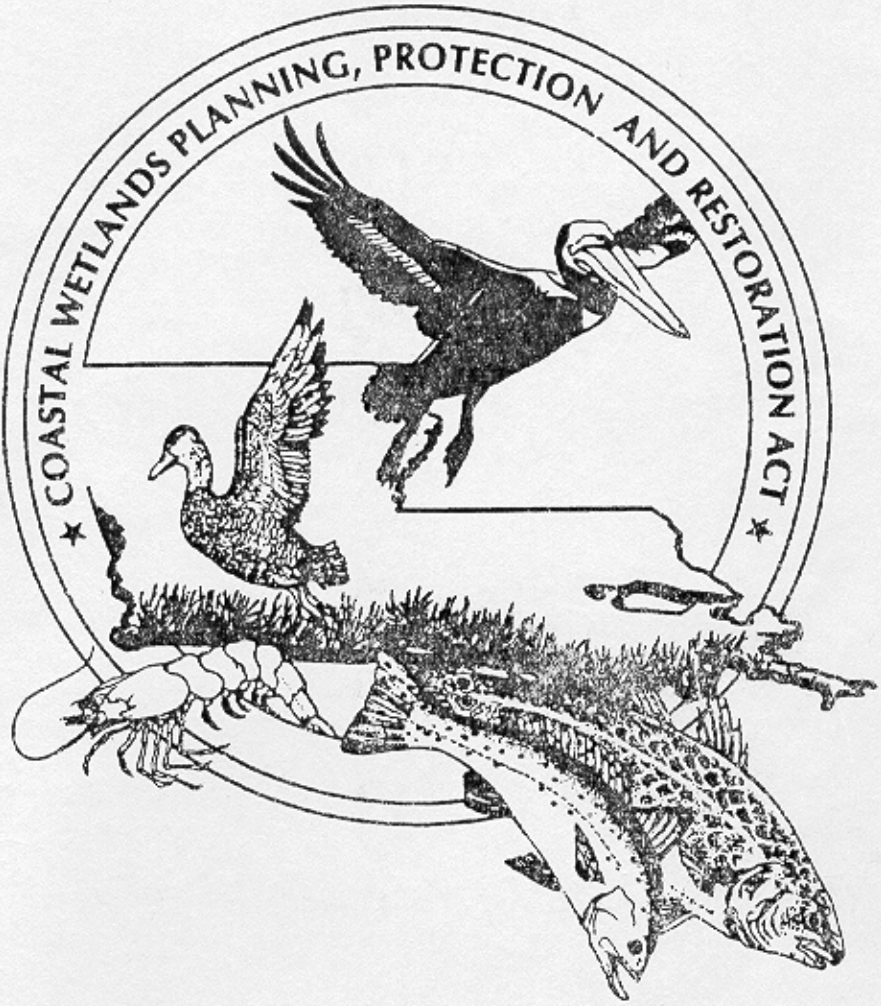
LOUISIANA COASTAL WETLANDS RESTORATION PLAN



PONTCHARTRAIN BASIN
APPENDIX A

PREPARED BY:

LOUISIANA COASTAL WETLANDS CONSERVATION AND RESTORATION TASK FORCE

November 1993

LOUISIANA COASTAL WETLANDS RESTORATION PLAN

PONTCHARTRAIN BASIN PLAN

APPENDIX A

Louisiana Coastal Wetlands Restoration Plan
Pontchartrain Basin

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INTRODUCTION

STUDY AREA

The 1,700,000 acre Pontchartrain Basin is an abandoned delta generally bounded by the Pleistocene Terraces on the north and west, by Chandeleur Sound on the east, and by the Mississippi River and the disposal area of the Mississippi River Gulf Outlet (MRGO) on the south. All or part of nine parishes lie in the basin: Ascension, St. James, St. John the Baptist, Tangipahoa, St. Charles, Jefferson, Orleans, St. Tammany, and St. Bernard.

The Pontchartrain Basin is divided into six distinct areas: the Upper Basin, the Pontchartrain/Maurepas Land Bridge, the Middle Basin, the Pontchartrain/Borgne Land Bridge, the Lower Basin and the Pearl Basin (Figure 1). Over 17 percent, or 125,000 acres, of the land in the basin is in public ownership.

EXISTING PROTECTS AND PROGRAMS

Many existing projects affect wetlands in the basin. The following is a list that includes those projects and programs that interact with the Pontchartrain Basin Restoration Plan.

U. S. ARMY CORES OF ENGINEERS

The MRGO project provides for a 36- by 500-foot tidewater channel, 76 miles long, from the Inner Harbor Navigation Canal (IHNC) in New Orleans to the Gulf of Mexico. Construction was completed in 1968. This deep draft route to New Orleans is 37 miles shorter than the Mississippi River. All material from construction of the project was placed in a 4,000 foot wide strip along the south bank of the channel.

Approximately 4.5 million cubic yards (cy) are dredged annually from the bar channel (mile 0 near Breton Island to mile minus 9 out in the gulf) and deposited in the open gulf. About 21.5 million cy are dredged from the portion of the channel through Breton Sound every two to three years. This material is used to create wetlands or islands. In the inland reach, about 14 million cy are removed every three to four years. Approximately 10 percent is used to create wetlands. The remaining 90 percent is placed on the existing south bank disposal area. In 1992, the U.S. Army Corps of Engineers (USACE) built 3.5 miles of shoreline rock dike on the north bank to prevent the breakthrough of the waterway into Lake Borgne.

The GIWW is a 12- by 150-foot channel along the gulf coast from Florida to Texas. In the Pontchartrain Basin it extends from the Mississippi Sound to the Mississippi River through the IHNC Lock. Portions of the GIWW are congruous with portions of the IHNC and the MRGO.

The IHNC provides a 30- by 150-foot navigation channel between the Mississippi River and Lake Pontchartrain. The canal and lock were constructed by the State of Louisiana in 1923. The USACE acquired the IHNC Lock and the portion of the IHNC between the lock and the MRGO from the State of Louisiana in 1986. The II-INC Lock has dimensions of 31.5 feet by 75 feet by 640 feet.

The Mississippi River and Tributaries project, the comprehensive flood control project for the lower Mississippi Valley, has a significant impact on water and land resources in the Pontchartrain Basin. Features pertinent to the basin are listed below.

- The east Mississippi River levee extends from Baton Rouge to Bohemia. It provides protection from the standard project flood on the Mississippi River. This levee is essentially complete in the Pontchartrain Basin.
- The Bonnet Carre Spillway is located about 20 miles west of New Orleans on the east bank of the Mississippi River. The purpose of the spillway is to divert up to 250,000 cubic feet per second (cfs) of Mississippi flows to Lake Pontchartrain to lower flood stages in the river in the New Orleans area. A structure consisting of 350 reinforced concrete bays, each equipped with removable timber needles, controls the flows from the river. The spillway was completed in 1932 and has been operated seven times.

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

The Soil Conservation Service has an active marsh conservation planning program with local landowners in the Pontchartrain Basin.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

The Lake Pontchartrain Basin Foundation (LPBF) received a grant from EPA to build a one-acre demonstration marsh near the Bonnabel Canal in Jefferson Parish. The purpose of this project is to test the feasibility of using constructed wetlands to treat stormwater runoff and to determine if such a system can be operated and maintained cost effectively.

Under a grant from EPA, the LPBF chaired an Interagency Working Group (IAWG) which formulated a draft Comprehensive Management Plan (CMP) for the Pontchartrain Basin. The Renewable Resources Subcommittee of the IWAG was composed of many of the same agencies, members of the academic community, and environmental groups that make up the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) Basin Team. The subcommittee report strongly endorsed many of the projects that are part of the CWPPRA plan for the basin. However, in preparation of their draft CMP, the LPBF chose not to follow many of the recommendations of this subcommittee. Their CMP does not include construction of the Bonnet Carre Freshwater Diversion project, numerous shoreline protection projects, gapping of spoil banks to reduce impoundment, and diversion of fresh water and sediments from the Pearl River. The draft CMP does include many of the projects that are part of the CWPPRA plan for the basin, including stabilization of the north bank of the MRGO.

U. S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service (USFWS) manages the Bayou Sauvage National Urban Wildlife Refuge (NUWR), consisting of 25,400 acres in the marshes of eastern New Orleans.

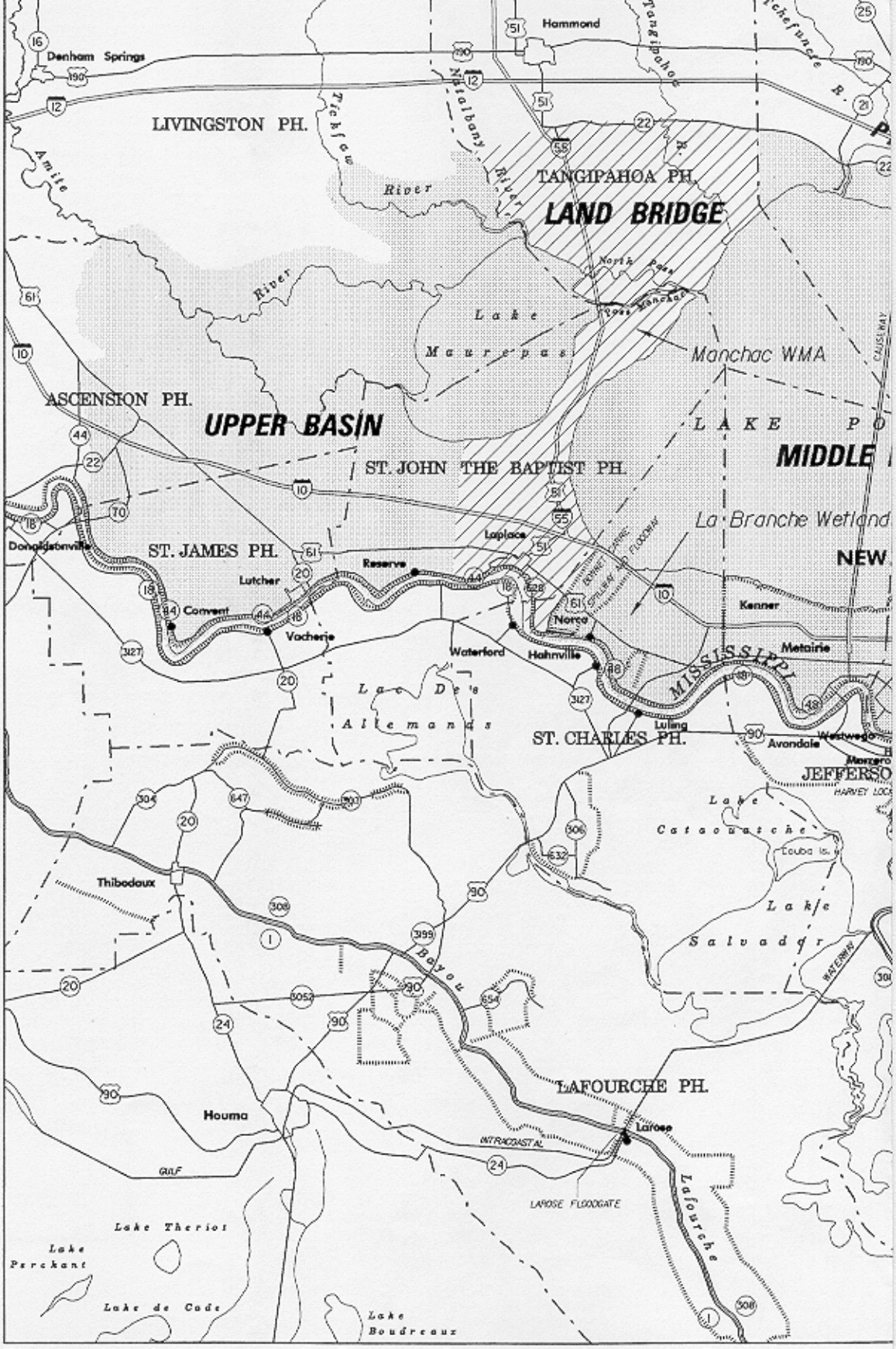
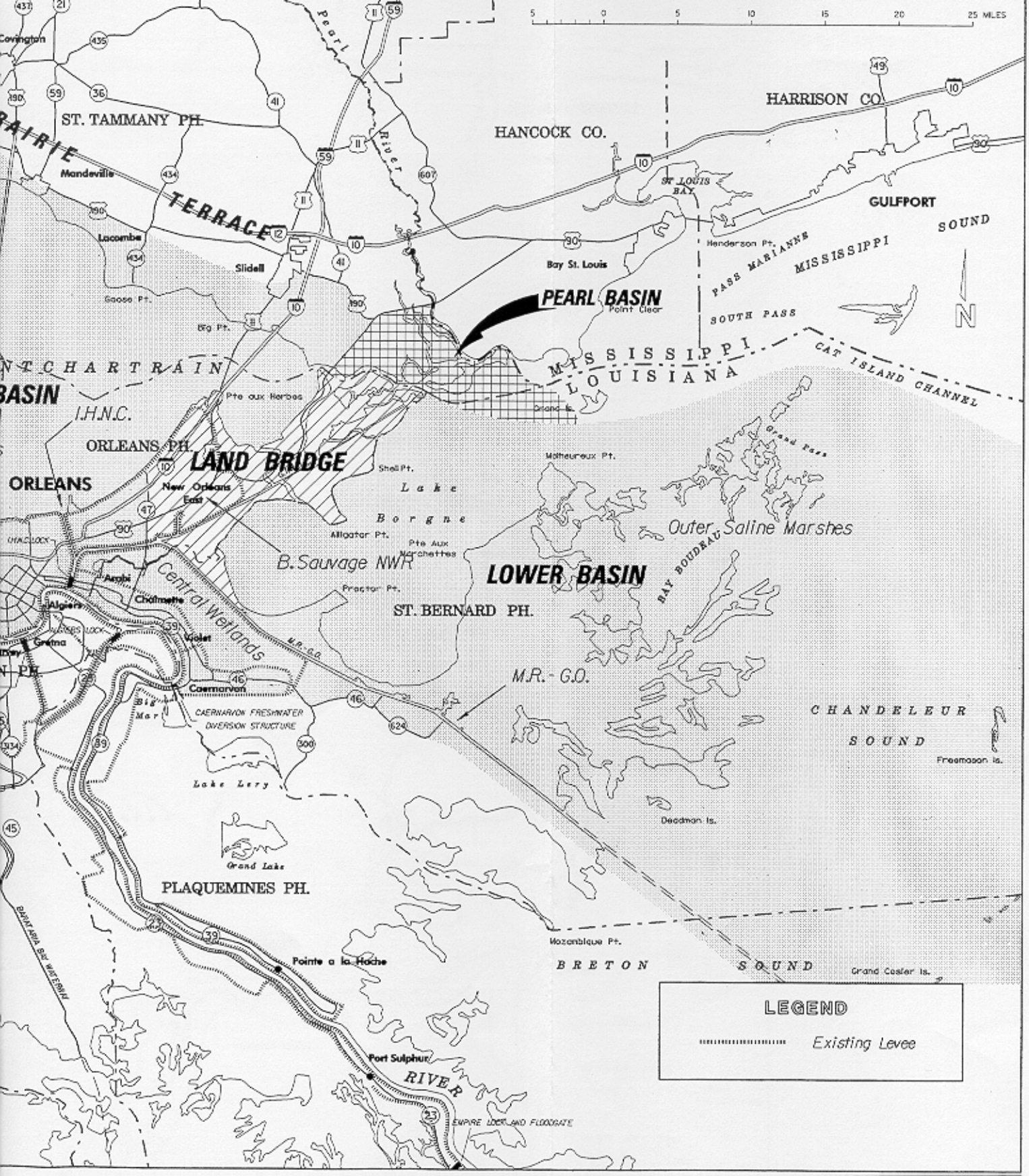


Figure 1. Pontchartrain Basin, Basin and Subbasin Boundaries.


