maintained to open up the marsh for improving fish and wildlife habitat. A pumping station was recently constructed to augment water level control within the unit.

Ground truthing and a comparison of 1983 and 1989 color infrared aerial photography revealed that expanding stands of California bulrush have converted substantial portions of shallow open water to emergent marsh. This project is compatible with the basin strategy of treating critical areas of wetland loss within the interior of the basin.

Description of Features

The objective for the hydrologic unit is to ensure long-term maintenance of the area as an impoundment. An additional water control structure is proposed for this unit. Although this element could be used to improve water level manipulations, its primary purpose is to redirect freshwater discharge into Unit SA-1 brackish marshes. The unit will need levee maintenance in order to maintain the present impoundment condition. Vegetative plantings within the unit will provide for opportunities to reduce wave energies and capture suspended sediment within the impoundment.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $913,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

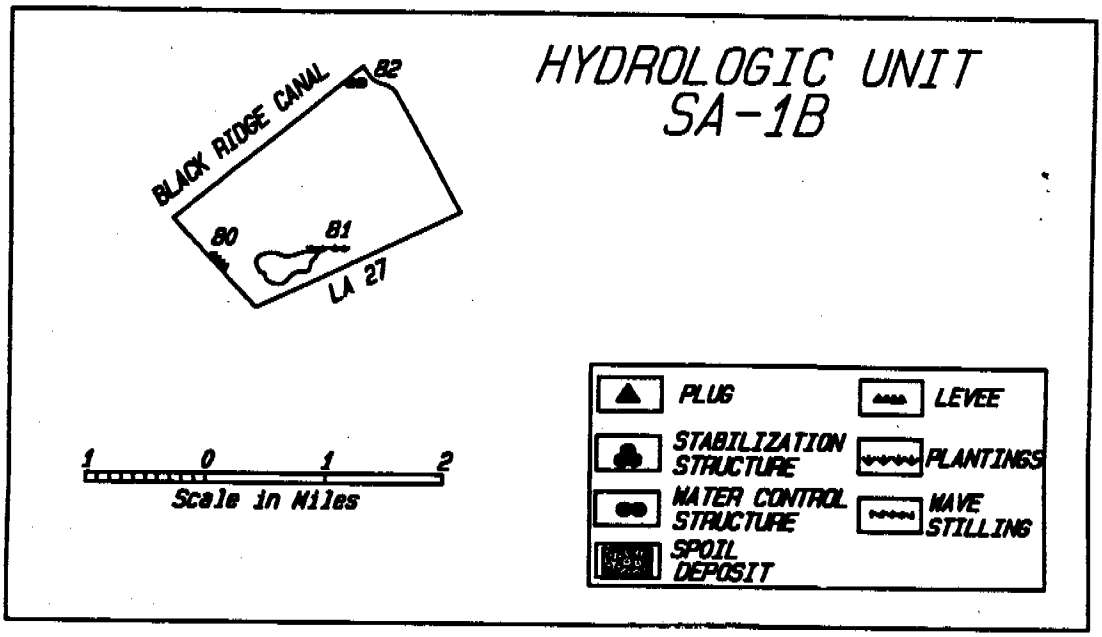

Figure 77. XCS-48 (SA-1B) East Back Ridge Canal Area

XCS-48 (SA-2) SOUTH BACK RIDGE CANAL AREA

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 78). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Starks Central Canal, and on the east by LA 27, on the south by Starks South Canal, and on the west by the Beach Canal. The project area is comprised of 7,552 acres of intermediate marsh, low salinity brackish marsh and open water.

Problems and Opportunities

The unit was historically a fresh and intermediate marsh according to the vegetation recorded in the 1931 vegetation maps. The 1949, 1968, 1978, and 1988 vegetative maps showed a gradual increase in intermediate marsh and decrease in brackish marsh between the 1949 and 1988 time frame. The 1949 map showed the unit to have half brackish and half intermediate marsh and the 1988 map shows one-eighth of the unit to be brackish marsh and remaining area to be intermediate marsh.

The marsh change map from 1956-1978 shows the unit to remain a stable marsh. However, the 1984 classified satellite data shows that the central part of the unit shows the marsh breaking up. Without implementation of proposed project elements, marsh loss rates within Unit SA-2 might increase due to deterioration of the Central Canal spoil bank and increased saltwater intrusion. Following a substantial tropical storm, ponding of saline storm tides could accelerate marsh loss rates due to limited water discharge potential. The project elements identified above would likely reduce the potential for marsh loss within this area.

Description of Features

The unit will need spoil bank maintenance along 18,000 linear feet of the Starks Central Canal in order to maintain the present impoundment condition.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $605,000.

Effects and Issues

This project would protect existing marsh for the benefit of wetland dependent wildlife and fisheries. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

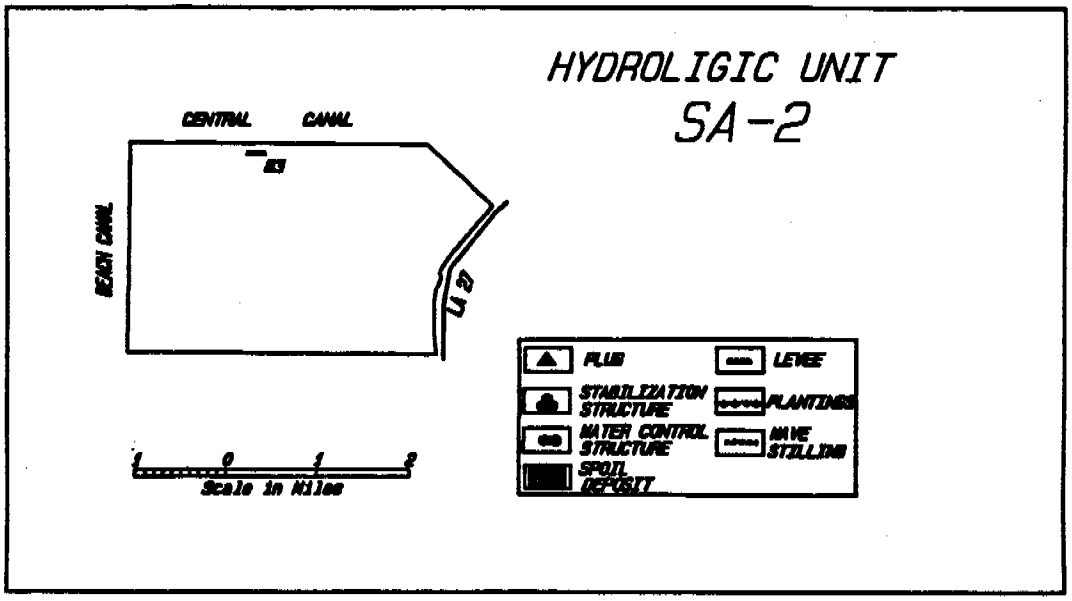

Figure 78. XCS-48 (SA-2) South Back Ridge Canal Area

XCS-48 (SO-4) FOUR MILE SQUARE UNIT

Location

The project is located in Cameron Parish, Louisiana in the south central part of the Calcasieu-Sabine River Basin Area (Figures 6 & 79). It is bordered by South Starks Canal on the south and management levees on the other three sides. The project area is comprised of 6,800 acres of intermediate marsh and open water.

Problems and Opportunities

This area has historically been a relatively stable marsh that has fluctuated between intermediate and brackish depending on prevailing environmental conditions. Presently the marsh is beginning to deteriorate along the fringes of the unit. There is an opportunity to improve productivity of this wetland through active marsh management to increase fresh water retention and encourage expansion of wetland vegetation. This project is compatible with the basin strategies of treating critical areas of wetland loss within the basin's interior and protecting the shoreline of the Gulf of Mexico.

Description of Features

Project features include maintenance of existing water control structures and the addition of a double flapgated culvert with a variable crest weir. A variable crest weir can be added to the existing flapgated culvert on the southeast corner of the Unit under LA 27.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $1,288,000.

Effects and Issues

Water control structures will reduce excessive water exchange and create conditions favorable for the recolonization of areas of marsh loss for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

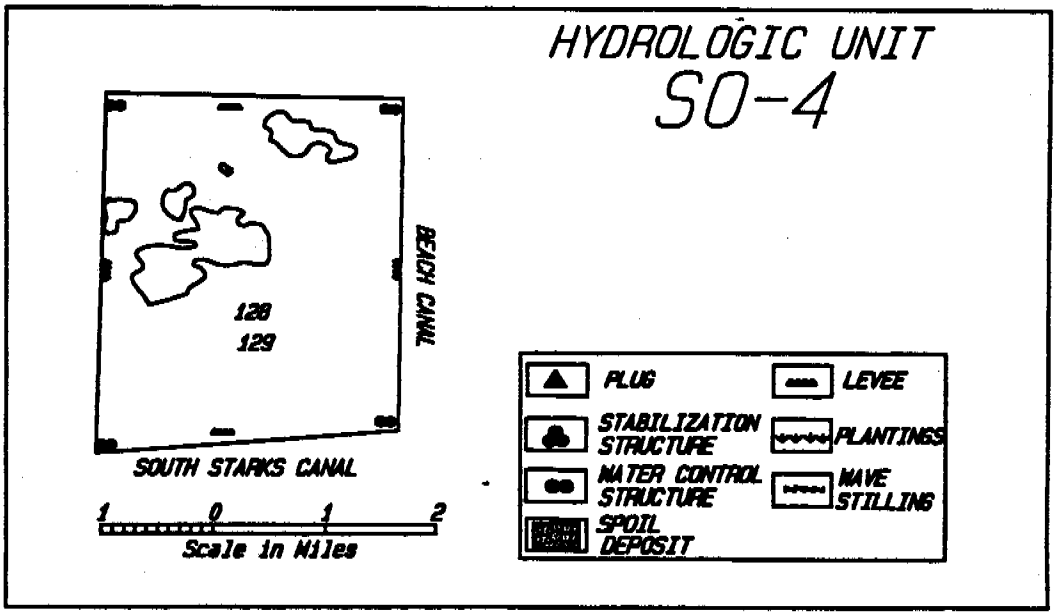

Figure 79. XCS-48 (SO-4) Four Mile Square Unit

XCS-48 (SO-9) RABBIT ISLAND

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area in the West Cove portion of Calcasieu Lake (Figures 6 & 80). The project area, known as Rabbit Island, is comprised of 300 acres of brackish marsh and open water.

Problems and Opportunities

This 300 acres marsh island is suffering from shoreline erosion. There is an opportunity to rebuild parts of the island using material dredged from the Calcasieu Ship Channel. This project is compatible with the basin strategy of protecting shorelines of lakes.

Description of Features

The objective is create emergent marsh where the marsh has eroded into shallow water areas. The project calls for the used of dredged material from the Calcasieu Ship Channel which would be used to restore open water areas into emergent marsh.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $249,000.