5 0 5 10 15 20 25 MILES
Covington
ST. TAMMANY PH.
Mandeville
Lacombe
Slidell
Goose Pt.
Bfg Pt.
Pearl River
HANCOCK CO.
HARRISON CO.
ST LOUIS BAY
GULFPORT
SOUND
Henderson Pt.
PASS MARIANNE
MISSISSIPPI
SOUTH PASS
Bay St. Louis
Point Clear
PEARL BASIN
N
MISSISSIPPI
LOUISIANA
CAT ISLAND CHANNEL
NTCHARTRAIN
BASIN
I.H.N.C.
Pte aux Herbes
Grand Is.
ORLEANS PH.
LAND BRIDGE
ORLEANS
New Orleans East
Shell Pt.
Lake
Borgne
Alligator Pt.
Pte Aux Marchettes
Malheureux Pt.
Grand Pass
Outer Saline Marshes
B. Sauvage NWR
Central Wetlands
LOWER BASIN
BAY BOUDREAU
Proctor Pt.
ST. BERNARD PH.
Arabi
Chalmette
Algiers
Gretna
Violet
Caernarvon
M.R.-G.O.
CAERNARVON FRESHWATER DIVERSION STRUCTURE
Big Mar
Lake Lery
CHANDELEUR SOUND
Freemason Is.
Deadman Is.
Grand Lake
PLAQUEMINES PH.
BARATARIA BAY WATERWAY
Mozambique Pt.
Pointe a la Hache
BRETON SOUND
Grand Gosier Is.
Port Sulphur
RIVER
EMPIRE LOCK AND FLOODGATE
LEGEND
Existing Levee

STATE OF LOUISIANA

Louisiana Department of Natural Resources

The Louisiana Department of Natural Resources (LDNR) built or shared in the cost of the following projects in the Pontchartrain Basin as part of the State Coastal Wetlands Conservation and Restoration Program (State of Louisiana 1990-1993).

A siphon at Violet diverts up to 300 cfs of Mississippi River water into the Violet Canal and thence into the Central Wetlands of St. Bernard Parish. A pumping station nourishes about 300 acres of marsh in the Central Wetlands with urban drainage. A series of variable crest weirs, gated control structures, and closure dams controls water exchange between Lake Pontchartrain and the La Branche wetlands south of I-10. Rocks on filter fabric protect about half of the Pontchartrain shoreline of the La Branche wetlands. Rock-filled gabions on the Pontchartrain shoreline of the Manchac Wildlife Management Area (WMA) prevent Lake Pontchartrain from breaking through into a pond heavily covered with submerged aquatic vegetation. The project is interim protection until the USACE constructs a five-mile segmented rock breakwater in the same area as mitigation for the Lake Pontchartrain and Vicinity Hurricane Protection project. The state funded several marsh creation projects using Christmas trees in cooperation with St. Charles and St. Tammany Parishes.

Louisiana Department of Wildlife and Fisheries

This department operates five WMA's covering nearly 100,000 acres in the Pontchartrain Basin: Biloxi, Joyce, Manchac, St. Tammany, and Pearl River. Additionally, several Louisiana Natural and Scenic Streams lie in the basin.

PROBLEM IDENTIFICATION

EXISTING CONDITIONS

GEOMORPHOLOGY AND HYDROLOGY

Bayou Sauvage, which runs just south of Lake Pontchartrain, was the main Mississippi River channel about 3,000 years ago. It provided sediments and nutrients to form a deltaic lobe in the basin. Lakes Pontchartrain and Borgne were part of an estuarine system when the lobe formed and remained as lakes in the delta. Once the delta was abandoned, fluvial and deteriorative processes were in equilibrium for a time, but eventually, the balance swung to deteriorative processes. The Chandeleur Islands and the sound behind them formed as the delta eroded. The land bridges between Lakes Pontchartrain and Borgne and Lakes Pontchartrain and Maurepas remained as prominent geologic features in the basin.

The basin has a pronounced upland margin on the north and northwest formed by the Pleistocene Terrace deposits. The natural levees along the present course of the Mississippi River provide high ground on the south and east side of the basin.

Average subsidence rates are 0.05 inches per year (0.4 feet per century) in the upper basin and 0.06 inches per year (0.5 feet per century) in the lower basin. Because the Pleistocene layer is shallower in the upper basin, subsidence rates there are lower. Pleistocene deposits surface west of Lake Maurepas and north of Lake Pontchartrain. This layer lies 180 feet below Chandeleur Sound.

The Pontchartrain Basin is approximately 55 percent open water. Major hydrologic features of the basin include Lakes Maurepas, Pontchartrain, and Borgne and Chandeleur Sound. Lakes Maurepas and Pontchartrain are connected by passes through an interlying land bridge. Lake Pontchartrain is connected to Lake Borgne and other estuaries by passes through the land bridge between them. Lake Pontchartrain is connected directly to the gulf by way of the IHNC and the MRGO.

Bayou Manchac provided fluvial input to the basin until its closure in 1812. Crevasses, such as those that occurred at Bonnet Carre, still occurred until construction of the modern Mississippi River levees in the 1930's. Since then, fluvial processes have been seriously curtailed and deteriorative processes predominate. When the Bonnet Carre Spillway is opened for flood control, freshwater flows of up to 318,000 cfs enter the basin. During high Mississippi River stages, water enters Lake Pontchartrain by leaking through the Bonnet Carre structure. Small amounts of Mississippi River also enter the basin via the IHNC Lock and the Violet Siphon.

Fresh water also enters the basin via direct rainfall and flows from numerous rivers and bayous draining into Lakes Pontchartrain and Maurepas. The mean monthly discharge from these rivers and bayous is 9,500 cfs. Highest discharges occur from February through April, and the lowest are from July through September. Lake Borgne receives this 9,500 cfs, plus an average monthly flow of 12,900 cfs from the Pearl River. Urban stormwater discharges from the New Orleans metropolitan area also enter Lake Pontchartrain.

Overall, the basin is a freshwater system at the upper (western) end and a salt water system at the lower (eastern) end, with Lake Pontchartrain as a mixing bowl in

the middle. Lake Maurepas is nearly fresh most of the year. Salinities in Lake Pontchartrain generally vary from 2 to 7 parts per thousand (ppt), with the western portion being freshest. Lake Borgne salinities range from 3 to 15 ppt, with the freshest areas being in the north and west. Chandeleur Sound varies from about 10 ppt to nearly 20 ppt. Salinity also varies by season and year. During the spring when discharge from rivers and bayous north of Lake Pontchartrain is high, salinities in the basin are lower. In the fall, less fresh water enters the lakes from the rivers, southeast winds push more saline waters into the system, and salinities increase. In years with little rainfall, salinities stay fairly high in the basin throughout the year.

The diurnal tide ranges about 1 foot. This is enough that most marshes in the basin are flooded daily. The range and height of the tides are often modified by the wind.

VEGETATION AND SOILS

Swamps and marshes are the predominant vegetative types in the Pontchartrain Basin (Table 1 and Plate 1 at the end of this appendix). Beds of submerged aquatic vegetation are present in Lake Pontchartrain and in lakes and bayous--the fresh through brackish areas of the basin. A discussion of these habitats, and associated soils and salinities, follows.

Table 1. Habitat Distribution in Pontchartrain Basin '

Habitat Type	Upper Basin (acres)	Pont/ Maurepas Land Bridge (acres)	Middle Basin (acres)	Pont/ Borgne Land Bridge (acres)	Lower Basin (acres)	Pearl Basin (acres)	Total (acres)
Fresh Marsh	3,890	10,290	10,960	5,070	3,750	4,500	38,460
Intermed Marsh	0	12,190	7,480	1,190	0	7,750	28,610
Brackish Marsh	0	0	13,660	31,990	67,490	3,690	116,830
Saline Marsh	0	0	0	0	83,860	0	83,860
Subtotal Marsh	3,890	22,480	32,100	38,250	155,100	15,940	267,760
Aquatic Vegetat.	1,190	680	1,000	3,700	50	30	6,640
Cypress/tupelo	138,610	61,220	15,380	310	90	30	215,640
Other Land	65,710	34,410	97,300	15,500	40,550	2,090	255,550
Water	28,870	38,290	408,710	38,030	405,530	12,070	935,140
Total area	238,270	157,080	554,490	92,790	601,300	30,150	1,674,080

' Data from USF'WS GIS database, 1993.

Most of the cypress swamps lie in the upper basin and on the Pontchartrain/ Maurepas land bridge. Salinities in the upper basin rarely exceed 1 ppt, but can exceed 3 ppt on the land bridge.

Fresh marsh is found mostly near river mouths, on the south shore of Lake Maurepas, and in the Bayou Sauvage NUWR. The soils are about 50 percent organic. Water salinities range from nearly fresh to 7 ppt. Fresh marshes have a greater variety of plant species than any other marsh type.

Intermediate marshes generally surround Lake Pontchartrain. Their soils have an organic content of about 40 percent, and salinities range from 2 to 9 ppt.

Some brackish marshes are found in the La Branche area and adjacent to the northeastern portion of Lake Pontchartrain. The remainder of the brackish marshes lie on the Pontchartrain/Borgne land bridge, north of the MRGO and east of Lake Borgne. Organic content of the soil is about 30 percent. Salinities range from about 5 ppt to 15 ppt.

The majority of the saline marshes in the basin form the outer limits of the ancient St. Bernard Delta of the Mississippi River. The remaining saline marshes are along the southern portion of the MRGO. The soil is generally a mineral soil with less than 15 percent organic matter. Salinities ranges from 10 to 20 ppt.

Submerged aquatic vegetation in quiet waters consists mainly of Eurasian water milfoil. Eelgrass and pondweeds exist along shores of eastern Lake Pontchartrain. The area supporting seagrass beds in Lake Pontchartrain decreased substantially in the 1970's and 1980's (Bums et al. 1993). There is some evidence that these beds are coming back along the north shore of the lake.

FISH AND WILDLIFE RESOURCES

The wetlands of the Pontchartrain Basin support a variety of wildlife. Numerous species of waterfowl winter in fresh and intermediate marshes. Wading and shore birds forage and rest in shallow waters throughout the basin. Large flocks of gulls and terns feed in the deeper waters. Some of the highest nutria populations in the state graze in the fresh and intermediate marshes. Muskrats heavily utilize the brackish marshes. Harvest of these furbearers is necessary to keep their numbers under control.

The basin supports nearly two million user-days of sport fishing annually. Spotted seatrout, red drum, and brown and white shrimp are the most popular recreational catches.

Several Federally listed threatened and endangered species occur in the basin. Bald eagles nest at eight sites in the basin. Brown pelicans feed in the shallow bays and sounds, and nest on the Chandeleur Islands. The piping plover and Arctic peregrine falcon winter in the basin, especially near Chandeleur Sound. The Gulf sturgeon feeds in the deeper waters of the coastal areas. The inflated heelsplitter, a mussel, inhabits the sediments in the Amite River. Endangered sea turtles, such as the Kemp's ridley, hawksbill, and leatherback, and threatened sea turtles, such as the loggerhead and green, forage in the bays and sounds.

ECONOMIC RESOURCES

Flood control and navigation projects, which contribute to the loss of wetlands, have made this portion of Louisiana habitable and have fostered economic development. Over a million people inhabit the basin. Over 108,000 acres are developed as farms, residences, businesses, or industries. Much of the economy of the basin is based on its fish and wildlife resources and its navigable waterways.

Fish and Wildlife Activities.

Oyster harvest is important in the basin; oystermen lease several thousand acres of water bottoms for oyster production. However, the zone of productive leases is squeezed between water that is polluted from inland sources and water that is too saline for oyster production. Oyster landings for 1989 were valued at $2.5 million.

Commercial fishermen harvest brown and white shrimp and blue crabs. In fresher years, they catch more white shrimp and blue crabs and in saline years, more brown shrimp. Historical data show that in the year following a Bonnet Carre Spillway opening, shrimp landings increase significantly. Taking the average of the 1991 and 1992 harvests shows that fishermen in Lakes Pontchartrain and Borgne caught $730,000 worth of brown shrimp, $430,000 worth of white shrimp, and $2,900,000 worth of blue crabs annually. In 1989, $6,500,000 worth of menhaden were harvested from Breton and Chandeleur Sounds. A limited amount of trapping for nutria and muskrat occurs in the basin.

Navigation and Port Activities.