Effects and Issues

This project would offset marsh loss on Rabbit Island. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

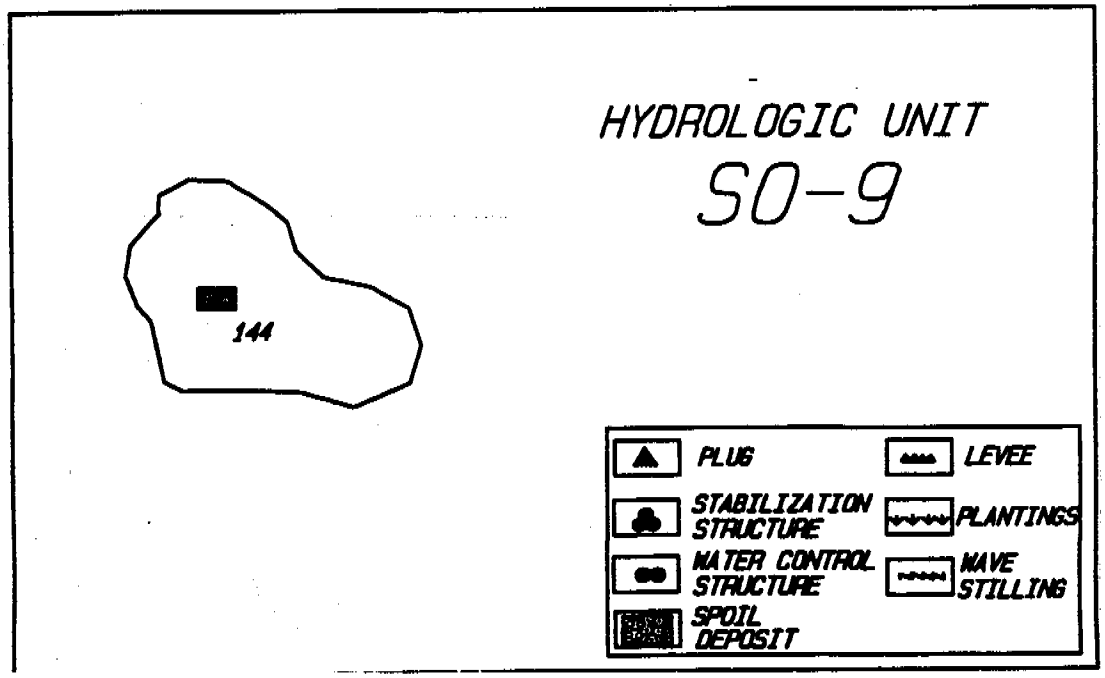

Figure 80. XCS-48 (SO-9) Rabbit Island

XCS-48H REBUILD SPOIL BANK ON THE SOUTH SIDE OF CANAL IN UNIT SA-8

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 81). It is part of the Sabine National Wildlife Refuge and is bordered on the northwest by marshes fringing the west side of LA 27, on the southeast by Calcasieu Lake, on the south by the Central Starks Canal. The project area is comprised of 220 acres of saline marsh and open water.

Problems and Opportunities

The western half of the unit drains through several spoil bank breaks into the extension of Central Canal (section connecting West Cove and Roadside Canal). Historically this area was brackish marsh, however, it now is a saline marsh.

Lakeshore retreat constitutes the greatest threat for marshes within this unit. Interior marshes within the western portion of the unit are very stable. Examination of 1983 and 1988 color infrared photography indicated that interior marshes experienced no net change. During high water periods, lake water tops the lakeshore rim and enters the broken marsh area. Once there, it flows into Headquarters Canal and thence, to Roadside Canal. This flow circumvents the water control structures at Hog Island Gully, Headquarters Canal, and West Cove. Continued lakeshore retreat will only make this problem worse and uncontrolled saltwater intrusion might become a problem. The objective for this hydrologic unit is to maintain and enhance the current vegetative community. This project is compatible with treating critical areas of wetland loss within the basin's interior.

Description of Features

This project proposes to rebuild 500 feet of south side spoil bank in the Headquarters Canal.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $30,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced due to rebuilding the spoilbank.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is a component of XCS-48 (SA-8) Northwest Cove Unit. A feasibility study is required and it may be a candidate for future priority lists.

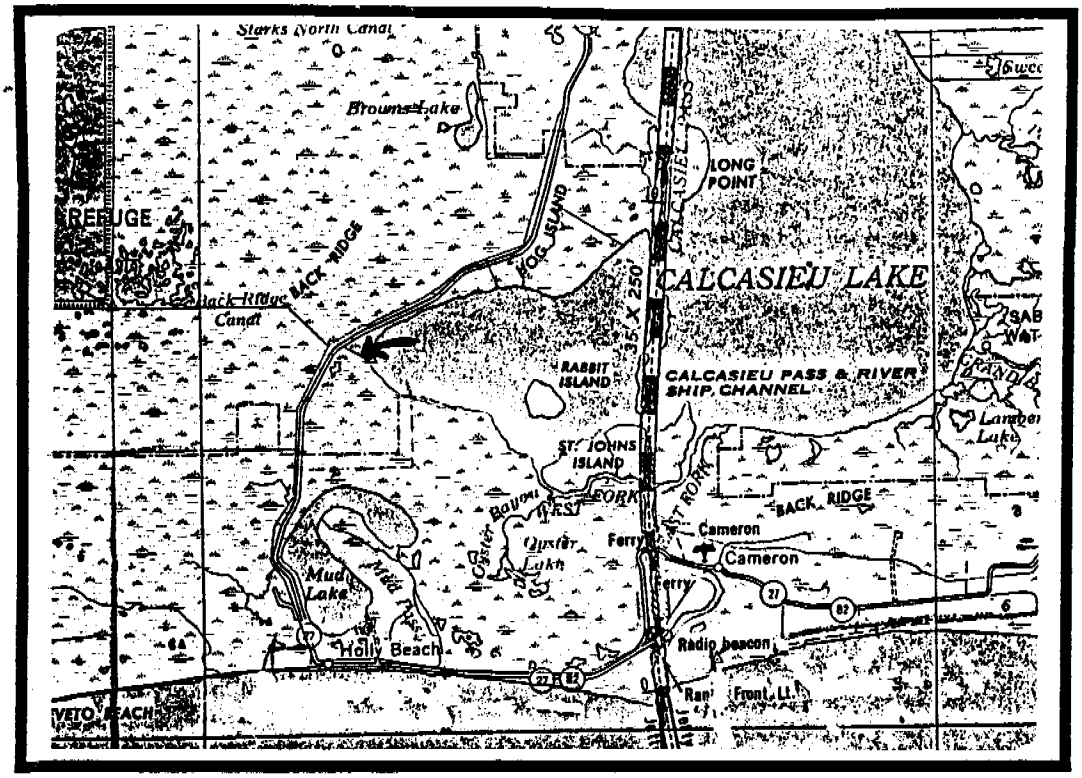

Figure 81. XCS-48H Rebuild Spoil Bank on the South Side of Canal in Unit SA-8

XCS-48L GATED CULVERTS UNDER LA HWY. 27 SOUTH OF HACKBERRY

Location

The project is located in Cameron Parish, Louisiana in the east central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 82). It is part of the Sabine National Wildlife Refuge and is bordered on the north by an unnamed bayou just south of the North Starks Canal, on the south by the West Cove Canal, on the east by the Calcasieu Ship Channel and on the west by LA 27. The project area is comprised of 4,600 acres of brackish marsh, saline marsh and open water.

Problems and Opportunities

The unit historically had bulrush and sawgrass in the northern part, a small forested island in the center, and submerged vegetation along with wiregrass, cane, and three square grass in the southern part of the unit. The 1949, 1968, 1978, and 1988 vegetative maps document the unit converting from brackish to a part brackish and part saline condition. The central and southern areas had large areas of marsh converted to water equal to about one-third of the unit between 1956-1978. The 1984 classified satellite data shows the further deterioration of marsh as only the northern one-fifth of the unit was still solid marsh and the remaining unit was water and broken marsh.

The unit consists of brackish and saline marsh and open water. Interior marshes have experienced moderate deterioration. In existing open water areas, physical erosion of adjacent marshes could be reduced by the construction of wave-break devices. The objective of the hydrologic unit is to maintain the present physical condition and enhance vegetative productivity. This project is compatible with the basin strategy of treating critical areas of wetland loss in the basin's interior

Description of Features

An existing structure will be modified to increase its capability to regulate flow and reduce saltwater intrusion from the Calcasieu Ship Channel into the marshes west of Louisiana Highway 27 by adding flapgates and/or stoplogs to the existing Sabine NWR structure. This is a major fisheries access site and any modification will address this issue. This structure would be actively managed by the Sabine NWR. Two flapgated culverts under Louisiana Highway 27 will be replaced. These culverts were initially equipped with flapgates on the east side of Louisiana Highway 27 to prevent westward flow of tidal waters. These flapgates have since deteriorated and no longer exist.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $180,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area and is a component of XCS-48 (NO-6). A feasibility study is required and it may be a candidate for future priority lists.

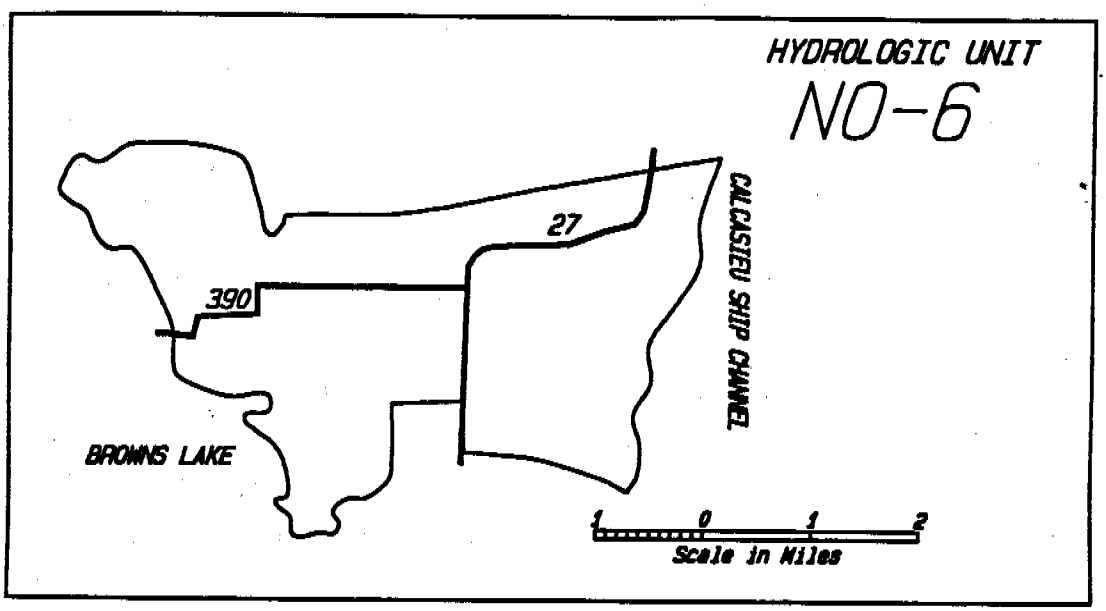

Figure 82. XCS-48L Gated Culverts Under La Hwy. 27 South Of Hackberry

XCS-48 (NO-14) WEST GUM COVE BLACK BAYOU AREA

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 83). It is bordered by the Shell Road on the north, Black Bayou on the west, Shell Road on the south, and a management levee/cattle walkway on the south. The eastern boundary is indistinct. The project area is comprised of 4,200 acres of deteriorating fresh to intermediate marsh and open water.