The other economic interest in the basin associated with wetlands is navigation and port activities. The MRGO is a major navigation route. An average of 750 deep-draft ships, 1,200 towboats, and 2,500 barges use it each year. Approximately 40 percent of the Port of New Orleans cargo passing over public facilities is handled in the MRGO tidewater area. The 4.8 million tons of containerized cargo handled at the MRGO facilities represent nearly 90 percent of the containerized cargo moving through the port. The deep-draft tonnage has increased five percent each year since 1967, and is expected to continue to increase. However, it is unlikely that the third and fourth generation container vessels will ever use the MRGO because such large ships would be mainly used on transoceanic routes. Average annual maintenance costs from 1977-1992 are $7.4 million. Annual transportation savings are $15 million, compared to use of an alternate route. The benefit to cost ratio, based on continued maintenance of the MRGO, is 1.9. Numerous cargo-handling and wharf facilities are associated with the northern terminus of MRGO. The USACE used data from a University of New Orleans report (Ryan and Muruggi 1989) to estimate that 4,600 jobs directly depend on these tidewater facilities and an additional 5,700 jobs are created by these direct jobs. The shallow depth and narrow width of the IHNC Lock limit the movement of ships between the Mississippi River and the MRGO facilities. Deep-draft ships can access these tidewater facilities only via the MRGO.

COASTAL WETLANDS PROBLEMS

Since 1932, over 66,000 acres of marsh converted to water in the Pontchartrain Basin-over 22 percent of the marsh that existed in 1932 (Dunbar, Britsch, and Kemp, 1992). Table 2 summarizes the losses over the last half century. Locations of the major areas of loss are shown in Figure 2. The primary causes of wetland loss in the Pontchartrain Basin are the interrelated effects of subsidence, sea level rise, erosion, saltwater intrusion, and human activities. The most significant human activity causing wetlands loss is the construction of the Mississippi River levees, which eliminated fluvial processes that nourished wetlands with fresh water and sediment. Other significant human activities include the filling, draining, flooding, or dredging of wetlands for various purposes, and the salinity intrusion, direct construction impacts, and erosion associated with the MRGO.

The four critical problems in the Pontchartrain Basin are: 1) increased salinity and reduced sediment and nutrient input, 2) MRGO bank erosion, 3) possible loss of the land bridges, and 4) possible loss of critical areas where marsh loss is imminent. These problems are described below.

CRITICAL SALINITY, NUTRIENT, AND SEDIMENT PROBLEMS

Increased salinity is a critical problem in the Pontchartrain Basin. The natural salinity balance changed for four reasons: 1) Mississippi River levees prevent the fluvial processes which once brought fresh water, sediment, and nutrients into the basin; 2) the MRGO breaches the Bayou La Loutre ridge and the Pontchartrain/Borgne land bridge and allows saline waters to push farther into the basin; 3) the subsidence/sea level rise of up to 0.96 feet per century allows saltier waters access to basin wetlands; and 4) between 1948 and 1970, approximately five square miles of canals and channels were dredged in the basin, which provided more avenues for salt water.

Thirty years ago, the elevated salinity, primarily brought in by the MRGO, destroyed all of the swamp in the lower basin, caused the loss of over 4,000 acres of marsh, and converted over 30,000 acres of marsh throughout the middle and lower basins to more saline marsh types.

Mean monthly salinities have increased from what they were prior to construction of the MRGO and other canals. For instance, salinities increased by an average of 0.3 ppt at Pass Manchac, 2.4 ppt at Chef Menteur Pass near Lake Borgne, and 4.8 ppt at Bayou La Loutre near Alluvial City (USACE 1984). However, the mean increases are less than the overall variability at each of these stations (Sikora and Kjerfve 1985). Salinities appear to have stabilized in recent years.

During periods of low flow, salinities may increase to as high as 5 ppt in Lake Maurepas and as high as 20 ppt near the IHNC (Schurtz, 1982). High salinities, whether before or after the MRGO, are deleterious to cypress and stress fresh marsh. The MRGO played a role in increasing salinity in the basin, but it is not the sole contributing factor. In fact, if the MRGO had never been built, salinities in the basin would still be elevated and wetlands would be stressed. Subsidence rather than construction of the MRGO is probably responsible for the

Table 2. Marsh Loss in the Pontchartrain Basin, 1932-1990

Time Period	Pontchatrain Maurepas Land Bridge		Middle Basm		Pontchartrain Borgne Land Bridge		Lower Basin		Pearl Basin		Total Basin	
	Loss (acres)	Loss per Year * (percent)	Loss (acres)	Loss per Year * (percent)	Loss (acres)	Loss per Year * (percent)	Loss (acres)	Loss per Year * percent)	Loss (acres)	Loss per Year * (percent)	Loss (acres)	Loss per Year * (percent)
1932-58	1,630	0.23	5,550	0.45	5,522	0.42	10,274	0.21	426	0.1	23,403	0.3
1958-74	2,140	0.53	8,393	1.24	4,595	0.64	15,168	0.53	407	0.2	30,706	0.6
1974-83	840	0.4	1,678	0.55	1,958	0.54	7,758	0.53	435	0.3	12,671	0.51
198390	219	0.14	1,354	0.6	1,685	0.63	3,911	0.36	121	0.11	7,292	0.39
Total acres	4,610		15,621		12,075		33,200		1,268		66,774	
Total percent		17		33		24		18		7		25

* Percent of marsh remaining relative to beginning of time period.

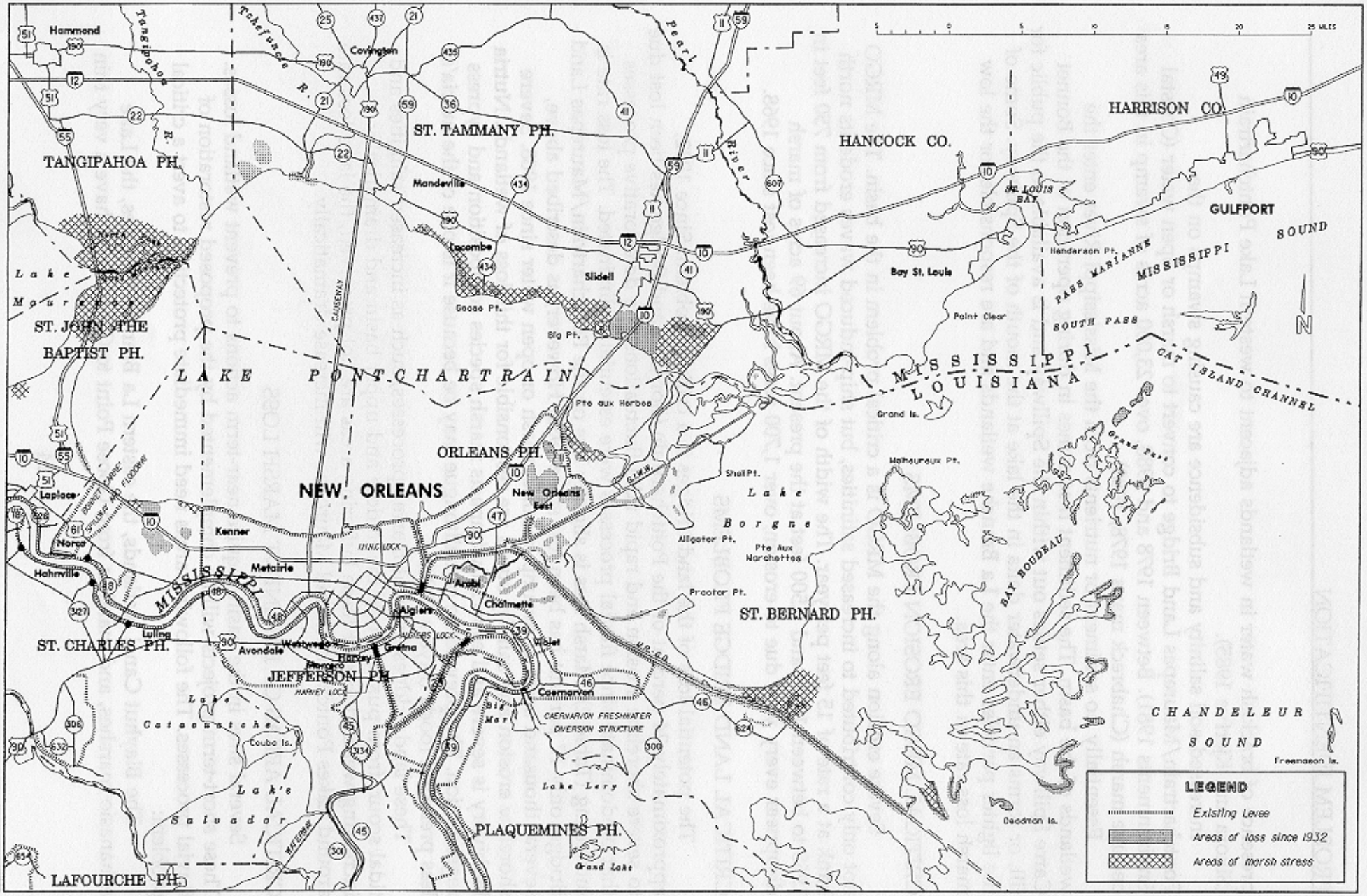


Figure 2. Pontchartrain Basin, Areas of marsh loss since 1932 and areas of current marsh stress.

presence of brackish water in wetlands adjacent to western Lake Pontchartrain (Sikora and Kjerfve 1985).

Increased soil salinity and subsidence are causing swamps on the Pontchartrain/Maurepas Land Bridge to convert to marsh or open water (Coastal Environments 1981). Between 1978 and 1988, over 23,000 acres of swamp in this area became marsh (Chabreck maps 1978, 1988).

Essentially no sediment or nutrients from the Mississippi River enter the wetlands of the basin. The sediment that comes in during operation of the Bonnet Carre Spillway either settles out within the Spillway and is available to the public for fill, or forms an underwater delta in the lake at the mouth of the Spillway. Some of the lighter particles enter the La Branche wetlands and are responsible for the low marsh loss rate in this area.

CRITICAL MRGO EROSION PROBLEMS

Severe erosion along the MRGO is a critical problem in the basin. The MRGO not only contributed to increased salinities, but ship-induced waves erode its north bank at a rate of 15 feet per year. The width of the MRGO increased from 750 feet in 1968 to between 1,000 and 1,500 feet at the present. About 69 acres of marsh disappear every year due to erosion; over 1,700 acres have been lost since 1968.

CRITICAL LAND BRIDGE PROBLEMS

The potential loss of the land bridges is a critical problem. Since 1932, approximately 24 percent of the Pontchartrain/Borgne Land Bridge has been lost due to severe shoreline erosion and rapid tidal fluctuations, the deteriorative processes that predominate since fluvial processes were essentially eliminated. The loss rate is increasing (Table 2). Marsh loss is slightly less on the Pontchartrain/Maurepas Land Bridge; only 17 percent has been lost since 1932. However, as described above, several thousand acres of swamp became marsh or open water since 1968. Severe shoreline erosion and salinity stress are responsible for this loss of wetlands. Nutria herbivory is severe and especially impacts marsh species composition and cypress regeneration. The prevalence of bulltongue may be because it is one of the nutria's less preferred foods (Myers 1993).

These land bridges prevent marine processes, such as increased salinities and tidal scour, from pushing into the middle and upper basin and dramatically increasing wetland loss. If these buffering areas are not preserved, the land loss rate around Lakes Pontchartrain and Maurepas will increase dramatically.

CRITICAL AREAS OF IMMINENT MARSH LOSS

Several sites in the basin require near-term actions to prevent wetland losses. These short-term projects will be complemented by the proposed restoration of fluvial processes. The following areas need immediate protection to avert a critical problem:

- The Blayhut Canal wetlands, the eastern La Branche marshes, the Lake Athanasio marshes, and marshes from Goose Point to Green Point have a very thin

shoreline protecting marsh or ponds. If this narrow rim of shore is lost, interior erosion will increase dramatically.

- The back levees of the MRGO disposal area trap rainwater and allow the development of "perched" fresh marshes. If these levees break, the elevated marshes will drain and revegetate with shrub.
- Canals near Bayou St. Malo allow rapid water level fluctuations and salinity intrusion into adjacent marshes. If the canals are not plugged, rapid loss will occur.

LESS CRITICAL, SITE SPECIFIC PROBLEMS

The four critical problems described above are not the only wetland problems that the basin faces. The upper basin has poor drainage, and standing water often remains in the swamps throughout the year, mainly due to impoundment caused by levees, highways, and canals, combined with relative sea level rise. This impaired drainage, plus nutria herbivory, greatly reduces cypress regeneration and stresses existing swamps.

In the middle basin, over 33 percent of the marshes fringing Lake Pontchartrain have become open water since 1932. The loss rate peaked between 1958 and 1974, when large-scale agricultural and residential development projects leveed nearly 8,000 acres of marsh. Loss rates have dropped significantly since 1974. Shoreline erosion and salinity stress are the major causes of recent marsh loss.

About 18 percent of the vast marsh in the lower basin opened into water since 1932. Much of the loss is due to construction of the MRGO, with its ensuing erosion and increased salinities. The outer saline marshes in St. Bernard Parish have the highest rate of loss in the basin because of wave-induced erosion.

The Pearl Basin is fairly stable due to the influx of sediment and fresh water from the Pearl River. Only 7 percent of the basin has been lost since 1932. Most of the existing loss is in the lower portion of the basin and is probably due to subsidence.

Lake Pontchartrain has severe water quality problems along the shorelines directly adjacent to Jefferson, Orleans, and St. Tammany Parishes. Much of this pollution originates from urban stormwater runoff, the largest single cause of water pollution in the basin. Stormwater contains pathogens, heavy metals, chlorinated hydrocarbons, pesticides, high nutrient levels, and large amounts of suspended sediments. In addition, more than 500 communities discharge treated and untreated wastewater into the basin. Tens of thousands of individual septic systems contribute to the water quality problems. In some cases, untreated sewage is discharged directly into the lake, bayous, and rivers. Agricultural runoff from animal operations, agri-chemical applications, and land clearing activities also contributes significant pollution loadings to the basin (Lake Pontchartrain Basin Foundation, 1993).