Problems and Opportunities

The primary causes of marsh loss in the area include construction of the Calcasieu Ship Channel and the GIWW leading to increased exposure to marine processes from the gulf including saltwater intrusion, rapid extreme water level fluctuations and tidal erosion and scour. There is an opportunity to improve productivity of this wetland through passive management by stabilizing salinity and rapid water level fluctuations to stimulate the growth of emergent marsh vegetation coupled with vegetative plantings. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh to intermediate emergent marsh. The project plans include vegetative plantings, installing rock weirs in openings through the Black Bayou natural levee and a one way flow water control structure under the cattle walkway in the southwest part of the unit.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $994,000.

Effects and Issues

Stabilizing salinity and water level spikes, and vegetative plantings will stimulate wetland productivity in this area for the benefit of wetland dependent fish and wildlife. Fisheries access will be slightly reduced by rock weirs at Black Bayou although, productivity of resident fisheries is likely to increase with the project. Boat access to the project area may be somewhat reduced.

Status

This project is included in the Calcasieu-Sabine River Basin Study and is interactive with project (CS-12) Black Bayou Hydrologic Restoration. A feasibility study is required and it may be a candidate for future priority lists. It is included as part of the Black Bayou Small Watershed Plan.

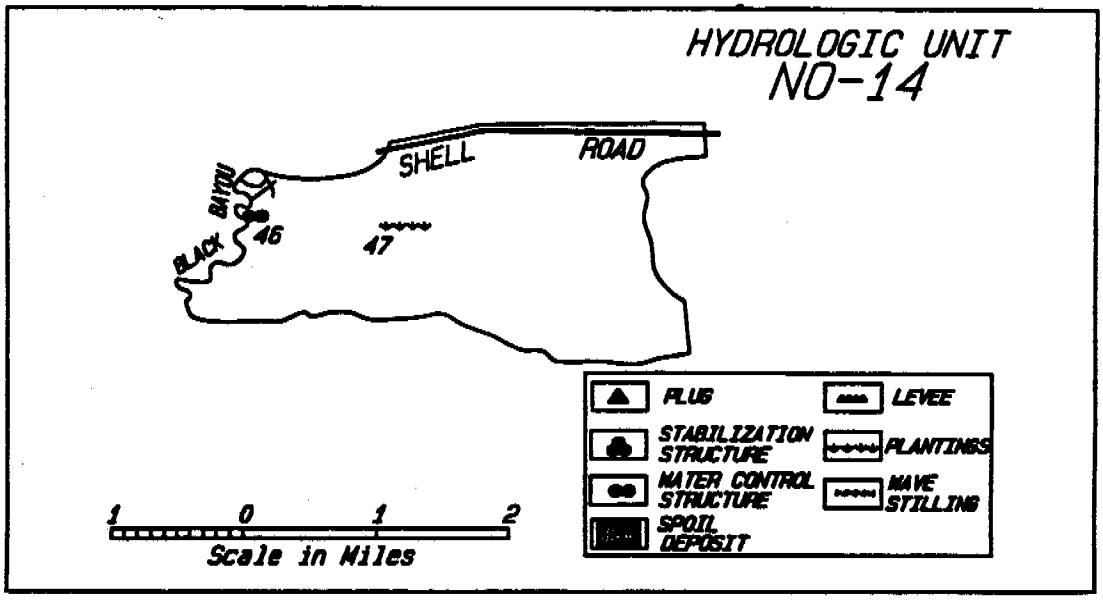

Figure 83. XCS-48 (NO-14) West Gum Cove Black Bayou Area

CS-6 BLACK LAKE SOUTH SHORE PROTECTION

Location

The project is located about 1 mile west of Vincent Island and 2 miles west from Hackberry, La. along the northern side of a road bordering the southern portion of Black Lake in Cameron Parish in Sec 25, T12S-R11W (see Figures 6 and 84).

Problems and Opportunities

A 40 ft wide strip of open water and brackish marsh along the north side of 3,300 ft of oil field access road is proposed to be planted with marsh vegetation. Marshland in the vicinity of Black Lake in north-central Cameron Parish has been lost as a result of saltwater intrusion, tidal scouring, and subsidence. Today, land in this area exists primarily as oil field access canal spoil banks, and oil field access roads, and impoundment and management levees. This project will restore several acres of emergent marsh and help protect an oil field access road from wind-induced erosion through the use of vegetation plantings.

Description of Features

Approximately 660 smooth cordgrass (*Spartina alterniflora*) gallon plugs will be planted along the north side along 3,300 ft of an existing oil field access road. The plugs will be planted on 5 foot centers parallel to the access road.

Benefits and Costs

The immediate project area contains 0 acres of brackish marshes and 3 acres of open water for a total of 3 acres. The Black Lake South shoreline Protection Project is expected to protect 2 acres of brackish marsh total benefit to 2 acres. The rough estimated project cost is $107,000.

Effects and Issues

The project will help to protect the oil field access road which in turn is protecting southern marshes from saltwater intrusion. These brackish marshes to the south are presently being protected from increased saltwater intrusion from Black Lake by the access road. The result will be the maintenance of the existing protected marsh south of the road. The Rycade Canal (CS-2) project to the east is intended to reduce saltwater intrusion and increased hydrology to these southern marshes.

Status

It is presently a conceptual state Coastal Wetlands Conservation and Restoration Program project.

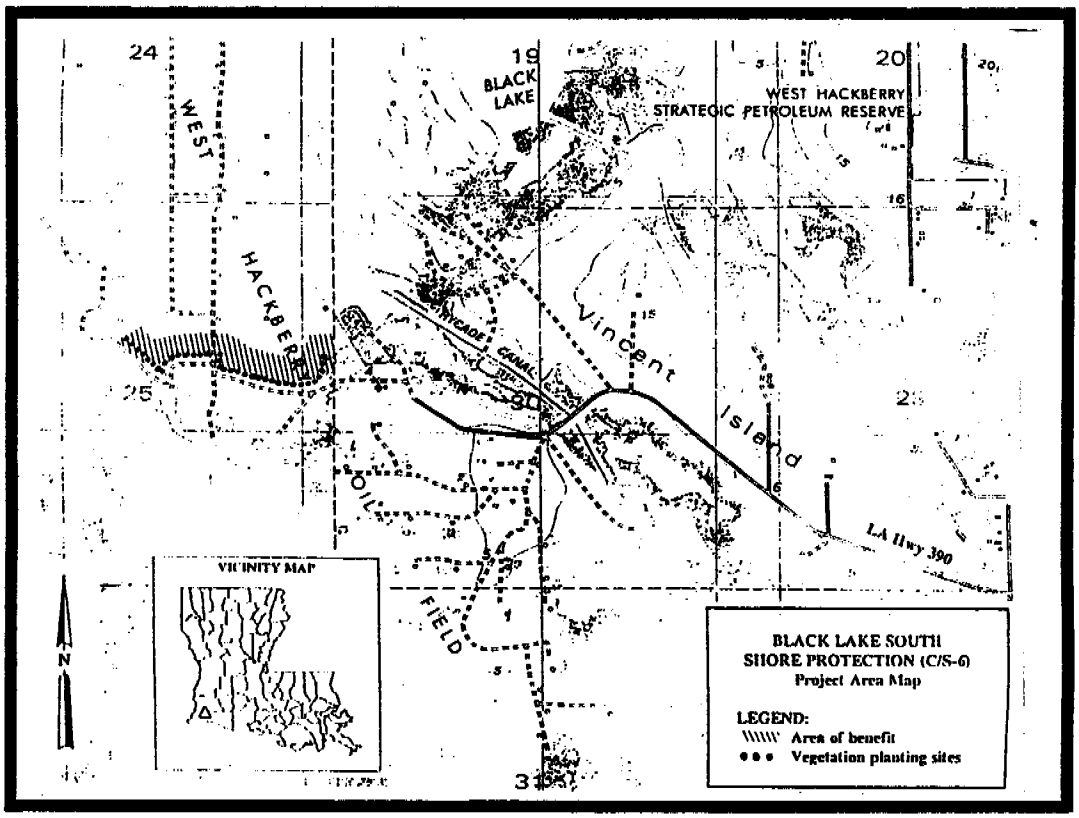

Figure 84. CS-6 Black Lake South Shore Protection

PCS-05 CALCASIEU SHIP CHANNEL EROSION

Location

The project is located in Cameron Parish at Choupique Island along the northern portion of Calcasieu Lake. The project is bounded by the Calcasieu Ship Channel to the west and Choupique Island to the north. It is located about six miles north east from Hackberry, La. (see Figures 6 and 16). The project may benefit a total of 100 acres of saline marshes.

Problems and Opportunities

Shoreline erosion is occurring along this stretch along the southern portion of Choupique Island and the Calcasieu Ship Channel. Ship channel boat wakes and increased tidal amplitude may be the prime causes of this erosion. This project will provide for shoreline protection for 100 acres of saline marshes.

Description of Features.

This is a shoreline stabilization project which consists of placing vegetative plantings, wave stilling, rip-rap or other devices along the shoreline of Choupique Island in areas which are in danger of being eroded though to sensitive interior marshes.

Benefits and Costs.

The area contains 100 acres of saline marshes. The Long Point Bayou shoreline protection project is projected to protect approximately 30 acres and enhance another 70 acres of saline marsh. The estimated project cost is $1,500,000.

Effects and Issues.

This project will protect or enhance about 100 acres of saline marshes on Choupique Island. The project should reduce Calcasieu Ship Channel and Calcasieu Lake shoreline erosion on the island and accelerate the deposition of some sediment in this area. Salt marsh fish and wildlife species will be benefited by the project. Structures will have to be implemented not to interfere with navigation.

Status.

This project is presently listed as a long term supporting project in the Calcasieu-Sabine Basin plan.

XCS-38 ROCK REVETMENT AT DUGAS LANDING

The project is located in Cameron Parish at Dugas' Landing and the western bank of the Calcasieu Ship Channel (CSC) about 1.5 miles south from Hackberry, La. The project is bounded by the Calcasieu Ship Channel to the east and Dugas' Landing to the west (see Figures 6 and 60). The project may benefit a total of 50 acres of saline marsh.