FUTURE WITHOUT-PROJECT CONDITIONS

WETLAND CHANGES

Table 3 indicates the projected marsh loss for the next 20 and 50 years using the 1974-1990 marsh loss rate from Table 2. Nearly 25 percent of the basin's marshes

Table 3. Projected Wetland Loss in the Pontchartrain Basin

Subbasin	Projected Loss in 20 years (Acres)	(Percent)	Projected loss in 50 years (Acres)	(Percent)
Upper Basin Swamp	0	*0*	*0*	*0*
Pontchartrain/Maurepas LB swamp	23,200	38	58,000	95
Marsh	1,320	6	3,300	15
Middle Basin Swamp	9,600	62	11,400	74
Marsh	3,800	12	9,500	30
Pontchartrain/Borgne LB Marsh	4,560	10	11,400	30
Lower Basin Marsh	14,580	9	36,450	24
Pearl River Basin Marsh	700	4	1,750	10
Total Swamp Loss	32,800	15	69,400	32
Total Marsh Loss	24,960	9	62,400	23

were lost from 1932 to 1990. Without action, another 23 percent of the basin's existing marshes will be lost by the year 2040. Losses will be concentrated in the middle and lower basin and on the land bridges.

The swamp loss rate is projected to continue into the future at a rate about half that of the 1978-1988 rate on the Pontchartrain/Maurepas Land Bridge and in the Middle Basin. Approximately 69,400 acres of the Basin's swamp will be lost in 50 years on the Pontchartrain/Maurepas Land Bridge and in the Middle Basin. The majority of this will convert to marsh.

Significant losses of swamp could occur in the Upper Basin. However, there is no data on which to project an acreage loss. Excessive flooding will continue and slightly higher salinities may start to enter the Upper Basin, resulting in wetter and more stressed swamps. Large-scale conversion of swamps to open water is not expected in 50 years; however, this process could begin within 100 years.

Marsh loss will average about 70 acres per year on the Pontchartrain/Maurepas land bridge; the area will lose 1,320 acres of marsh in 20 years. The Blayhut Canal marsh will become open water when the shoreline erodes. New ponds will open up in the Manchac area. Lake Maurepas will increase in size due to shoreline erosion, and the land bridge will become thinner. Cypress swamps will be stressed by water logging and high salinity peaks and will convert to marsh or open water. In 20 years, 23,200 acres of land bridge swamp will be lost. By 2045, a total of 3,300 acres of land bridge marsh and 58,000 acres of swamp will be gone. This represents 95 percent of the swamp that was present in 1988.

The middle basin will lose 190 acres of marsh per year, so by the year 2015, 3,800 acres will be gone. The eastern La Branche marshes and the area from Goose Point to Green Point will consist of shallow ponds inside a broken lake rim. The Fritchie marsh will be replaced by a large, shallow lake. Lake Pontchartrain will increase in size due to shoreline erosion. By 2045, nearly 9,500 acres of middle basin marsh will be gone. Swamps will convert to marsh or open water in this area also; in 20 years 9,600 acres of swamp will be lost and by 2040, the only remaining swamp will be within the Bonnet Carre Spillway. These swamps receive enough sediment to keep them healthy.

The vital Pontchartrain/Borgne land bridge has one of the highest rates of marsh loss in the basin and will lose about 230 acres per year. By 2015, 4,600 acres of marsh will be gone. Lake Pontchartrain will lap at the South Point-to-GIWW levee as the Bayou Sauvage NUWR loses most of the Bayou Chevee marshes. The rest of the refuge will consist of a series of shallow ponds, surrounded with tiny remnants of marsh. Alligator Point will contain many more ponds due to a combination of tidal scour and salinity intrusion. By the year 2045, 11,500 acres of land bridge marsh will be lost. Nearly 50 percent of the land bridge marsh that existed in 1932 will be gone. Losses on this land bridge will significantly impact the middle basin and the Pontchartrain/Maurepas land bridge. If excessive losses occur, marine processes will enter further into the basin, and the loss rate projected above for the western areas will increase dramatically.

The lower basin is expected to lose 730 acres per year, so by the year 2015, 14,600 acres of marsh will be lost. The MRGO will be 300 feet wider and will break into Lake Borgne near Shell Beach. The fresh marshes on the MRGO disposal area will be drained. The outer saline marshes, where recent loss is greatest, will decrease by 4,900 acres. By the year 2045, about 36,500 acres will disappear from the lower basin.

The Pearl Basin loss rate is low; an average of 35 acres per year is expected to be lost. By the year 2015, 700 acres will be gone, and by 2045, 1,750 acres will be lost.

In summary, the Pontchartrain Basin will lose 62,400 acres of marsh over the next 50 years if no restoration action is taken. Approximately 61 percent of the marsh present in 1932 will be lost as a result of erosion, tidal fluctuations, and salinity stress caused by a combination of the Mississippi River levees, the MRGO and other canals, and subsidence.

In the same 50 years, the basin will lose 69,400 acres of swamp due to salinity stress and subsidence. Nearly 32 percent of the swamp that was present in 1988 will be gone.

FISH AND WILDLIFE RESOURCES

Moderate wetland losses in the Pontchartrain Basin will result in loss of critical breeding, nesting, nursery, foraging, and overwintering habitat for recreationally important fish, shellfish, and waterfowl, and for several endangered species. The near total loss of swamp on the Pontchartrain/Maurepas Land Bridge will result in a change in the species composition of the animals that use this area.

ECONOMIC RESOURCES

The recent decline in commercial harvests of fish and shellfish is attributable to past marsh loss. This downward trend in harvests will continue as the marshes of the Pontchartrain Basin become open water. The concurrent decline in recreational harvest will adversely impact the supporting businesses such as marinas, boat manufacturers, etc.

Storm surge protection provided by basin marshes will be lost as lakes and bays inch closer to the Lake Pontchartrain hurricane protection levees, U.S. Highways 11 and 90, and roads in St. Bernard Parish. Additional public money must then be spent to protect this infrastructure.

PLAN FORMULATION

PLANNING OBJECTIVES FOR THE BASIN

Problems, needs, and opportunities identified at public meetings and during the CWPPRA plan formulation meetings form the basis for the basin's planning objectives.

These objectives are end points toward which efforts to address the basin's wetland problems are directed. Key objectives are those considered essential because they address the most fundamental causes of wetland losses or have regional impacts. The first five objectives listed below are key objectives for the Pontchartrain Basin.

1) Restore fluvial input of water, nutrients, and sediment to reduce salinity and create and preserve wetlands.
2) Prevent bank erosion along the MRGO to preserve marsh.
3) Prevent marine processes from pushing into the basin.
4) Preserve the critical areas where wetland loss is imminent.
5) Preserve the St. Bernard Parish saline marshes and achieve no net loss.
6) Preserve wetlands in areas of site specific wetland loss or create and restore wetlands in areas of significant opportunity.

STRATEGIES CONSIDERED

Strategies are approaches to achieving the basin objectives. The basic overall plan for this basin is to implement short term strategies that will preserve the existing wetlands until long-term strategies can be implemented. Strategies 1 through 5 below are considered key short-term strategies because they are the most effective approaches that can address the key objectives in the short term. Strategies 6 and 7 are key strategies that can only be implemented in the long term. Strategy 8 is an additional short term strategy that addresses specific problems or opportunities. Strategy 9 reduces salinity, but not by restoring fluvial input. Because of the public interest in blocking the MRGO, this strategy is retained to compare to the Bonnet Carre Freshwater Diversion.

1) Introduce and manage fresh water to reduce salinity and preserve marsh and swamp throughout the basin.
2) Close or move the MRGO to prevent erosion and preserve marsh.
3) Stabilize the bank of the MRGO and create marsh to prevent erosion and preserve marsh.
4) Stabilize shorelines, improve hydrology, and manage marshes to preserve the land bridges.
5) Stabilize shorelines, improve hydrology, beneficially use dredged material, and trap sediments to preserve and restore critical areas where wetland loss is imminent.
6) Introduce sediment to nourish and create wetlands.
7) Create artificial barrier islands to preserve outer saline marshes.
8) Utilize small-scale measures (shore protection, hydrologic restoration,

sediment trapping, dedicated dredging, marsh management, and herbivore control) in areas of need or where there is an opportunity to preserve marsh and swamp.

9) Gate the MRGO to reduce salinity and preserve marsh.

STRATEGY 1 - INTRODUCE AND MANAGE FRESH WATER

The short-term phase of this strategy consists of the major, already authorized, Bonnet Carre Freshwater Diversion plus a newly developed project to manage the outfall of this diversion. A freshwater diversion structure in the Bonnet Carre Spillway would restore fluvial input and reduce salinity on the land bridges and in the middle and lower basins. Outfall management of the water from the diversion would route as much water as possible (5 to 20 percent) to the east through the Sarpy Swamp to help preserve the La Branche Wetlands.

Smaller diversions at various locations in the basin form the long-term phase of this strategy. Bayou Manchac and Blind River are excellent candidates for small (1,500 to 3,000 cfs) diversions from the Mississippi River. The USACE considered and eliminated these two locations as possible sites for a major diversion because of the extensive relocations of infrastructure, the swamp destroyed by the outfall channel, and the high probability of destroying cultural resources.

Diversion from the Tickfaw River into adjacent swamps would reduce salinities and introduces sediment into stressed swamp. Small diversions into marshes east and west from the Tchefuncte are also possible.

STRATEGY 2 - CLOSE OR MOVE THE MRGO

Eleven ways of closing or moving the MRGO are analyzed in Table 4. Closing the existing MRGO and moving the channel eastward is infeasible due to excessive cost and increased travel time for vessels. Neither allowing the MRGO to replace the main Mississippi River navigation channel and diverting the river into Lake Borgne, nor, constructing a large sediment diversion at the Violet Canal, closing the MRGO, and relocating the container facilities are feasible. The costs are high, and more efficient sites to divert Mississippi River sediments exist in other basins. Constructing a deep-draft lock at the IHNC is very costly, and a new lock (and lock site) would be required in 20 years. Imposing speed limits on the MRGO is impracticable because pilots believe that they cannot maintain steerage at low speeds. Negotiations are underway between St. Bernard Parish and the pilots to set a trial no-wake zone between Shell Beach and Hopedale, where ship wakes damage boat launches and other facilities. Widening, deepening, and stabilizing the banks of the MRGO allows ships to move faster, but construction impacts extensive areas of marsh.

After comparing the various methods of closing the MRGO, a notched, armored sill in the MRGO with relocation of the deep-draft facilities to the Mississippi River is the most efficient means to achieve Strategy 2. This relocation is necessary because these facilities are inaccessible to deep-draft vessels once the MRGO is closed.

Table 4

Methods of Closing or Moving the MRGO

No.	Project Name	Reduces Salinity in Basin	Prevents MRGO Erosion	Prelim. cost *	Result of Screening
XPO-67A	New MRGO in via Gulfport Ship Channel	yes	yes		Infeasible due to excessively high maintenance dredging costs and increased vessel travel time.
XPO-67B	New MRGO in Chandeleur Sound	no	yes		Infeasible due to excessively high maintenance dredging costs, increased travel time anddamage to Breton NWR.
PPO-6B	MRGO Speed Limit	no	yes		Infeasible because pilots cannot maintain steerage at slow speeds.
XPO-86	IHNC "Deep Draft" Shiplock	yes	yes		Dropped due to high cost, risks to port-related jobs if container industry relocates, & requirement for new lock in 20 years.
XPO-87	MRGO Becomes Main Navigation Channel	partly	no		Infeasible due to excessive costs of relocations. Also, there are more efficent sites for sediment diversion.
XPO-68	MRGO, Widen, Deepen, and Stabilize	no	yes	$396,100,000	Dropped due to excessive costs and damage to marsh
XPO-62	MRGO 3 Sills/Facility Relocation	Yes	yes	$504,600,000	Dropped because a one sill closure is effective.
XPO-57	Violet Sediment Diversion, Close MRGO, Relocate Facilities	yes	yes	$537,500,000	Dropped due to excessive costs and fact that there are more efficient sites for sediment diversion in other basins.
XPO-5	MRGO Sill/Facility Relocation	yes	yes		Kept to be analyzed in detail.

* costs are for 50 year project life with present value of operation and maintenance.

STRATEGY 3 - STABILIZE THE BANK OF THE MRGO AND CREATE MARSH

This short-term strategy consists of one project: a shoreline rock dike along the north bank of the MRGO from the jetties to the GIWW. In addition, all dredged material from this reach would be used to create or nourish marsh. This project stops bank erosion on the MRGO and creates several hundred acres of marsh.

STRATEGY 4 - PRESERVATION OF THE LAND BRIDGES

This short-term strategy consists of a variety of defensive projects to preserve the land bridges. Hydrologic restoration would reduce tidal scour and shoreline erosion in the Alligator Point and Cutoff Bayou area. Protective measures would preserve shorelines of Lakes Borgne, Pontchartrain, and Maurepas. Marsh management would preserve marsh and swamp on the Manchac WMA. Cleaning out of culverts would preserve swamp in the Ruddock area.

STRATEGY 5 - PRESERVATION OF CRITICAL AREAS WHERE WETLAND LOSS IS IMMINENT

This short-term strategy consists of defensive projects such as shoreline protection at critical sites where loss of lake rims allows fragile interior marsh to erode rapidly: Blayhut Canal, Goose Point to Green Point, and the eastern La Branche area. Restoration of the MRGO back levee would prevent the loss of the perched fresh marsh. Marsh creation would preserve the spit east of Lake Athanasio. Hydrologic restoration would preserve marshes in the St. Malo area.

STRATEGY 6 SEDIMENT INTRODUCTION

This long-term strategy consists of sediment import into basin wetlands by a pumping or by dedicated dredging with distribution via a series of pipelines or barging. Sediment could come from the Mississippi River anywhere from Ascension Parish to Caemarvon. Canals near Reserve and into the La Branche wetlands are possible sites for sediment pumping and distribution. Material dredged from Mississippi Sound could be pumped into the Lower Basin to create saline marsh.