Problems and Opportunities

Shoreline erosion is occurring along this stretch of the Calcasieu Ship Channel at this intersection with Dugas' Landing. Ship channel boat wakes and increased tidal amplitude may be the prime causes of this erosion. This project will provide for shoreline protection for 50 acres of saline marsh adjacent to Dugas' Landing.

Description of Features.

This is a shoreline stabilization project which consists of placing limestone rip-rap adjacent to Dugas' Landing.

Benefits and Costs.

The Dugas' Landing shoreline protection project is projected to protect 40 acres of saline marsh and benefit another 10 acres for a total benefit to 50 acres. The estimated project cost is $1,083,000.

Effects and Issues.

This project will benefit about 50 acres of saline marshes in the vicinity of Dugas' Landing. The project should reduce Calcasieu Ship Channel shoreline erosion in this area. Salt marsh fish and wildlife species will be benefited by the project. Shoreline stabilization structures will have to be implemented so that they do not interfere with navigation.

Status.

This project is presently listed as a long term supporting project in the Calcasieu-Sabine Basin plan. It supports the basin "Perimeter Plan" restoration strategy.

XCS-48 (SO-8A) WEST CALCASIEU RIVER CHENIER

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 85). It is bordered on the south by the Gulf of Mexico, on the north by LA 82, on the west by Louisiana Highways 27 and 82, and on the east by the Calcasieu Ship Channel. The project area is comprised of 1,100 acres of brackish marsh and open water.

Problems and Opportunities

The unit was first vegetatively mapped as sea rim in 1949, and mapped as non-marsh in 1968. The 1978 and 1988 maps show the southeastern portion of the unit as saline marsh and the remaining unit as non-marsh. The 1984 classified satellite data shows the southeastern portion of the unit as broken marsh.

There is an opportunity to protect of this wetland by stabilizing the gulf shoreline, This project is compatible with the basin strategy of protecting the shoreline of the Gulf of Mexico.

Description of Features

The objective is to maintain the unit in its present condition. Project features include approximately 4.7 miles of segmented rock breakwaters of similar design to those at Holly Beach. The dredged material could be used for beach nourishment in order to protect the present shoreline. The rock breakwaters (element 143) will afford shoreline protection by reducing wave energies near the beach line.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $11,171,000.

Effects and Issues

Rock breakwaters and beneficial use of dredged material will reverse erosion along this stretch of gulf shoreline by promoting sediment deposition landward of the breakwaters.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

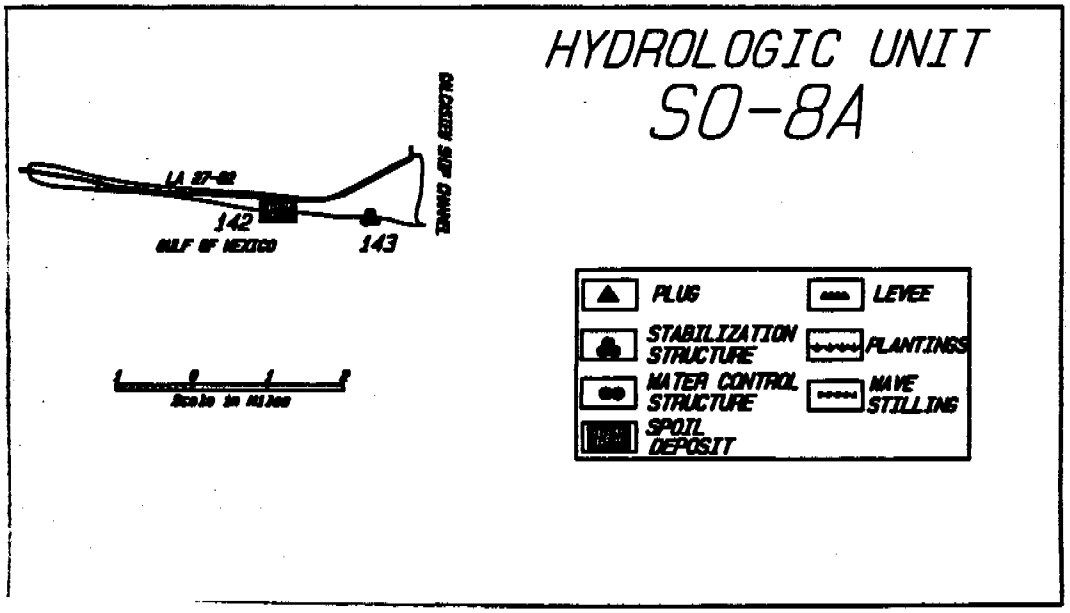

Figure 85. XCS-48 (SO-8A) West Calcasieu River Chenier

XCS-48 (SA-3) POOL 3 UNIT

Location

The project is located in Cameron Parish, Louisiana in the central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 86). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Starks North Canal, on the south by Starks Central Canal, and on the west by the Burton Sutton Canal, and on the east by the Beach Canal. The project area is comprised of 26,356 acres of fresh marsh and open water.

Problems and Opportunities

The construction of this freshwater impoundment was completed during 1951. Except for a small area of broken marsh in the southeast corner and several small lakes in the east central area, fresh marshes within the impoundment were very solid at that time. The north central portion of the impoundment includes some high prairie-like fresh marsh. This is the southern most extension of the Gum Cove ridge. When construction of the impoundment was complete, water levels within the area were maintained above marsh level to improve habitat for freshwater game fishes and migratory waterfowl. Three large variable-crest weirs are used to regulate impoundment water levels.

In 1957, the tidal surge of Hurricane Audrey breached impoundment levees and caused mechanical damage to organic marshes in the east central portion of the impoundment. The tidal surge of Hurricane Carla also breached impoundment levees in 1961. Following Hurricane Audrey, damaged marshes continued to deteriorate. By the late 1970's, much of the marsh located in the southeast quadrant had converted to shallow, turbid open water. A three-year-long drawdown period during the early 1980's served to restore several perimeter areas of the large open water area. The central open water area remained turbid despite water level lowering, but open water areas along the western side of the unit are full of aquatic vegetation.

Examination of 1981/1983 and 1989 color infrared aerial photography reveals that noticeable closure of marsh occurred during that period. Additionally, floating-leafed and aquatic vegetation appeared to be more abundant within interior ponds. These trends are likely the result of low water levels during one or more growing seasons.

Description of Features

The primary threat to emergent marshes within Unit SA-3 are wind-induced erosion and stresses associated with high water levels. The plan objective for the unit is to keep it in a freshwater impoundment condition. Additional flapgate/stoplog assemblies will be installed to improve water level reduction capabilities. A water control structure with a boat bay will be placed in the North Line Canal for greater water control capabilities. Wave stilling devices and vegetation would serve to reduce wind induced-deterioration of marshes adjacent to large open water areas and improve vegetative productivity. Additional components include vegetation and wave stilling/sediment trapping devices. The plan calls for 24,000 linear feet of vegetation and 225,000 linear feet of wave stilling/sediment trapping devices. The result of the additional work will improve emergent and submergent vegetative productivity and reduce erosion potential within the unit.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $2,085,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

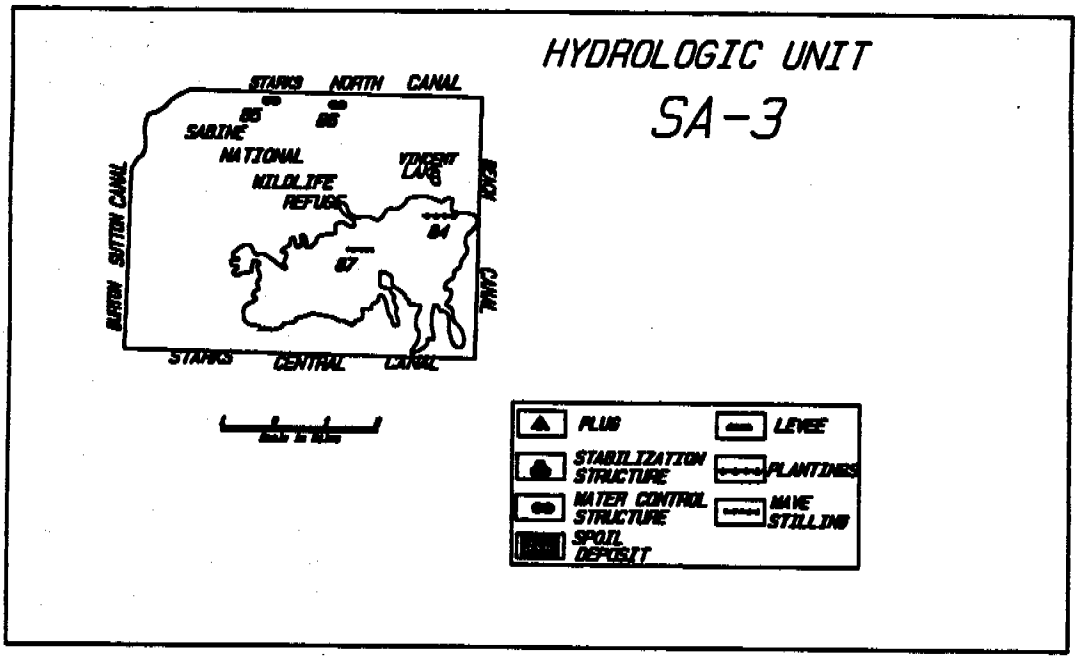

Figure 86. XCS-48 (SA-3) Pool 3 Unit

XCS-48 (SA-4) OLD NORTH BAYOU UNIT

Location

The project is located in Cameron Parish, Louisiana in the central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 87). It is part of the Sabine National Wildlife Refuge and is bordered on the north by Starks Central Canal, on the south by Starks South Canal, and on the west by the Burton Sutton Canal, and on the east by the Beach Canal. The project area is comprised of 13,614 acres of intermediate marsh and open water.

Problems and Opportunities

Historically little open water existed and the area was dominated by fresh marsh. Prior to 1920, access canals were dredged through the marsh around the perimeter of the unit. Following construction and enlargement of the Calcasieu Ship Channel, canal-induced saltwater intrusion impacted sawgrass and associated low-salinity vegetation in the northern part of the unit. The increased salinity regime resulted in a conversion to more saline vegetative types and a conversion of some marsh to open water. Marshes in the southeast portion of the unit have remained very solid despite hydrologic changes. Due to abundant rainfall and subsequent low salinity conditions since 1990, cattail, bullwhip, three-corner grass, and seashore paspalum have colonized some of the shallow open water areas in the northern broken marsh areas. Despite this healing, *Spartina patens* appear to be severely stressed and dying in some areas. Consequently, preservation of marshes will depend heavily upon the presence and growth of cattails and other low-salinity emergent marsh species. Preservation features must avoid causing increased water levels since that would likely result in accelerated rates of *Spartina* loss.