This strategy could provide enough sediment to offset the annual basin-wide loss of 1,255 acres of marsh and could help stem the loss of swamp. However, its cost effectiveness is questionable since it requires a large dredging and sediment delivery capacity. Containment structures are probably necessary to maximize the amount of wetlands created and adverse minimize impacts.

Sediment diversion to the upper basin was considered, but is not included in this strategy because of the increased chance of flooding developed areas. Sediment diversion to Lake Borgne was also considered, but eliminated because this lake is 5-7 feet deep and would require large amounts of sediments to create wetlands. There are far more effective sites for sediment diversions in other basins.

STRATEGY 7 CREATION OF ARTIFICIAL BARRIER ISLANDS

This long-term strategy consists of creation of an interior string of barrier islands along the fringing marshes of St. Bernard Parish from the MRGO to Malheureaux Point. A possible concept for this strategy is to use a dedicated high-capacity dredge to supply a permanent submerged pipeline. The pipeline would be extended incrementally as needed to create additional islands. Provisions could be made to bifurcate the pipeline if necessary. This project would dramatically slow erosion in these marshes; however, costs are very high using present technology.

STRATEGY 8 - SMALL-SCALE MEASURES

This short-term strategy consists of defensive and offensive site specific solutions to many local problems in the basin. In several areas throughout the basin, shorelines would be protected to prevent shoreline erosion. In the middle and Pearl Basins, sediment trapping combined with vegetative plantings would restore marsh. In the Upper Basin, gapping of spoil banks would restore normal overland flows. In the La Branche area, at Eden Isles east, and in the jetty reach of the MRGO, marsh would be created with dredged material. In fresher areas, herbivory control would be utilized.

STRATEGY 9 GATE THE MRGO

If a gated structure is placed in the MRGO, the tidal head across the gate would generate currents too dangerous for ships to navigate without assistance. Comparing costs for a single gate and a tug assisted passage with those for a double-gated structure indicates that the single gate is the more cost effective method. This strategy consists of a navigable sector gate in the MRGO at the La Loutre Ridge with a bypass channel to allow passage of small commercial and recreational fishing boats.

RATIONALE FOR SELECTED STRATEGIES

In two cases, the same objective is achieved by mutually exclusive strategies. The discussion below describes the rationale for selecting strategies in these two cases. Then rationale for selection of the remainder of the strategies is described.

SELECTION OF A STRATEGY FOR MRGO BANK STABILIZATION

Closing the MRGO (Strategy 2) and stabilizing its banks (Strategy 3) are mutually exclusive ways to accomplish the key objective of preventing MRGO bank erosion.

Placing a sill in the MRGO is a inexpensive method of stopping bank erosion and reducing salinities in the basin north of the sill. However, the sill also prevents deep-draft vessels from accessing the tidewater container facilities at the northern end of the MRGO. These large ships cannot pass through the existing IHNC Lock. Ninety percent of the Port of New Orleans's containerized cargo and 40 percent of its public cargo could no longer reach its destination. The government cannot

close such viable facilities without making the Port of New Orleans whole. Thus, Strategy 2 must include the approximately $500 million cost of relocating the tidewater facilities to somewhere on the Mississippi River.

Bank stabilization along the northern bank of the MRGO (Strategy 3) costs only $57.8 million and is the most cost effective way to achieve the key objective of preventing MRGO bank erosion. It is therefore the selected strategy and is regarded as critical to be implemented in the short term.

Since there is extensive public interest in closing MRGO, the USACE will evaluate the feasibility of continuing maintenance every 10 years. If and when the cost of maintenance exceeds the benefits, the USACE will recommend some method of closure.

SELECTION OF A STRATEGY TO REDUCE SALINITY

The first key objective is to restore fluvial input to the basin in order to reduce salinity and add sediments and nutrients to the wetlands. The Bonnet Carre Freshwater Diversion (part of Strategy 1) accomplishes two/thirds of this objective by reducing salinity and adding nutrients. Placing a navigable gate in the MRGO (Strategy 9) achieves only one/third of the objective since it reduces salinities but does not provide nutrients or sediments. Table 5 compares the effects of the diversion and the gate in the MRGO.

Table 5. Comparison of the Bonnet Carre Freshwater Diversion and a Navigable Gate in the MRGO.

	Bonnet Carre Freshwater Diversion	Navigable Gate in the MRGO
Restores fluvial input	Yes	No
Acres of wetlands preserved after 50 years	10,000	8,020
Cost for 50 years, incl. operation and maintenance ($ million)	73.5	83.8
Cost per acre of wetland preserved ($)	7,200	10,500

The diversion restores fluvial processes to the basin by allowing Mississippi River water containing nutrients to enter the lake and flow through the middle and lower basin and the land bridges. The diversion maintains and enhances the

ecological framework of the basin by reducing salinities and providing vital nutrients.

The gate in the MRGO has none of these benefits. The gate does not lower salinities as effectively as the diversion, especially in the western end of the lake. The gate does not bring in the nutrients to nourish wetlands that a diversion does. The strategy of closing the MRGO with a gate has a significant drawback. The gate would cause a one- hour delay in each round trip on MRGO. This delay could encourage the container ships to use an alternate port in an adjacent state and thus cause Louisiana to lose some or all of the 10,000 jobs associated with the tidewater port.

Since subsidence is the major cause of salinity stress in the Manchac (and probably the La Branche) wetlands, restoration of fluvial input is a two-pronged solution. Diversion not only provides fresh water in a controlled manner, but also brings nutrients that are necessary to increase plant growth. Promoting vigorous plant growth appears to be the best counter-measure to subsidence and salinity intrusion (Nyman et al 1993). Thus, the gate does not preserve as many wetlands over the next 50 years (8,020 acres) as the diversion does (10,000 acres).

The diversion optimizes salinity conditions for fish and wildlife, especially furbearers, oysters, and waterfowl. It produces more benefits to oysters than the gate does. Salinity reductions caused by the diversion might displace brown shrimp and spotted seatrout eastward in the summer. However, the gate might displace the same species nearly as far east.

The diversion costs over $10 million less than the gate. Thus, an acre of wetlands preserved by the diversion costs $7,200 compared to $10,500 per acre by the gate.

In summary, the diversion is the best strategy in terms of costs, wetland benefits, and overall health of the basin. The already authorized Bonnet Carre Diversion and its outfall management plan, proposed as a CWPPRA project, preserve hundreds of acres of marsh and swamp. These two projects are considered critical short-term components of the basin plan. The diversion will not be funded under CWPPRA, but is part of the Restoration Plan because it is the most cost effective way of restoring fluvial input to the Pontchartrain Basin on a large scale.

RATIONALE FOR SELECTION OF OTHER STRATEGIES

Preserving the land bridges prevents marine processes from pushing farther into Lakes Pontchartrain and Maurepas and increasing wetland losses. Preserving areas where wetland loss is imminent is also important. These two strategies are part of the short-term critical phase of the plan. They help preserve the basin until the long-term strategies can be implemented. Strategy 8, the small-scale measures such as hydrologic restoration and shoreline protection projects, is less critical, but forms a supporting part of the short-term phase.

The small freshwater diversions are considered critical because they help reverse the loss of swamp and marsh by restoring fluvial input. They are proposed for implementation in the long term once a feasibility study on Mississippi River water and sediment budgets is completed and the details of the Tchefuncte and Tickfaw diversions are developed. Sediment import is considered critical and selected for analysis and possible implementation in the long term if and when technology is

improved and less costly. Artificial barrier islands reduce the extremely rapid loss rate occurring in the outer saline marshes. It is presently an expensive strategy, but is retained as critical for possible future implementation because it helps achieve no net loss in the lower basin. If construction costs decrease or benefits increase, creation of artificial barrier islands becomes more feasible. A feasibility study on methods to reduce costs and to better evaluate benefits of barrier islands to interior marshes is necessary. If the sediment import and barrier island strategies can be implemented in a cost effective manner, they will achieve no net loss of wetlands.

Figure 3 summarizes the basin strategies, which are dominated by the Bonnet Carre Freshwater Diversion, MRGO bank protection/marsh creation, and land bridge preservation in the short-term phase and small freshwater diversions, sediment introduction, and barrier island creation in the long-term phase. As shown in Table 6, each strategy implements one of the planning objectives. The strategies are complementary and act together to preserve and restore the wetlands of the basin.

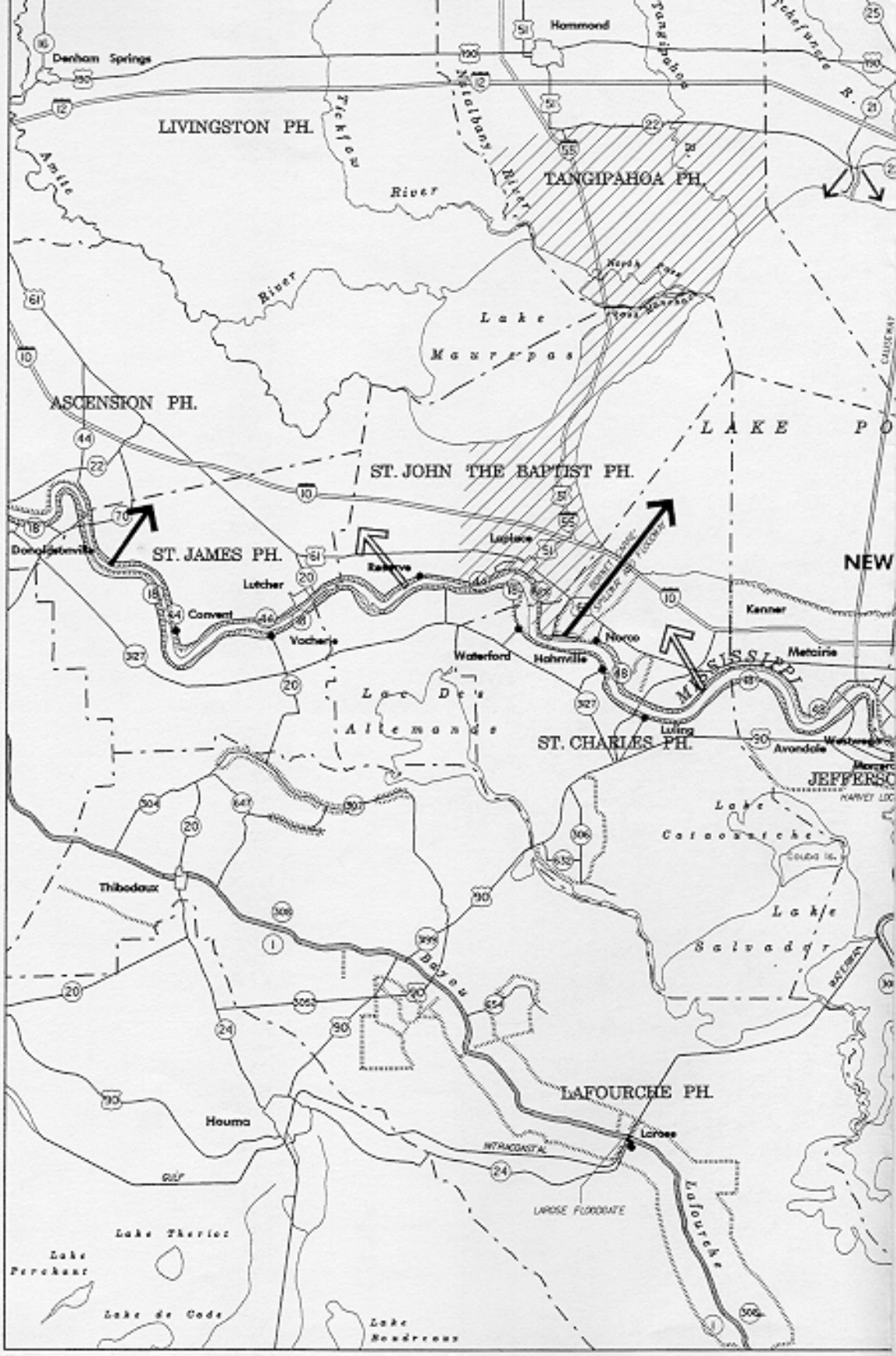


Figure 3. Pontchartrain Basin, Strategy Map.