Examination of 1981/1983 and 1989 color infrared aerial photography indicated that a very slight loss of marsh occurred. Visual inspection of marshes within Unit SA-4 suggest that those marshes have begun to heal as cattail and other intermediate marsh species colonize shallow open water areas. This trend is likely due to heavy rainfall and subsequent low-salinity conditions over the past two years. Increased Sabine Lake or Calcasieu Lake salinities entering area marshes through spoil bank breaks along Burton Canal and Central Canal could threaten marshes within Unit SA-4. Marshes might also be damaged through slow drainage and ponding of saline storms surges. This project is compatible with the basin strategy of treating critical areas of marsh loss within the basin's interior.

Description of Features

The objective of the unit is to maintain as a fresh/intermediate marsh, but reduce interior erosion and improve vegetative productivity. The unit plan will require the use of vegetation and wave stilling/sediment trapping devices. These components will reduce the erosion potential by reducing wave fetch and improve submerged aquatic productivity by reducing the suspended sediment in the water column. A water control structure on North Line Canal, would improve freshwater retention. Consequently, additional freshwater would be available around the northeast portion of the unit and

would buffer against canal-induced saltwater intrusion from the east via Central Canal and from the west via Burton and Central Canals.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $1,036,000.

Effects and Issues

This project would offset marsh loss increase habitat diversity and productivity for the benefit of wetland dependent wildlife and fisheries. Fisheries access will be reduced slightly due to placement of water control structures.

Status

This project is included in the Calcasieu-Sabine River Basin Study area. A feasibility study is required and it may be a candidate for future priority lists.

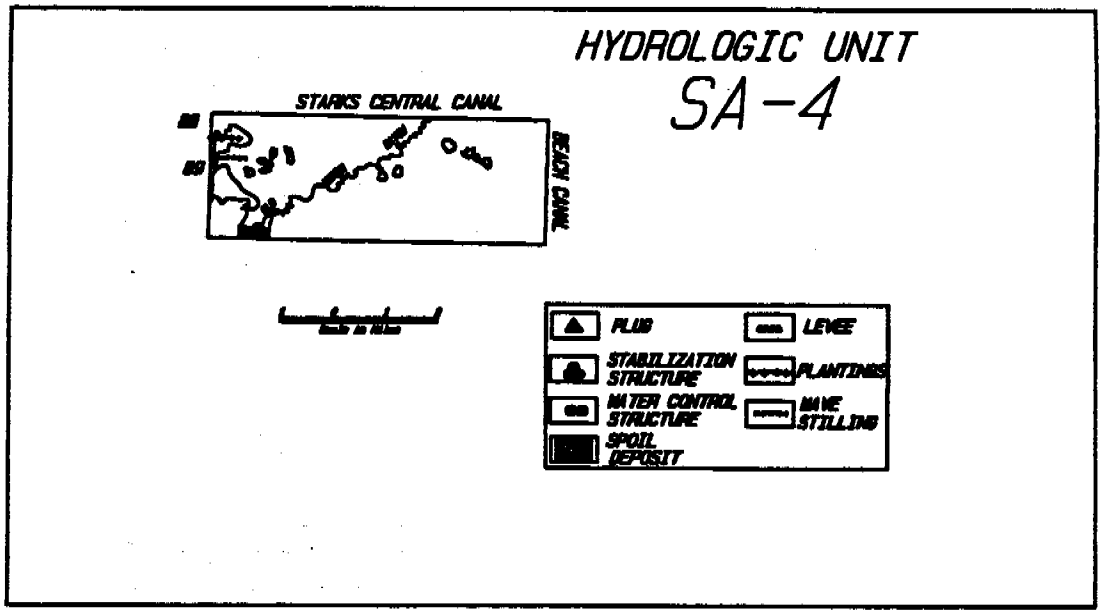

Figure 87. XCS-48 (SA-4) Old North Bayou Unit

XCS-48 (SO-7) SOUTHWEST WEST COVE AREA

Location

The project is located in Cameron Parish, Louisiana in the southeast quadrant of the Calcasieu-Sabine River Basin Area (Figures 6 & 88). It is bordered by Calcasieu Lake on the north and east, LA 27 on the west and an oil field road on the south and LA 27 on the east. The project area is comprised of 2,400 acres of brackish marsh and open water.

Problems and Opportunities

Marshes adjacent to West Cove are relatively high and stable. The center of the unit is an area of deeper organic marshes. Construction of the canal between the western tip of West Cove and Roadside Canal, and the subsequent breaks in its southern spoil bank breached the hydrologic barrier of the high lake rim marshes and allowed water exchange to occur between West Cove and the interior deep organic marshes. The eastern boundary of the unit consists of a canal which also cuts through the high like rim marsh and connects West Cove with interior marshes. Interior marshes in the vicinity of that canal have experienced some deterioration and loss but not as much as in the area of deep organic marsh.

Construction and enlargement of the Calcasieu Ship Channel increased salinities and tidal exchange and promoted the deterioration and loss of marshes in the deep marsh area. Adjacent to the canal spoil bank breaks and southward for approximately one-half mile, the central deep marsh area appears to be in transition from a deteriorating brackish marsh to a building/expanding saline marsh. Open water area and mud flats here are being closed in by Spartina alterniflora.

There is an opportunity to reduce land loss by reducing water exchange between the lake and interior marshes. This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

The objective of the hydrologic unit is to maintain the unit as a brackish marsh by reducing canal-induced water exchange between the lake and interior marshes. The components include spoil bank maintenance, a rock weir, wave stilling/sediment trapping devices and a water control structure. The boundary spoil bank between Units SA-8 and SO-7 will be rebuilt. The installation of a rock weir in the canal that leads into West Cove would protect the existing channel cross section from further erosion. The installation of a water control structure in the spoil breaks, at the marsh opening into West Cove Canal will reduce water level fluctuation, salinities and tidal scouring for Units SO-7 and SO-6. The wave stilling/sediment trapping devices will improve vegetative productivity in the unit by placement in open water areas to reduce erosion of marshes adjacent to open water areas.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $944,000.

Effects and Issues

Water control structures, sediment trapping devices and spoil bank maintenance will improve water circulation in this marsh and thus promote productivity of marsh and submerged aquatic vegetation for the benefit of wetland dependent fish and wildlife. Fisheries access will be reduced by water control structures although productivity of resident fisheries is likely to increase with the project.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

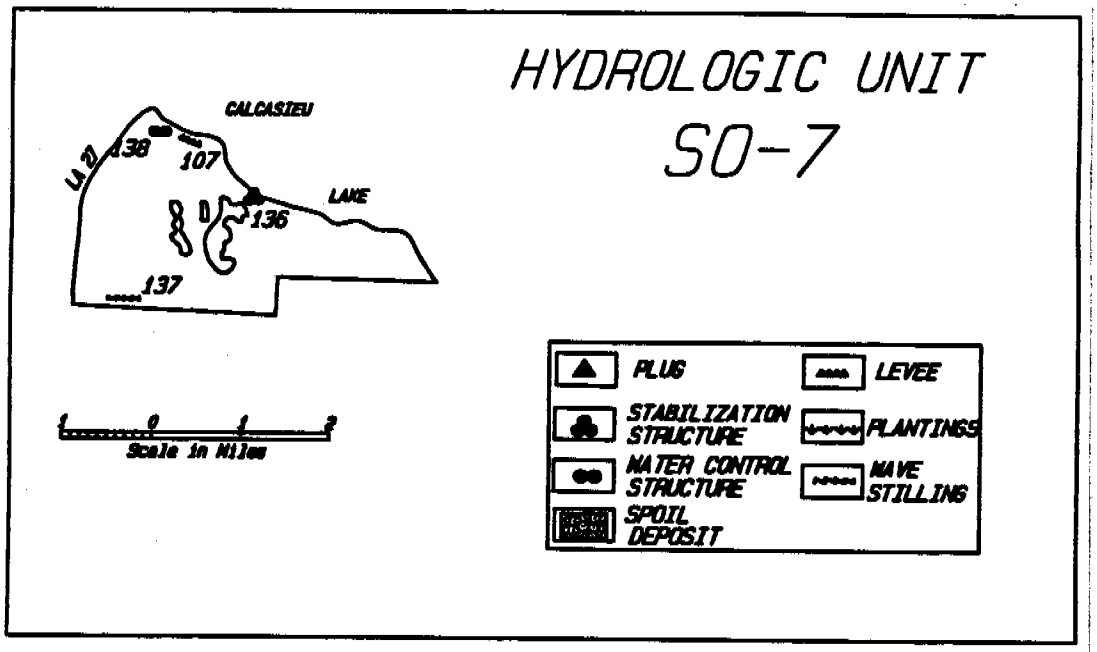

Figure 88. XCS-48 (SO-7) Southwest West Cove Area

XCS-48 (NO-10) EAST GUM COVE AREA

Location

The project is located in Cameron Parish, Louisiana in the north central portion of the Calcasieu-Sabine River Basin Area (Figures 6 & 89). It is bordered by Shell Road on the south and management levees on the north, east and west. The project area is comprised of 800 acres of managed fresh marsh.

Problems and Opportunities

This area is currently under pump and is managed as a fresh marsh for waterfowl. The objectives of this project are to maintain the area as it is while increasing water management capability in this unit and adjacent unit. The project plans is to move the existing pump to the southeast corner of the area. Routing the pump discharge to the south would enhance water control capabilities in Unit NO-4 (West Black Lake Area) and provide freshwater introduction into Unit NO-8 (Southwest Black Lake Area). This project is compatible with the basin strategy of treating critical areas of wetland loss within the basin's interior.

Description of Features

This area will be passively managed for fresh marsh. The project plans is to move the existing pump to the southeast corner of the area.

Benefits and Costs

Rapid protocol Wetland Value Assessment data is unavailable at the time of this writing. The estimated cost of the project is $684,000.

Effects and Issues

This project will improve management capabilities as well as protect and enhance marsh productivity for the benefit of wetland dependent fish and wildlife populations. No adverse impacts are anticipated.

Status

This project is included in the Calcasieu-Sabine River Basin Study. A feasibility study is required and it may be a candidate for future priority lists.