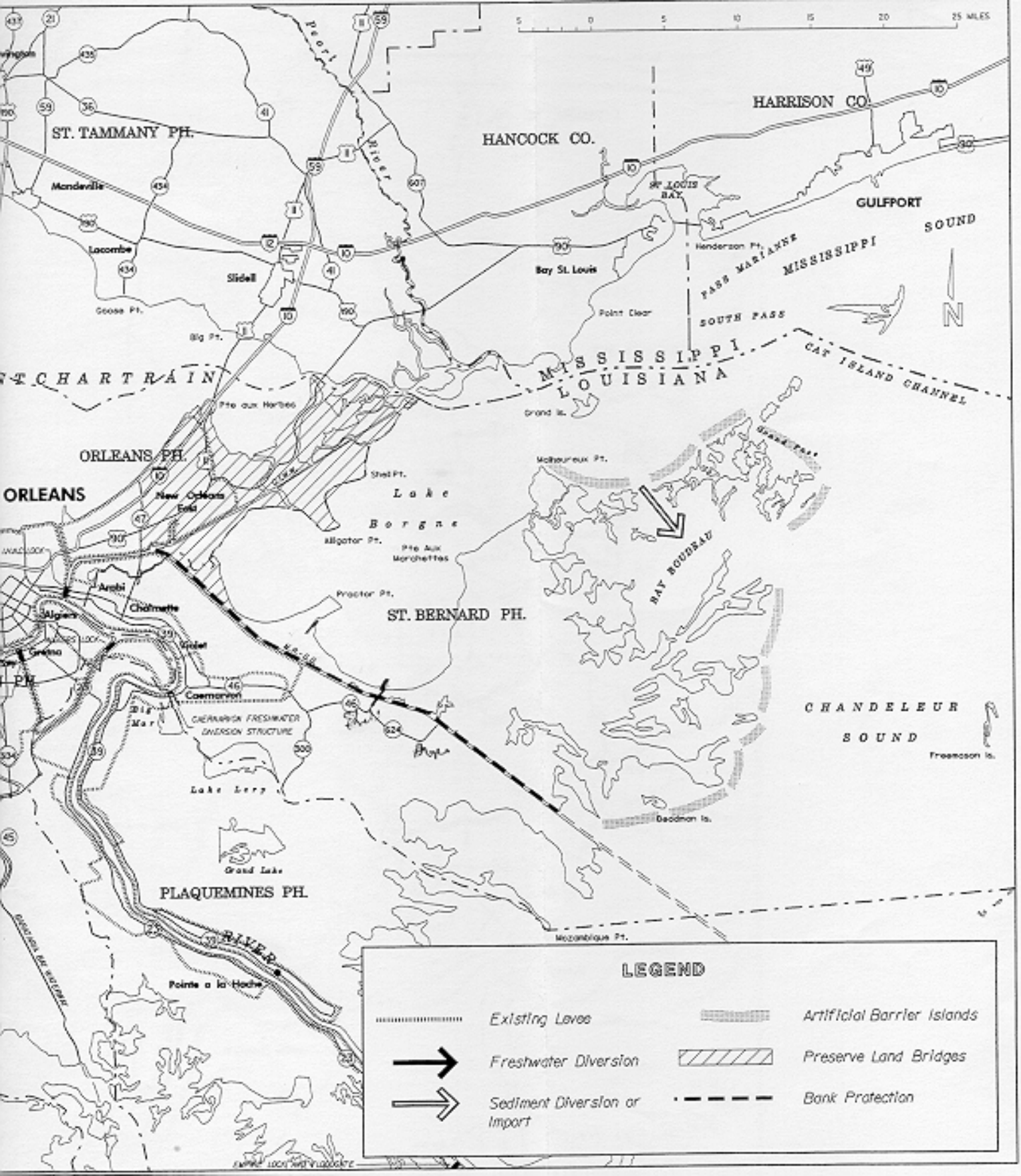

ST. TAMMANY PH.
HANCOCK CO.
HARRISON CO.
Mandeville
Lacombe
Slidell
Goose Pt.
Big Pt.
Bay St. Louis
ST. LOUIS BAY
Henderson Pt.
GULFPORT
SOUND
PASS MARIANNE
MISSISSIPPI
SOUTH PASS
Point Clear
N
CAT ISLAND CHANNEL
LOUISIANA
Pte aux Herbes
Grand Is.
ORLEANS PH.
ORLEANS
New Orleans Intl
Shell Pt.
Lake Borgne
Alligator Pt.
Pte Aux Marchettes
Malheureux Pt.
BAY BOUDREAU
Arabi
Chalmette
Algiers
Gretna
Proctor Pt.
ST. BERNARD PH.
Violet
Caernarvon
Big Mar
CHERNIER FRESHWATER DIVERSION STRUCTURE
Lake Lery
CHANDELEUR SOUND
Freemason Is.
Deadman Is.
Grand Lake
PLAQUEMINES PH.
RIVER
Mozambique Pt.
Pointe a la Hache
LEGEND
Existing Levee
Artificial Barrier Islands
Freshwater Diversion
Preserve Land Bridges
Sediment Diversion or Import
Bank Protection

Table 6. Relationship between Objectives, Strategies, Phases, and Projects.

OBJECTIVE	STRATEGY	PHASE	PROJECT
1) Restore fluvial input.	1) Introduce and manage fresh water.	ST	XPO-55.
		LT	XPO-85, Xro-89.
	6) Sediment import via pumping or dedicated dredging.	LT	XPO-45.
	9) Gate the MRGO	-	Not chosen, reduces salinity, but doesn't restore fluvial input.
2) Prevent MRGO bank erosion.	2) Close or move MRGO.	-	Not chosen, may be considered in the future.
	3) Stabilize bank of MRGO.	ST	PPO-38.
3) Prevent marine processes from entering basin.	4) Preserve land bridges.	ST	PO-11, PO-15, XPO-69, XI'O-58.
4) Preserve critical areas where loss is imminent.	Preserve these critical areas with various methods.	ST	PO-6, PO-14, XPO-70, XI'O-83.
5) Preserve outer saline marshes.	6) Dedicated dredging to introduce sediment.	LT	XPO-90.
	7) Create artificial barrier islands.	LT	XPO-66
6) Preserve wetlands in areas of loss or opportunity.	8) Small-scale measures.	ST	PO-7, PPO-31, PO-9a, PPO-4.

IMPLEMENTATION OF SELECTED PLAN

COMPONENT PROJECTS

All projects that have been proposed for the Pontchartrain Basin are listed in Table 7. This table summarizes these projects by criticality and time frame for implementation. Within each classification (e.g. critical short term) the projects are grouped by the strategy that they implement. The table also indicates project type, cost, and acres benefitted. Comments in the table indicate projects which 1) duplicate other projects, 2) are not appropriate for the CWPPRA since creation/preservation of vegetated wetlands is not their main objective, 3) are deferred until other projects are completed, and 4) are dropped due to high cost. Figures 4 through 6 show the locations of the individual projects that make up the plan.

Projects listed in the plan were recommended by the public and participating agencies based on current knowledge of existing conditions, within time constraints required by the Act. Additional projects can be recommended in the future for incorporation in the Pontchartrain Basin Restoration Plan as problems and needs change in the basin (see Implementation section of the Main Report).

The projects comprising the selected plan are listed starting on page 40, and described in detail in the remainder of this appendix.

DEVELOPMENT OF BENEFITS AND COSTS

The benefits for most of the projects in the selected plan were estimated according to a rapid-assessment modification of the 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 tends to be site specific and is likely to be fairly accurate. Benefits for hydrologic restoration and marsh management projects are more generic and thus less accurate. Projects included on the first three Priority Project Lists have had 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 12.5 percent for planning and 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 Lists received more rigorous and detailed cost estimates.

PRIORITY LIST PROJECTS

Two projects were selected for funding on the first Priority Project List. A contract was awarded in November 1993 for the creation of 204 acres of marsh in the La Branche wetlands. A project which removes water from the Bayou Sauvage NUWR is in the detailed planning stage.

Table 7. Summary of the Pontchartrain Bain Projects

Project No.	Project Name	Project Type	Priority List Project	Marsh Acres Created, Protected, or Restored	swamp Acres Created, Protected, or Restored	Net Benefitted Acres	Estimated cost ($)	Cost Per Benefited Acre ($/Ac)	Comment
Critical Projects, Short-Term									
PO-6	Fritchie Wetland Hydrologic Restortation	HR, FD	PPL 2	1,040		1,686	2,297,000	1,400	
PO-11	Cutoff Bayou Hydrologic Restoration	HR		103		503	722,000	1,480	
PO-13	Tangipahoa/Pontchartrain Shore Protect	SP		142		627	4,850,000	7,700	
PO-14	Green Point/Goose Point Marsh Rest	SP		249		1,026	3,252,000	3,200	
PO-15	Alligator Point Marsh Restortation	HR		139		1,489	1,575,000	1,100	
PPO-2a	Lk Borgne SP, Rigolets to Chef	SP		84		94	1,421,000	15,100	
PPO-2b	Lk Borgne SP, South of Bienvenue	SP		41		91	578,000	6,400	
PPO-2g	Lk Borgne SP, Chef to GIWW Bypass	SP		81		96	1,708,000	17,800	
PPO-7	La Branche Shore Protection, East	SP		524		1,083	1,309,000	1,200	
PPO-10	La Branche Marsh Creation, West	MC	PPL 1	205		266	4,087,000	15,400	
PPO-19	Highway 51/Railroad Cul ts	HR			73	283	342,800	1,208	
PPO-38	MRGO Bank Stabilization and	MC	MC, SP	4,220		6,745	54,500,000	8,100	
XPO-50a	Lk Maurepas SP, Blayhut Canal	SP		162		631	1728,000	2,700	
XPO-50b	Lk Maurepas SP, W Jones Island	SP		118		164	2,044,000	12,500	
XPO-51	Manchac WMA Marsh Management	MM		454	32	1,195	1,021,000	900	
XPO-52a	B Sauvage NWR HR, Hwy 90 to GIWW	HM	PPL 1	1,550		1,953	1,448,000	700	
XPO-52b	B Sauvage NWR HR, Hwy 90 to I-10	HM	PPL 2	1,280		2,077	1,114,000	500	
XPO-54	Bonnet Carre, Outfall Management	OM		1,000	300	1,300	8,500,000	6,500	
XPO-55	Bonnet Carre Diversion, 30,008 cfs	FD		1,560	2,450	4,010	72,000,000	18,080	Authorized USACE project
XPO-58	Pass Manchac Shore Protection	SP		72		107	1,745,000	16,300	
XPO-69	B Sauvage NWR, B Chevee SP	SP		468		1,367	2,672,000	2,000	
XPO-70	Lk Pontchartrain SP, Bon Car to Ruddock	SP		25	124	188	1,867,000	9,900	
XPO-71	MRGO Disposal Area Marsh Protection	HR	PPL 3	755		775	434,900	600	
XPO-81	Pt au Herbes Shore Protection	SP		42		49	590,080	12,000	
XPO-83	Lk Athanaslo Spit Marsh Creation	MC		99		1,713	895,080	500	
XPO-84	St. Malo Hydrologic Restoration	HR		2		122	658,000	5,400	
XPO-91	La Branche SP, Walker Canal to Blowhole	SP		19		37	351,000	9,500	
Subtotal: Critical Projects, Short-Term				12,870	530	25,670			Total does not include Bonnet Carre FWD

Table 7. Summary of the Pontchartrain Baln Projects (Continued)

Project No.	Project Name	Project Type	Priority List Project	Marsh Acres Created, Protected, or Restored	Swamp Acres Created, Protected, or Restored	Net Benefitted Acres	Estimated cost ($)	Cost Per Benefited Acre ($/Ac)	Comment
Critical Proiects. Lone-Term									
PPO-27	Tchefucte Freshwater Diversion, West	FD							
PPO-28	Tchefuncte Freshwater Diversion, East	FD							
XPO-45	Upper/Middle Basin Sediment Pumping	SD							Feasibility study of water and sediment first
XPO-46	Tlckfaw Freshwater Diversion	FD							
XPO-66	Artificial Barrier Is onSaline Marsh Fringe	BI							
XPO-85	Bayou Manchac Diversion	FD							
XPO-89	Blind River Freshwater Diversion	FD							
XPO-90	Sediment Input Lower Basin	MC							
Supporting Projects, Short-Term									
PO-7	North Shore Wetlands	ST		22		1,213	488,000	400	
PO-9a	Violet Outfall Management	HR	PPL3	247		1,124	1,364,OOO	1,200	
PPO-2c	Lk Borgne SP, Proctor Point	SP		99		143	651,000	4,600	
PPO-2d	Lk Borgne SP, East of Shell Beach	SP		246		383	l&64,000	430	
PPO-2e	Lk Borgne SP, Point au Marchettes	SP		106		121	1,056,OOO	8,700	
PPO-2f	Lk Borgne SP, South of Malheureaux Pt	SP		49		52	651,000	12,500	
PPO-4	Eden Isles East Marsh Restoration	HM, MC		1,092		1,494	8,856,OOO	5,900	Cost does not include land purchase
PPO-9	La Branche Marsh Creation, East	MC		733		830	9,937,OOo	12,000	
PPO-12	Tchefuncte Marsh Shore Protection	SP		81		152	854,cQO	5,600	
PPO-13	B Chinchuba Marsh Shore Protection	SP		42		63	732,000	11,900	
PPO-31	Indian Beach Marsh Creation	MC		11		34	464,000	13,600	
XPo-47	Amite River DIversion Canal Bank Mod	SP			340	5%	SS3$JOO	900	
XPO-48a	Tennessee Williams Canal Bank Mod	HR			70	122	269,000	2,200	
XPO-48b	Hope Canal Bank Modification	HR			160	281	290,000	1,000	
XPo-63	Lk Maurepas SP, Mouth of Blind River	SP		14	48	73	1,096,OOO	15,000	
XPO-72	MRGO MC, (Material From 9-23 to Jetties)	MC							
XPO-74	Bienvenue Marsh	OM, MC							
XPO-8Oa	Lower Pearl Basin Sediment Trapping	ST		55		2,940	660,000	200	
XPO-82	Fontainbleau Shore ProtectIon	SP		16		28	246,000	8,800	
XPO-88	Point Platt Sediment Trapping	ST		74		1,138	1,199,OOo	1,100	
XI094	Lake Pontchartrain Grassbeds	ST							
Subtotal: Supporting Projects, Short-Term				**2,890**	**620**	**10,790**	**31,030,000**		

Added

XPO-95 [illegible] SP

XPO-96 [illegible] HR

XPO-97 [illegible] HR

XPO-[illegible] SP

added in FY 95

Table 7. Summary of the Pontchartrain Bain Projects (Continued)

Project No.	Project Name	Project Type	Priority List Project	Marsh Acres Created, Protected, or Restored	Swamp Acres Created, Protected, or Restored	Net Benefitted Acres	Estimated cost ($1	Cost Per Benefited Acre	Comment
Supporting Projects, Long-Term									
PPO-17	Amite/Petite Amite Swamp Restoration	HR							
PPO-36	G&VW Bank Stab, Rigolets to MRGO	SP							
XPO-59	North Shore Marsh Rest w/ Dredged Mat	MC							
XPO-60	Ascension Parish Swamp Restoration	HR							
XPO-61	St. James/St. John Swamp Restoration	HR							
XPO-64	B Sauvage NWR Hyd Rest, I-10 to Lake	HM							
XPO-73	MRGO Bar Wetland Creation	MC							
XPO-75	St. Bernard Brackish Marsh	HR							
XPO-76	Pontchatoula Marsh	HR							
XPO-77	GIWW Northern Marsh, Chief to Rigolets	HR							
XPQ75	Tangipahoa/Bedico Marsh	HR							
XPO-79	Jones Island Marsh	HR							
XPO-80	Pearl River Marsh	FD, HR							
Demonstration Projects									
PPO-21	N.O. East, Marsh Creation for Stormwater	MC							
PPO-25	Bayou St. John Grassbeds	VP							
PPO-34	Bonnabel Canal, Marsh Creation Stormwater	MC							
XPO-47	Amite R Div Canal Bank ModificaHon	HR							
XPO-92	Shoreline Protection Demonstration Methods	SP							
XPO-93	N.O. East Marsh CreationW/ Biosolids	MC							
Defferred Projects									
PO-lb	Violet Siphon Enlargement	FD							Consider after PO-9a
PO-5	SE Lake Maurepas Wetlands	HR							Defer until benefits &cost are known
PO-12	La Branch Wetland Management, West	HR							Defer until benefits& cost are known
PPO-20	Port Louis Hydrologic Restoration	HR ,MC							Landowner not interesed
PPO-35	Duncan Canal, Marsh Creation Stormwater	MC							Defer until other stormwater demo's done
XPO-49	Tangipahoa Swamp Hydrologic Rest	HR							Defer until Bonnet Carre benefits are realized
XPO-56b	Seabrook Sill	HR							
XPO-65	Artificial Oyster Reek	SP							Defer until results of similar demo's known
Total Pontchartrain Basin*				15,760	1,150	36,469	132,73B,CnXl		Includes Short-Term Projects Only
Total Pontchartmin Basin with Bonnet Carre Freshwater Diversion**				17,320	3,@B	40,470			Includes Short-Term Projects and Bonnet Carre

Table 7. Summary of the Pontchartrain Bain Projects(Conttnued)

Project No.	Project Name	Project TYPB	Priority List Project	Marsh Acres Created, Protected, or Restored	swamp Acres Created, Protected, or Restored	Net Benefitted Acres	Estimated cost (8	Cost Per Beneftted Acre ($/Ac)	Comment
Projects not in Plan									
PO-B	Central Wetlands Pump Outfall								Dropped too costly
PO-9	Violet Freshwater Distribution w/pumps								Dropped too costly
PPO-1	Restore Central Marsh								Same as PO%
PPO3	Alligator Point **Marsh** Restoration								Same as PO-15
PPO-5	MRGO Sill/Facility Relocation								Analyzed and dropped, too costly
PPO-6a	MRGO Navigable Gate								Analyzed and dropped, too costly
PPO-6b	MRGO Speed Limits								Not Feasible
PPO-B	GIWW Bypass Bank Protectton								Same as PPO-15
PPO-11	La Branche Shore Protection, East								Same as PPO-7
PPO-14	La Branche Shore Protection, East								Same as PPO-7
PPO-15	Tchefuncte **Marsh** Shore Protection								Same as PPO-12
PPO-16	Amite RIv Diversion Channel Weir Matnt								Constructed
PPO-18	Eden Isles East Marsh Restoration								Same as PPO-4
PPO-22	Create MarshTreat Stormwater Runoff,EJ								Same as PPO-34/35
PPO-23	Project Swallow								Not a CWPPRA Project
PPO-24	Buy Marshes Around Lake Pontchartrain								Not a CWPPRA Project
PPO-26	Eden Isles East MarshRestoratIon								
PPO-29	Green Pt/Goose Pt Marsh Restoration								Same as PPO-14
PPO-30	Fritchte/North Shore Hydrologic Rest								Same as PPO-6 & PPO-7
PPO-32	Eden Isles East Marsh Restoration								Same as PPO-4
PPO-33	Destroy Miss R Levee, Relocate N. 0.								Defer until feasibility is shown
PPO-37	Lake Borgne Shore Protection								Same as PPO-2
PPO-39	MRGO Navigable Gate								Same as PPO-6a
PPO-40	Violet Outfall Management								Same as **PPO-9a**
PPO-41	Violet Outfall Management								Same as PPO-9a

Table 7. Summary of the Pontchartrain Bain Projects (Continued)

Project No.	Project Name	Project Type	Priority List Project	Marsh Acres Created, Protected, or Restored	swamp Acres Created, Protected, or Restored	Net Benefitted Acres	Estimated cost ($)	Cost Per Benefited Acre ($/Ac)	Comment
projects not in Plan (Continued)									
PPO-42	Violet Outfall Management								Same as PPO-9a
PPO-43	Violet Outfall Management								Same as PPO-9a
XPO-44	Maurepas Basin Sediment Diversion								Dropped, flooding of infrastructure
XPO-53	Bonnet Carre, Small Diverslon								Not cost effective
XPO-S6a	Seabrook Lock								Dropped does not meet basin objectives
XPO-37	Violet Sed Mv, Close MRGO, Relocate Fac								
XPO-62	Close MRGO w/ 3 Sills, Relocate Facilities								Not feasible
XPO-67a	New MRGO via Gulfport Ship Channel								Not feasible
XPO-67b	New MRGO via Chandeleur Sd/GIWW								Not feasible
XPO-63	Widen and Deepen MRGO								Not feasible
XPO-86	Close MRGO, IHNC Shiplock								Not feasible
XPO-87	MRGO becomes Main Navigatton Chan								Not feasible

BI Barrier Island Restoration
FD Freshwater Dtvesion
HM Hydrologic Management of Impoundments
HR Hydrologic Restoration
MC Marsh Creation
MM Marsh Management
OM Outfall Management
SD Sediment Diverslon
SP Shoreline or Bank Protection
ST Sediment Trapping
VP Vegetative Planting

• Total cost and benefits for the basin plan include only Critical Short-Term Projects and Supporting Short-Term Projects.
** Total cost and benefits include only Critical Short-Term, Supporting Short-Term, and the Bonnet Carre Freshwater Diversion project.

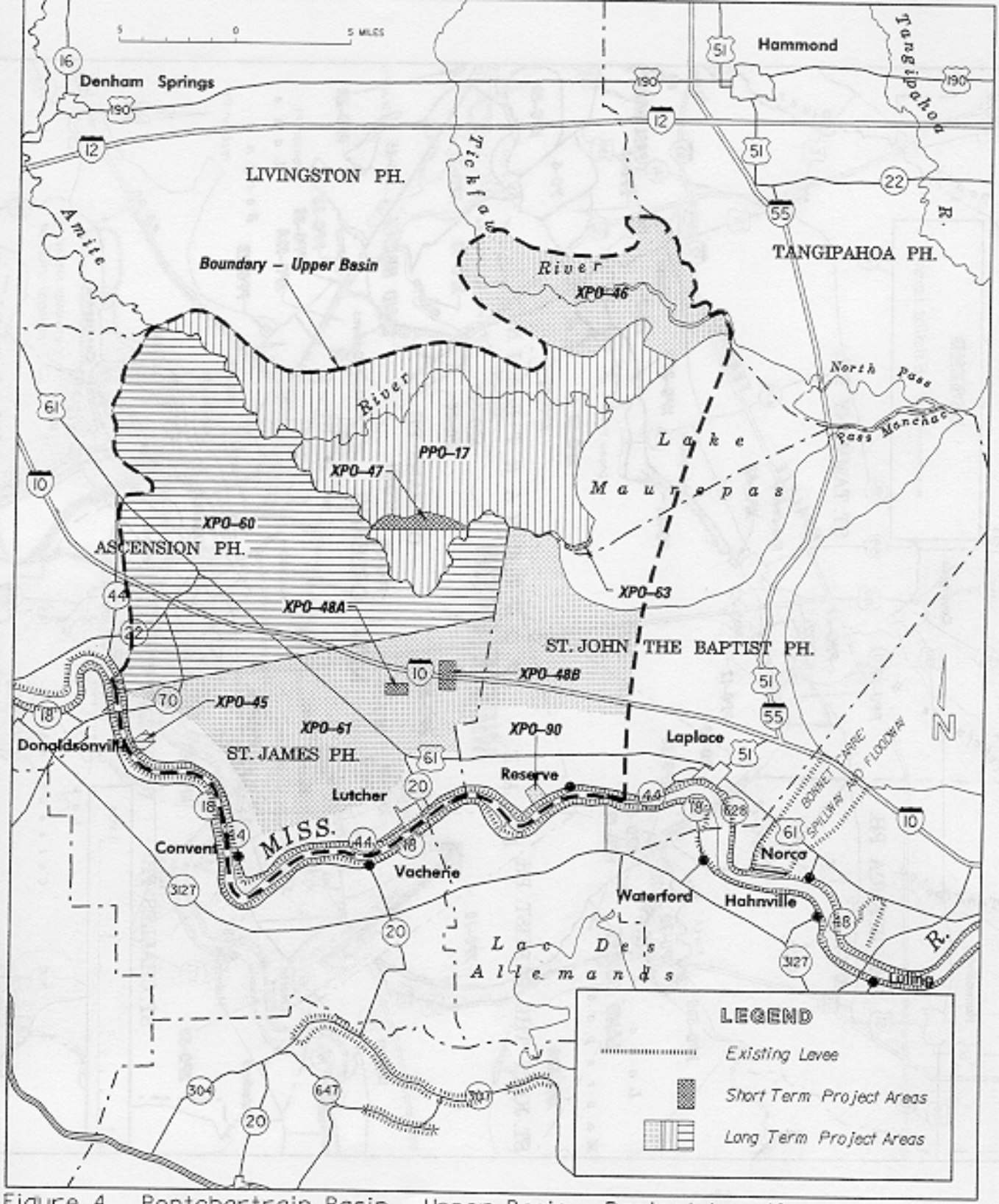


Figure 4. Pontchartrain Basin, Upper Basin, Project Locations.

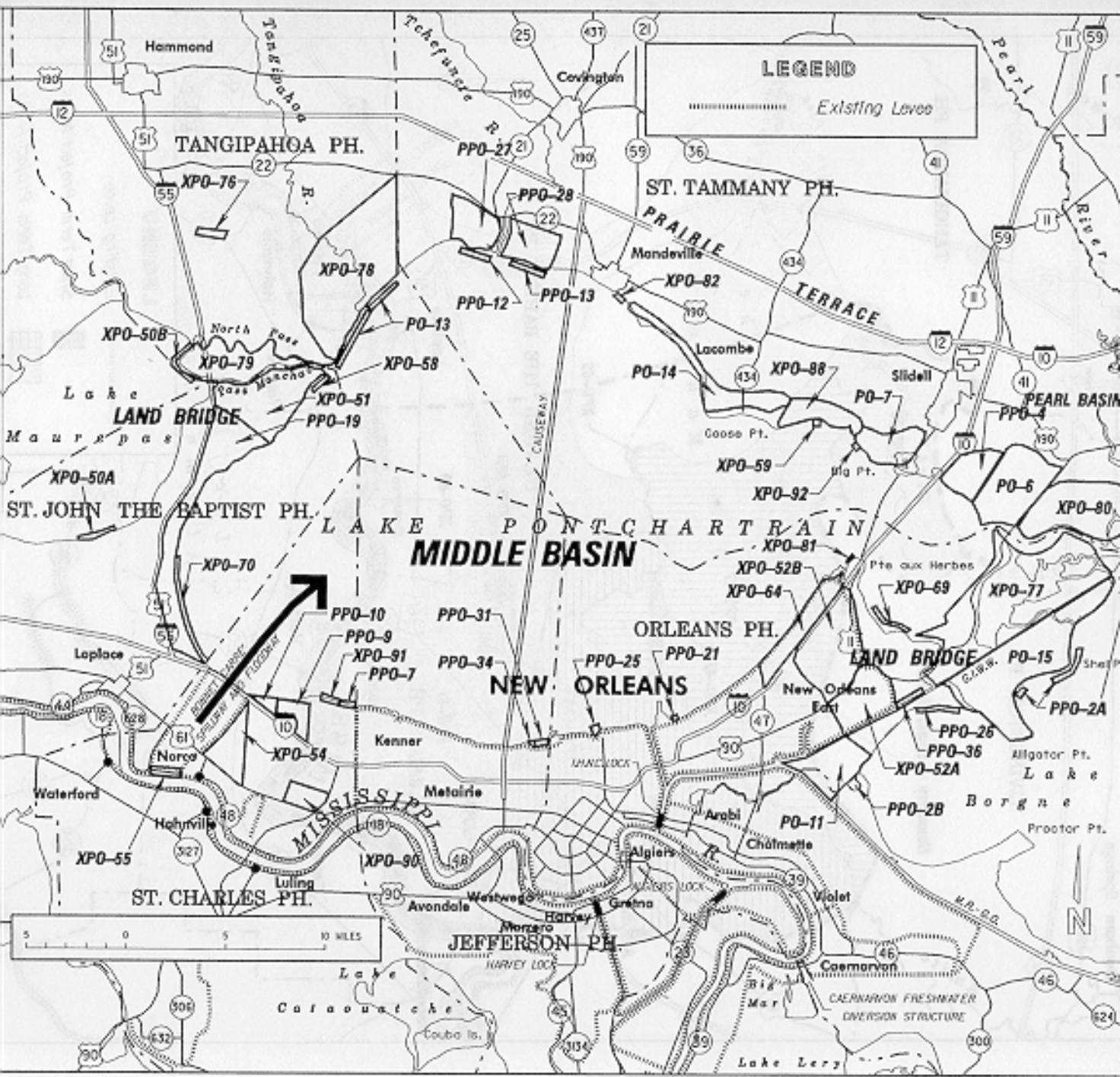


Figure 5. Pontchartrain Basin, Middle Basin, Pearl Basin, and Land Bridges, Project Locations.