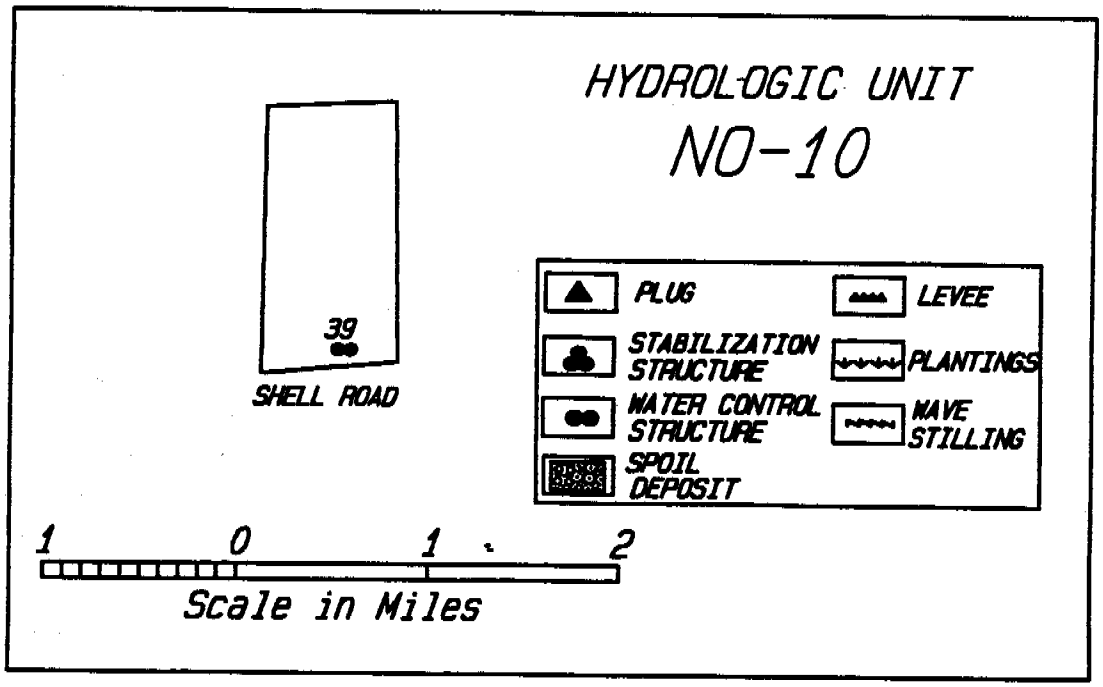

Figure 89. XCS-48 (NO-10) East Gum Cove Area

DUPLICATE AND COMPONENT PROJECTS

CS-11a SWEET LAKE/GIWW BANK STABILIZATION

Location

Cameron Parish at the boundary between the GIWW and Sweet Lake, 3.5 miles west of LA Hwy. 27 Gibstown bridge (see Figures 6 and 33). The project consists of 2,412 acres of open water and fresh marsh. Approximately 3.0 miles southwest from the town of Sweet Lake.

Problems and Opportunities

This has increased wave fetch in the lake which contributes to further shoreline erosion. Increased hydrology also has caused increased physical removal of organic material from the lakes and adjacent marshes which leads to increased land loss in the area. This project reestablishes the barrier between the lakes and the GIWW thus reducing wind fetch and water movement to and from the GIWW and the lake.

Approximately 1.3 miles of the southern shoreline of Sweet Lake has eroded into the GIWW, increasing turbidity in the waters of the lake. Severe wind induced erosion is also occurring along the northern and northwestern shorelines, where high water levels are impacting the adjacent marshes to the north of the lake. Water exchange will be reduced by re-establishing the hydrologic boundary between the shoreline of Sweet Lake and the GIWW. This will reduce turbidity in the lake waters, encouraging the re-growth of submersed aquatic plants, which will help reduce wind induce wave action. Brush fencing will be constructed along the northern and northwestern shorelines to halt erosion and trap sediments needed to rebuild marsh along these shorelines.

Description of Features

This is a shoreline protection and re-establishment project which restores the hydrologic boundary between the GIWW and Sweet Lake with an 2.7 mile armor plated dike.

Specific Project Components

1. Construct approx. 2.7 mi. of rip rap breakwater between the GIWW and Sweet Lake to re-establish the shoreline between the lake and canal. The finished breakwater will be 16 feet wide x 4 feet high with a slope of 2:1.
2. Deposit spoil material from maintenance dredging of the GIWW along the north side of the proposed breakwater to rebuild the shoreline where it has been completely eroded away.
3. Transplant approx. 2,850 units of Giant Cutgrass (*Zizaniopsis miliacea*) along the north side of the breakwater.
4. Construct 12,000 linear feet of brush fencing along an equal length of the northern and northwestern shorelines of Sweet Lake to protect the shoreline from erosion and encourage accretion.
5. Transplant approx. 2,400 units of Giant Cutgrass (*Zizaniopsis miliacea*) or Bulrush (either *Scirpus californicus* or *Scirpus validus*) along the northern and

northwestern shoreline of Sweet Lake. .

Benefits and Costs

The area contains 338 acres of fresh marsh, 2,074 acres of open water for a total of 2,412 acres. The Sweet lake shoreline project is projected to protect 82 acres of fresh marsh and stimulate the production of 1,410 acres of aquatic vegetation and enhance 74 acres of marsh for a total benefit to 1,566 acres. The rough estimated project cost is $1,334,500.

Effects and Issues

Conserve wetlands along the Sweet Lake shoreline and interior marshes for a total benefit to over 1,566 acres. The project should reduce lake turbidity and reduce export of organic material to the GIWW. The project will have to allow for navigation to the Sweet Lake area due to oil platforms and commercial and recreational fishing in the lake.

Status

This project is presently listed on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It was a CWPPRA candidate project for 1993. It is in the conceptual phase of development.

XCS-41 WILLOW LAKE BANK STABILIZATION (See CS-11b)

Location:

Cameron Parish at the boundary between the GIWW and Willow Lake, approximately 3.5 miles west of LA Hwy. 27 Gibstown bridge (see Figures 6 and 33)and 3.0 miles southwest from the town of Sweet Lake. The project consists of 7,138 acres of open water and fresh marsh. Same location as the Willow Lake portion of CS-11b.

Problems and Opportunities

The northern shoreline of the GIWW has eroded into Willow Lake for approx. 0.5 mile. This has eroded marsh and increased marsh loss, submerged aquatic vegetation loss and turbidity in the lake. Water exchange will be reduced by re-establishing the hydrologic boundary; the shoreline, between the GIWW and the lake. This will reduce turbidity in the lake waters, encouraging the re-growth of submerged aquatic plants. The vegetation will help reduce wind induce wave action, protecting the restored shoreline from further erosion from within the lake.

Description of Features

Construct approx. 0.8 mi. of rip rap breakwater between the GIWW and Willow Lake. The project differs from CS-11b in that it does not lacks the Sweet Lake, the marsh management, dedicated dredging or sediment fencing components of project CS-11b.

Benefits and Costs

The area contains 653 acres of fresh marsh, 411 acres of open water for a total of 1,064 acres. The Willow Lake shoreline project is expected to protect 94 acres of fresh marsh and stimulate the production of 279 acres of aquatic vegetation and enhance 55 acres of marsh for a total benefit to 429 acres. The rough estimated project cost is $502,500.

Effects and Issues

Conserve wetlands along the Willow Lake shoreline for a total benefit to approximately 429 acres. The project should reduce shoreline erosion, marsh loss, lake turbidity and the export of organic material to the GIWW. The project will have to allow for navigation to the Willow Lake area due to oil platforms and commercial and recreational fishing in the lake.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program by being a part of the Willow Lake component of project CS-11b. It was part of the CS-11b CWPPRA candidate project for 1993. It presently is in the conceptual phase of development.

CS-5B SABINE FRESHWATER INTRODUCTION FROM THE SABINE RIVER TO THE VINTON CANAL (ALTERNATIVE 1)

This project description is also found with CS-5a/12 described earlier.

Location

The project area comprises from 5,000 to 10,000 acres of fresh/intermediate to brackish marshes, riparian hardwood forests, and small intermixed prairie areas south of the GIWW between the Sabine River, Gum Cove Ridge, and Black Bayou, about 18 miles west-northwest of Hackberry, Louisiana in northwestern Cameron Parish (Figures 6 and 8).

Problems and Opportunities

Wetlands in the Black Bayou area have suffered a loss of approximately 33% of the project area from 1956 to 1990 resulting from hydrological changes. These changes included; reduced freshwater inflow, increased magnitude and duration of tidal fluctuations, increased salinities, higher water levels, excessive water exchange, and artificial water circulation patterns. The objectives of the project are to divert freshwater from the Sabine River to the Sabine River Diversion Canal to the Vinton Drainage Canal into the wetlands south of the GIWW.

Description of Features

Freshwater introduction structures including pumps to bring freshwater into the area from the Sabine River north of Niblett Bluff to the Sabine River Diversion Canal then to the Vinton Drainage Canal are recommended for this project with no outfall management structures (see CS-5B/12 and CS-12 descriptions above and Alternative 5 in the DNR/CRD-Crowley feasibility report for Project C/S-5A). Various additional freshwater introduction and retention structures are proposed for CS-5b which would divert water from the Vinton Drainage Canal across the GIWW to the marshes north of the Black Bayou Oil Field (See the description for CS-5B/12).

Related Projects.

The project differs from CS-5B/12 and CS-12 in that additional freshwater is diverted from the Sabine River to the Vinton Drainage Canal to the GIWW to the Black Bayou Cutoff Canal to marshes in units 11, 16 and 17 north of and surrounding the Black Bayou Oil Field and no outfall management within the Black Bayou watershed is planned. These project is an integral part of CS-5B/12 and CS-12. This project differs from CS-12 in that CS-12 is the outfall management plan for CS-5A or CS-5B. CS-5B differs from CS-5A in the source and route of freshwater introduction. In CS-5B the source of freshwater is the Sabine River and the route is through the Sabine River Drainage Canal and the Vinton Drainage Canal, and in CS-5A the source is the Sabine River through the GIWW.

Benefits and Costs

The entire Bayou Black area contains 19,600 acres of fresh, intermediate and brackish marshes and 8,400 acres of open water for a total of 28,000 acres. The Sabine Freshwater Introduction from the GIWW project is expected to protect 376 acres of fresh

to brackish marsh and stimulate the production of 2,688 acres of aquatic vegetation and enhance 1,247 acres of marsh for a total benefit to 4,311 acres. The rough estimated project cost is $9,025,000.

Effects and Issues

The project will conserve and protect wetlands in the northern Black Bayou area of the northwestern portion of the Calcasieu/Sabine basin for a total benefit to 4,311 acres. The project should reduce marsh loss due to saltwater intrusion caused by connections of Black Bayou to the GIWW to the north. The project structures will have to be designed to allow for navigation. The amount of water diverted into the Vinton Drainage Canal will have to be monitored so as not to contribute to increased flooding in the community of Vinton.

Status

This project is presently listed in part on the Louisiana's state Coastal Wetlands Conservation and Restoration Program. It presently is in the conceptual phase of development. A feasibility report has been prepared by the La. DNR Coastal Restoration Division for part of this project as it relates to CS-5A. This project is an integral part of CS-5B/12 and readers are referred to this project description. It is unlikely that any of the freshwater introduction components of CS-5B will be completed without the outfall management components of CS-5A/12 and/or CS-12. Initial feasibility reports have indicated that CS-5A, the diversion of freshwater from the GIWW to the Black Bayou marshes may be preferable to CS-5B diverting water through the Vinton Drainage Canal.

PROJECTS NOT CONSIDERED

PCS-16 WEST GULF INTRACOASTAL WATERWAY LOCK.

Location

The project is located in Calcasieu Parish at the intersection of the GIWW and the GUM Cove Ridge about 20 miles northwest from Hackberry, La. The project area is bounded to the south by marshes south of the GIWW to the west by the Sabine River to the north by marshes north of the GIWW and to the east by the Calcasieu River (see Figures 6 and 90). This major project may benefit a total of more than 150,000 acres of fresh to saline marshes in the area north and south of the GIWW.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Calcasieu Ship Channel, the GIWW, and the removal of the sand bar at the mouth of the Calcasieu River. This has resulted in the conversion of area fresh to brackish mashes to more saline marshes and open water. Canals connecting existing marshes to the GIWW and Calcasieu Lake have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a major navigation lock at the intersection of Gum Cove and the GIWW. This lock would prevent saltwater intrusion and large tidal fluctuations from moving in an east to west direction then into the marshes north and south of the GIWW.

Description of Features.

The project features consist of the installation of a major navigational lock at the junction of Gum Cove and the GIWW. The purpose is to reduce saltwater intrusion and water level fluctuations into the brackish and saline marshes to the east and west between Calcasieu and Sabine Lakes.

Benefits and Costs.

An estimate of the amount of marsh restored, protected and enhanced was not calculated by the Wetland Value Assessment Group for this project. A conservative estimate would be that approximately 30,000 acres of fresh to saline marshes and 20,000 acres of aquatic vegetation will be protected and another 15,000 acres will be enhanced by the project for a total benefit to about 65,000 acres. The estimated project cost is $150,000,000.

Effects and Issues.

This project will protect and benefit about 65,000 acres of fresh to saline marshes by reducing saltwater intrusion and water level fluctuations. Fresh to saline marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for sufficient navigation along the GIWW between Calcasieu and Sabine Lakes. The conceptual project design is similar to the Calcasieu Lock on the GIWW northeast of

Calcasieu Lake at Hwy. 384. One issue is the large project cost. Separate authorization from the CWPPRA (PL 646-100) would be required to construct it.

Status.

This project is a long term critical project in the Calcasieu-Sabine Basin Plan along with two other large lock projects on the Calcasieu and Sabine Rivers. It is a partial alternative, with the two other locks, to the preferred "Perimeter Plan" for the basin. The maintenance of the GIWW spoil banks and the installation many structures, weirs, and plugs along openings between the GIWW and marshes to the north and south will accomplish many of the same results as the W. GIWW Lock.

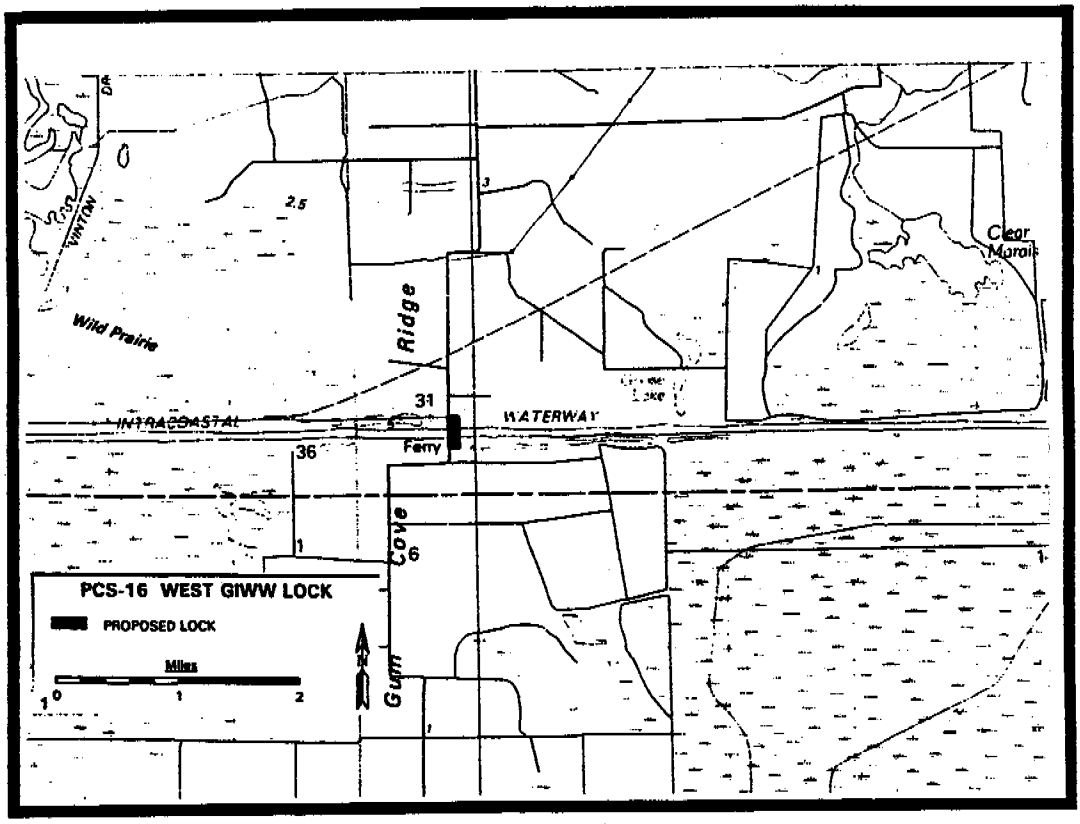

Figure 90. PCS-16 West GIWW Lock

PCS-17A CALCASIEU RIVER LOCK

Location

The project is located in Cameron Parish about one mile southwest from Cameron, La. south of Monkey Island in the Calcasieu River. The structure is proposed for the intersection of the Calcasieu River and a point just south of Monkey Island (see Figures 6 and 91). The project area is bounded to the south by the Gulf of Mexico, to the west by marshes west and south of West Cove, to the north by marshes west and east of Calcasieu Lake and to the east by the Cameron-Creole Watershed project east of Calcasieu Lake. This major project may benefit a total of more than 150,000 acres of fresh to saline marshes and open water in the area north to the intersection of the Calcasieu Ship Channel and the GIWW.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Calcasieu Ship Channel, the GIWW, and the removal of the sand bar at the mouth of the Calcasieu River. This has resulted in the conversion of area fresh to brackish mashes to more saline marshes and open water. Canals connecting existing marshes to the GIWW and Calcasieu Lake have increased these marsh destruction processes. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a major navigation lock near the mouth of the Calcasieu River and the Gulf of Mexico. This lock would prevent saltwater intrusion and large tidal fluctuations from moving in an northerly direction then into the marshes surrounding Calcasieu Lake.

Description of Features.

The project features consist of the installation of a major navigational lock at the Calcasieu River south of Monkey Island just south of Cameron, La.

Benefits and Costs.

An estimate of the amount of marsh restored, protected and enhanced was not calculated by the Wetland Value Assessment Group for this project. A conservative estimate would be that approximately 30,000 acres of fresh to saline marshes and 20,000 acres of aquatic vegetation will be protected and another 15,000 acres will be enhanced by the project for a total benefit to about 65,000 acres. The estimated project cost is $250,000,000.

Effects and Issues.

This project will protect and benefit about 65,000 acres of fresh to saline marshes by reducing saltwater intrusion and water level fluctuations. Fresh to saline marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for sufficient navigation along in the Calcasieu River and Ship Channel. The conceptual project design is similar to the Calcasieu Lock on the GIWW northeast of Calcasieu Lake

at Hwy. 384. One issue is the large project cost. Separate authorization from the CWPPRA (PL 646-100) would be required to construct it.

Status.

This project is a long term critical project in the Calcasieu-Sabine Basin Plan along with two other large lock projects on the GIWW (PCS-16) and Sabine River (PCS-17B). It is a partial alternative, with the two other locks, to the preferred "Perimeter Plan" for the basin. The maintenance of and the installation many structures, weirs, and plugs along openings between Calcasieu Lake and marshes surrounding the lake will accomplish many of the same results as the Calcasieu River Lock.

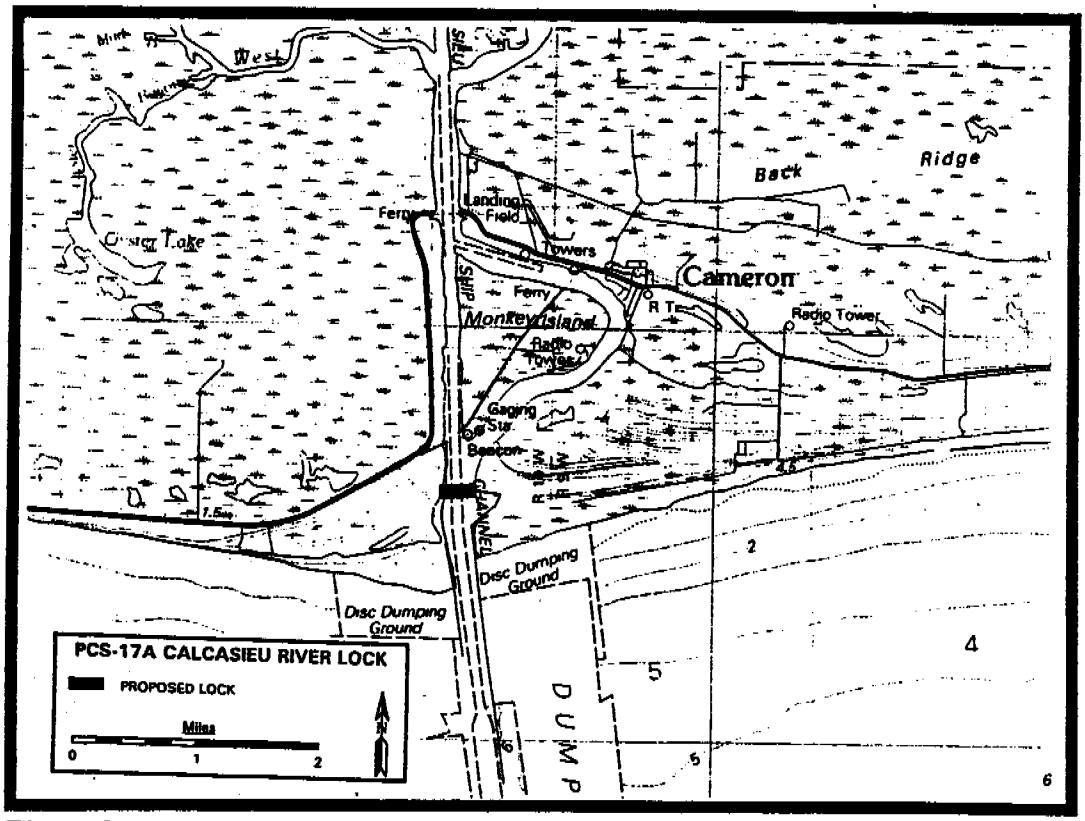

Figure 91. PCS-17A Calcasieu River Lock

PCS-17B SABINE RIVER LOCK

Location

The project is located in Cameron Parish in Calcasieu Pass near Lighthouse Bayou about ten miles southwest from Johnsons Bayou, La. The structure is proposed for the intersection of the Sabine River and a point near Lighthouse Bayou (see Figures 6 and 92). The project area is bounded to the south by the Gulf of Mexico, to the west by marshes west of Sabine Pass and Sabine Lake, to the north by marshes north of Sabine Lake, and to the east by marshes east of Sabine Lake. This major project may benefit a total of more than 120,000 acres of fresh to saline marshes and open water in the area north to the intersection of the Sabine Lake and the GIWW.

Problems and Opportunities

Marsh loss in the project area has been caused by saltwater intrusion and increased water level fluctuations which were in turn caused by the construction of the Sabine Pass Channel, the GIWW, and the construction of canals connecting Sabine Lake with marshes to the east and west. This has resulted in the conversion of area fresh to brackish mashes to more saline marshes and open water. This hydrologic restoration project has the goals of reducing saltwater intrusion and water level fluctuations in the area through the installation of a major navigation lock near the mouth of the Sabine River and the Gulf of Mexico. This lock would prevent saltwater intrusion and large tidal fluctuations from moving in an northerly direction then into the marshes surrounding Sabine Lake.

Description of Features.

The project features consist of the installation of a major navigational lock at the Sabine River near Lighthouse Bayou.

Benefits and Costs.

An estimate of the amount of marsh restored, protected and enhanced was not calculated by the Wetland Value Assessment Group for this project. A conservative estimate would be that approximately 15,000 acres of fresh to saline marshes and 10,000 acres of aquatic vegetation will be protected and another 7,500 acres will be enhanced by the project for a total benefit to about 32,500 acres. The estimated project cost is $350,000,000.

Effects and Issues.

This project will protect and benefit about 32,500 acres of fresh to saline marshes by reducing saltwater intrusion and water level fluctuations in the Sabine Lake region of Louisiana. Fresh to saline marsh fish and wildlife will benefit from the project. The project should be designed so as to provide for sufficient navigation and estuarine fisheries access through Sabine Pass. The conceptual project design is similar to the Calcasieu Lock on the GIWW northeast of Calcasieu Lake at Hwy. 384. One issue is the large project cost. Separate authorization from the CWPPRA (PL 646-100) would be required to construct it.

Status.

This project is a long term critical project in the Calcasieu-Sabine Basin Plan along with two other large lock projects on the GIWW (PCS-16) and Calcasieu River (PCS-17A). It is a partial alternative, with the two other locks, to the preferred "Perimeter Plan" for the basin. The maintenance of and the installation many structures, weirs, and plugs along openings between Sabine Lake and marshes surrounding the lake will accomplish many of the same results as the Sabine River Lock.

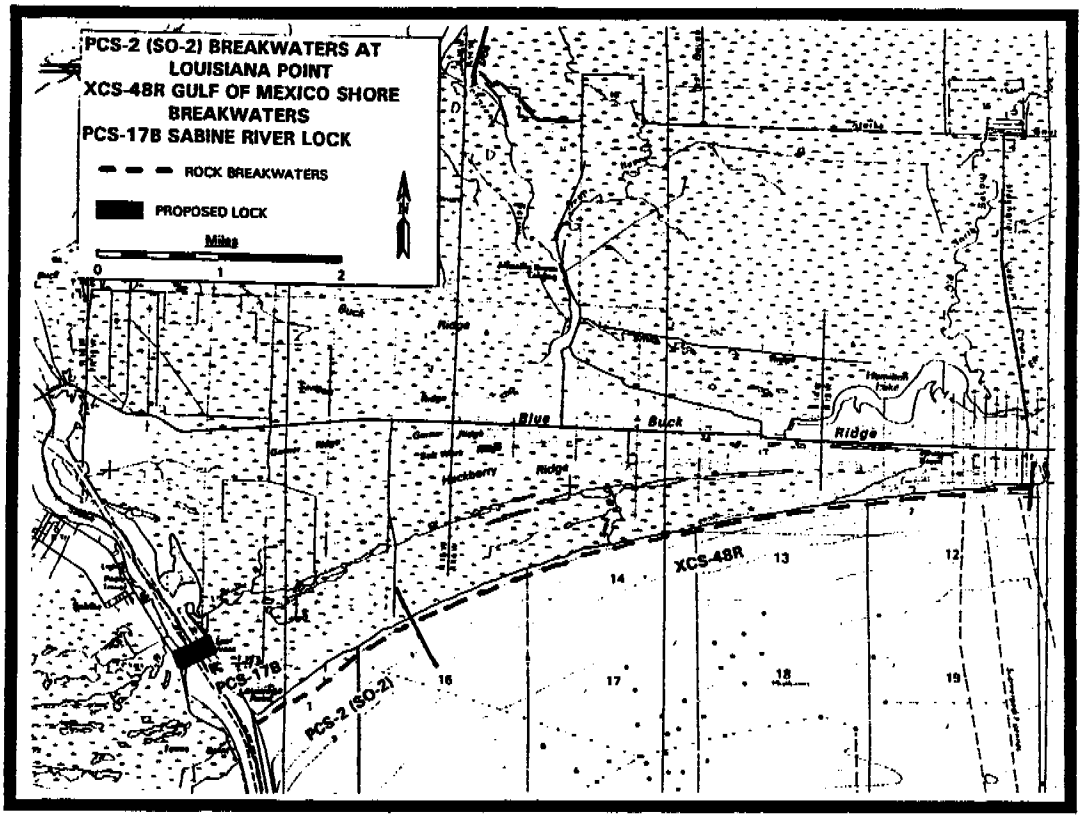

Figure 92. PCS-17B Sabine River Lock

SUPPORTING RESEARCH

Paille and Shuck (1992) reported that recruitment and abundance of shrimp within managed marshes was reduced during low-salinity periods. Recruitment of some organisms was found to be greater at certain water control structures.

There are many areas in this basin where structural marsh management is used in an attempt to mitigate wetland loss and improve habitat for wildlife production and harvest. Monitoring reports from the Amoco Production Company's West Black Lake management area revealed that active management with pumps and gravity drainage structures increased the area of emergent and submerged vegetation and increased alligator and waterfowl harvest.

Underwood et. al. (1988) reported on the construction of terraces and vegetative planting on the Sabine National Wildlife Refuge west of Calcasieu Lake. They concluded that this type of approach to marsh restoration and protection could improve sediment deposition and accretion, reduce wind general waves, reduce shoreline erosion, increase coverage of submerged aquatic vegetation and increase overall primary productivity.

W. G. Duffy (FWS) and Darryl Clark (Louisiana Department of Natural Resources - LDNR) 1988 edited the document entitled, "Marsh management in Coastal Louisiana: Effects and Issues..Proceedings of a Symposium." The document was jointly published by the FWS and LDNR. It contains articles dealing with the social, recreational, economic, regulatory and ecological issues and matters related to marsh management.

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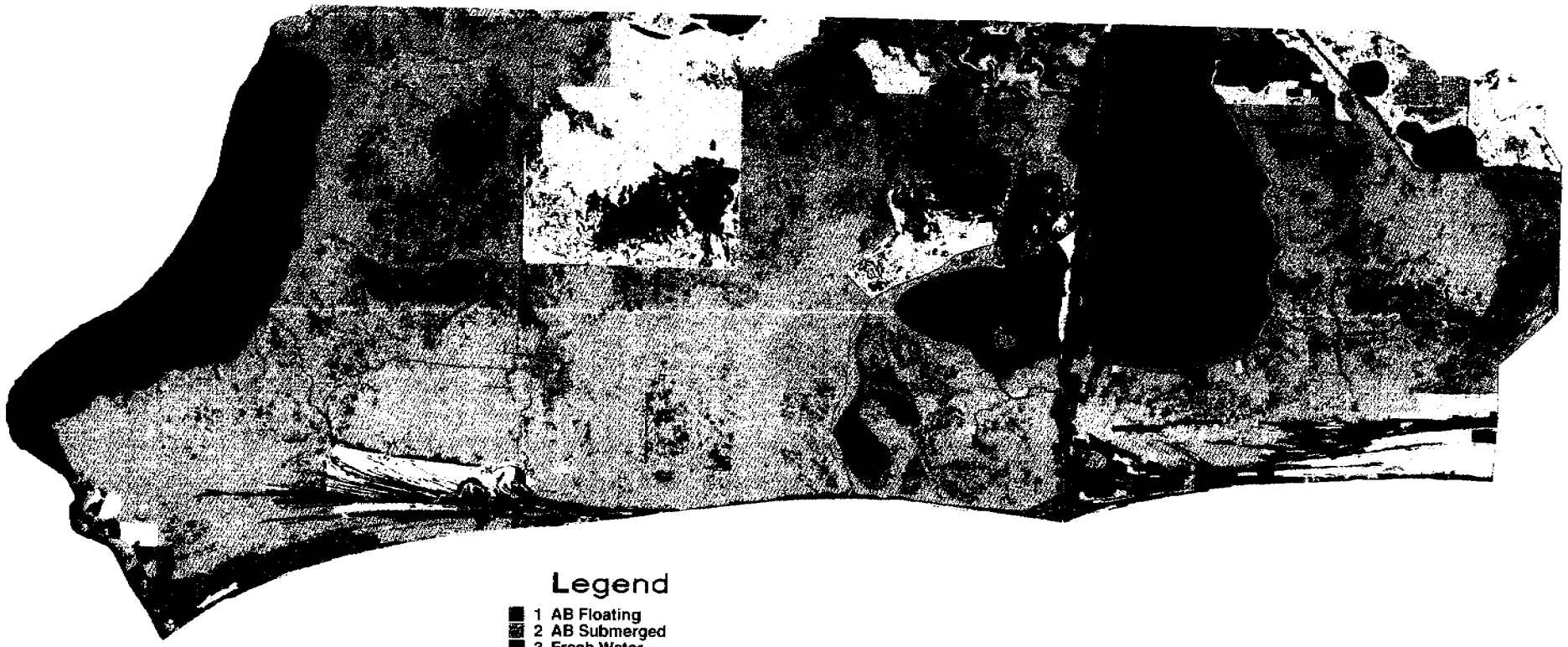

Legend

- 1 AB Floating
- 2 AB Submerged
- 3 Fresh Water
- 4 Estuarine Water
- 5 Fresh Marsh
- 6 Intermediate Marsh
- 7 Brackish Marsh
- 8 Saline Marsh
- 9 Estuarine Marsh
- 10 Cypress Forest
- 11 Bottomland Forest
- 12 Dead Forest
- 13 Bottomland SS
- 14 Shore/Flat
- 15 Ag/Pasture
- 16 Upland Barren
- 17 Upland Forest
- 18 Developed
- 19 Upland SS

Louisiana Coastal Wetlands
Restoration Plan
Sabine-Calcasieu Basin

1988 HABITAT DATA

date: April 1993

PLATE 1