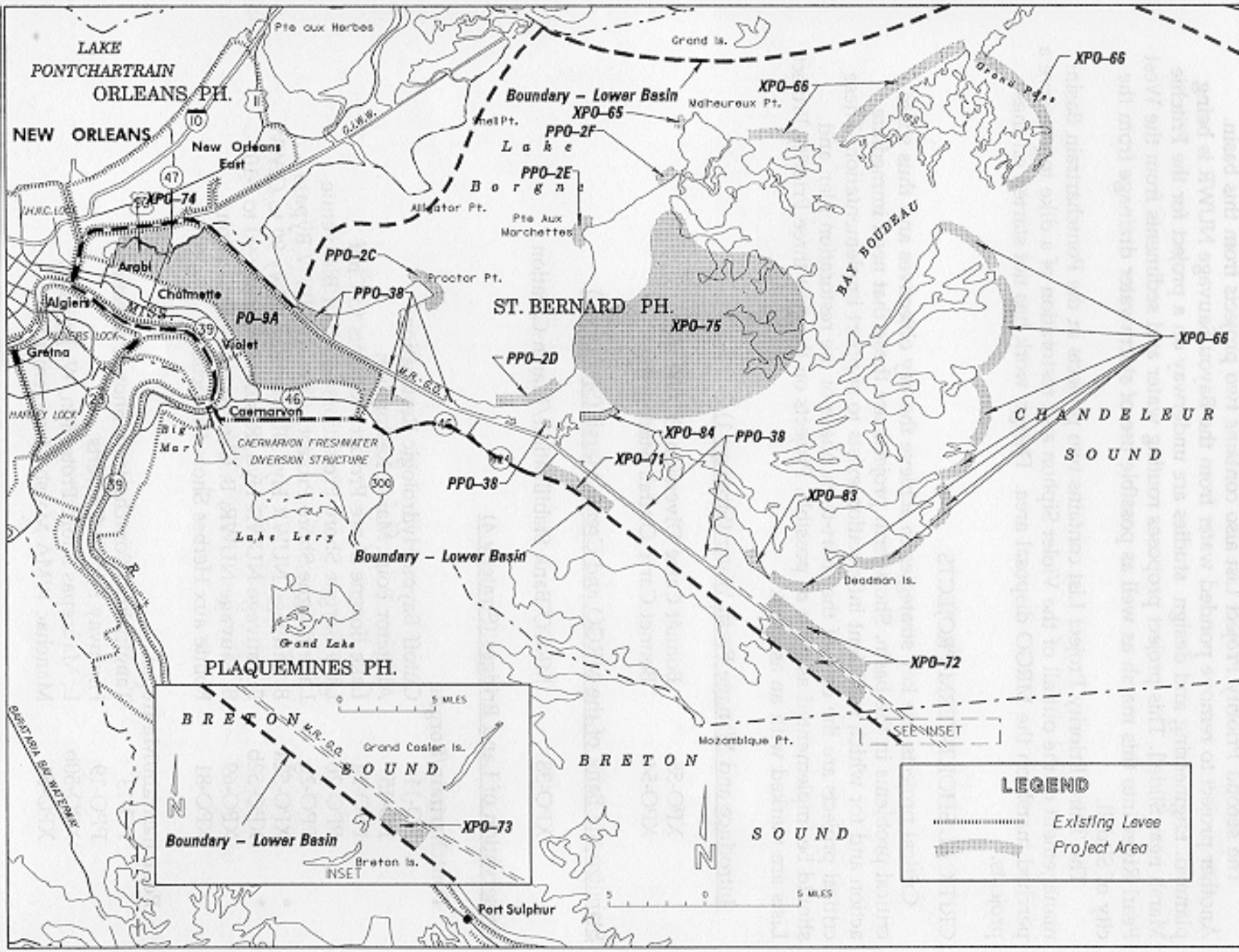


Figure 6. Pontchartrain Basin, Lower Basin, Project Locations.

The second Priority Project List also contains two projects from this basin. Another project to remove ponded water from the Bayou Sauvage NUWR is being planned. Engineering and design studies are underway on a project for the Fritchie Marsh near Slidell. This project proposes routing water and sediments from the West Pearl River into this marsh as well as possible use of stormwater drainage from the city of Slidell.

The Third Priority Project List contains two projects in the Pontchartrain Basin: management of the outfall of the Violet Siphon and restoration of a dike to preserve a perched marsh on the MRGO disposal area. Design work has not started on these projects.

CRITICAL SHORT-TERM PROJECTS

Critical projects use key strategies to achieve the key objectives and thus solve critical problems in the basin. Short-term projects are those that need immediate action and for which sufficient information exists to support implementation. These critical projects are the core of the short-term phase of the restoration plan and should be implemented as soon as possible. Projects on the first three Priority Project Lists are marked with an asterisk.

Introduce and Manage Fresh Water (Strategy 1)

Xro-55	Bonnet Carre Diversion, 30,000 cfs
XPO-54	Bonnet Carre Outfall Management

Stabilize the Bank of the MRGO and Create Marsh (Strategy 3)

XPO-38	MRGO Bank Stabilization/Marsh Creation

Preservation of Land Bridges (Strategy 4)

Pontchartrain/Borgne

	PO-11	Cutoff Bayou Hydrologic Restoration
	PO-15	Alligator Point Marsh Restoration
	PPO-2a	Lake Borgne Shore Protect., Rigolets to Chef
	PPO-2b	Lake Borgne Shore Protection, south of Bienvenue
	PPO-2g	Lake Borgne Shore Protect., Chef to GIWW Bypass
*	XPO-52a	B. Sauvage NUWR Hyd. Restoration, Hwy 90 to GIWW
*	XPO-52b	B. Sauvage NUWR Hyd. Restoration, Hwy 90 to I-10
	XPO-69	B. Sauvage NUWR, B. Chevee Shore Protection
	XPO-81	Pointe aux Herbes Shore Protection

Pontchartrain/Mau.repas

PO-13	Tangipahoa/Pontchartrain Shore Protection
PPO-19	Highway 51 /RR Culverts
XPO-50b	L. Maurepas Shore Protection, W. Jones Is.
XPO-51	Manchac WMA Marsh Management

	XPO-58	Pass Manchac Shore Protection
	XPO-70	L. Pontch. Shore Protection, B. C. to Ruddock

Preservation of Critical Areas Where Marsh Loss is Imminent (Strategy 5)

*	PO-6	Fritchie Wetland Hydrologic Restoration
	PO-14	Green Point/Goose Point Marsh Restoration
	pro-7	La Branche Shore Protection, East
*	PPO-10	La Branche Marsh Creation, West
	XPO-50a	Lake Maurepas Shore Protection, Blayhut Canal
*	XPO-71	MRGO Disposal Area Marsh Protection
	XPO-83	Lake Athanasio Spit Marsh Creation
	XPO-84	St. Malo Hydrologic Restoration
	XPO-91	La Branche Shore Protection, Walker Canal to Blowhole

CRITICAL LONG-TERM PROJECTS

These projects use key strategies to achieve key objectives, but are conceptual at this time and using currently available technologies, would be very expensive to implement. They require complex feasibility studies prior to implementation. These feasibility studies should proceed as rapidly as possible since these projects are the core of the long term phase of the plan.

Sediment Import (Strategy 6)

XPO-45	Maurepas Basin Sediment Pumping
XPO-90	Sediment Import via Pipeline or Barging

Small Freshwater Diversions (Strategy 1)

PPO-27	Tchefuncte Freshwater Diversion, West
PPO-28	Tchefuncte Freshwater Diversion, East
XPO-46	Tickfaw Freshwater Diversion
XPO-85	Bayou Manchac Diversion
XPO-89	Blind River Freshwater Diversion

Artificial Barrier Islands (Strategy 7)

XPO-66	Artificial Barrier Islands

SUPPORTING SHORT-TERM PROJECTS

Supporting projects contribute to wetland projection, but do not address key strategies. They use the small-scale measures in Strategy 8 and usually address local situations. Short-term supporting projects are those with sufficient information and implementation potential to be candidates for future priority lists. They are listed below by area.

Small-Scale Measures (Strategy 8)

Upper Basin

XPO-48a	Tennessee Williams Canal Bank Modification
XPO-48b	Hope Canal Bank Modification
XPO-63	L. Maurepas Shore Protection, Mouth of Blind R.

Middle Basin

PO-7	North Shore Wetland Sediment Trapping
PPO-4	Eden Isles East Marsh Restoration
PPO-9.	La Branche Marsh Creation, East
PPO-12	Tchefuncte Marsh Shore Protection
PO-13	B. Chinchuba Marsh Shore Protection
PPO-31	Indian Beach Marsh Creation
XPO-82	Fontainbleau Shore Protection
XPO-88	Point Platt Sediment Trapping
XPO-94	Lake Pontchartrain Grassbeds

Lower Basin

* PO-9a	Violet Outfall Management
PPO-2c	L. Borgne Shore Protection, Proctor Point
PO-2d	L. Borgne Shore Protection, E. of Shell Beach
PPO-2e	L. Borgne Shore Protection, I?. au Marchettes
PPO-2f	L. Borgne Shore Protect., S. of Malheureaux Pt.
XPO-72	MRGO Marsh Creation (material 9-23 to jetties)
XPO-74	Bienvenue Marsh

Pearl Basin

XPO-80a	Lower Pearl Basin Sediment Trapping

SUPPORTING LONG-TERM PROJECTS

Long term supporting projects are not ready to be proposed for CWPPRA evaluation at this time. Some require additional study and development and others are in areas of the basin that do not presently show signs of wetland stress or loss.

Small-Scale Measures (Strategy 8)

PPO-17	Amite/Petite Arnite Swamp Restoration
PO-36	GIWW Bank Stabilization, Rigolets to GIWW
XI059	North Shore Marsh Restoration, Dredged Material
XPO-60	Ascension Parish Swamp Restoration
XPO-61	St. James/St. John Swamp Restoration
XPO-64	B. Sauvage NUWR Hyd. Restoration, I-10 to lake
XPO-73	MRGO Bar Wetland Creation
XPO-75	St. Bernard Brackish Marsh
XPO-76	Ponchatoula Marsh

XPO-77	GIWW Northern Marshes, Chef to Rigolets
XPO-78	Tangipahoa/Bedico Marsh
Xro-79	Jones Island Marsh
XPO-80	Pearl River Marsh

DEMONSTRATION PROJECTS

These demonstration projects support implementation of various basin strategies or illustrate new techniques. The following concerns regarding rock breakwaters surfaced during review of the draft plan: 1) excessive cost, 2) excessive weight for soft soils, and 3) allowance for the passage of aquatic organisms. A demonstration_ project (XPO-92) compares the costs and efficiency of several different types of shoreline protection. Once this demonstration is completed, the best type of shoreline protection for each site will be chosen. Since shoreline protection is an integral part of the basin plan, XI092 should have a high priority.

The technique of gapping spoil banks to reduce water levels and relieve stress on swamps is an often-discussed concept whose validity should be tested as soon as possible.

Urban areas such as New Orleans have limited sites for land fills. The possibility of using treated sewage sludge mixed with dredged material to create marsh is a concept which needs testing.

Polluted stormwater, which is discharged into Lake Pontchartrain from urban areas each time it rains, was identified as a significant problem in the 1990 Strategic Planning Meetings for this basin. Several studies indicate the feasibility of treating this stormwater by allowing it to filter through man-made wetlands. The two projects (PPO-21 and PI034) which demonstrate the feasibility of this concept are recommended for some funding.

Urban stormwater is blamed as one cause of the demise of submerged aquatics on the south shore of Lake Pontchartrain. Project PPO-25 tests the validity of this theory and will determine if submerged aquatics can be restored to the south shore.

PPO-21	New Orleans East Marsh Creation for Stormwater
PPO-25	Bayou St. John Grassbeds
PPO-34	Bonnabel Canal Marsh Creation for Stormwater
XPO-47	Amite River Diversion Canal Bank Modification
XPO-92	Shoreline Protection Measures
XPO-93	New Orleans East Marsh Creation with Bio-solids

DEFERRED PROJECTS

The projects listed below are deferred for a variety of reasons. Four projects (PO-5, PO-12, XPO-49, and XPO-56B) do not need implementation until the effects of the Bonnet Carre diversion are known. Two projects (PPO-35 and XPO-65) await the results of demonstration projects. The Violet Siphon enlargement does not need implementation until results of the outfall management plan are known.

PO-1B	Violet Siphon Enlargement
PO-5	Southeast Maurepas Wetlands
PO-12	La Branche Wetland Management, West
PPO-20	Port Louis Hydrologic Restoration
PPO-35	Duncan Canal Marsh Creation for Stormwater
xro-49	Tangipahoa Swamp Hydrologic Restoration
XPO-56b	Seabrook Sill
XPO-65	Artificial Oyster Reefs

BENEFITS AND COSTS OF THE SELECTED PLAN

Table 8 summarizes the wetland benefits and the costs of the short-term projects proposed in the selected plan and the Bonnet Carre Diversion. It compares wetland loss over the next 20 years with and without the selected plan. An expenditure of $132,738,000 on short term projects and $72,700,000 on construction and 20 years of maintenance of the Bonnet Carre Diversion will create or preserve 17,330 acres of marsh and 3,600 acres of swamp and thus prevent 69 percent of the marsh loss and 7 percent of the swamp loss.

Implementation of the plan prevents 83 percent of the loss on the Pontchartrain/Maurepas land bridge and 90 percent of the loss on the Pontchartrain Borgne Land Bridge. The short-term phase helps preserve these vital barriers that prevent marine processes from entering further into Lakes Pontchartrain and Borgne. The short-term phase also achieves no net loss, plus some enhancement, in the middle basin. The short-term projects in the selected plan prevent only 9 percent of the losses in the Pearl Basin; however, no net loss is achievable in this sediment-rich basin with projects to be implemented in the long term.

Implementation of the short-term phase prevents only 44 percent of the loss in the lower basin. Clearly, the additional efforts of the long-term phase of the plan are needed to preserve these eroding marshes. Implementation of Strategy 7, construction of the artificial barrier islands, prevents the loss of an additional 4,900 acres of marsh and an additional 33 percent of the lower basin loss. However, the cost of barrier islands, using present technology, is an additional $600 million. Implementation of sediment import projects in Strategy 6 is necessary to achieve no net loss in the lower basin. The costs of sediment import are uncertain, but expensive. Complete restoration of the lower basin requires investigation of cost-effective techniques to build barrier islands and import sediment.

In addition, short-term projects enhance 9,441 acres of wetlands and allow submerged aquatic vegetation to cover an additional 7,466 acres.

The plan has some effect on slowing loss of swamp, but the combination of the Bonnet Carre Diversion with other small scale projects only preserves 7 percent of the basin's swamps. Additional efforts will be needed to preserve these swamps. The demonstration project on bank gapping will indicate if this concept is a viable one for increasing the life of swamps.

The selected plan uses a mix of measures to achieve basin objectives. Hydrologic restoration (38 percent), freshwater diversion (23 percent), shoreline protection (23 percent), and marsh creation (13 percent) account for the majority of the acres preserved or created.

Table 8. Results of Short Term Projects and Bonnet Carre Diversion

Area	CWPPRA Net Acres Marsh Created/ Preserved	CWPPRA Net Acres Swamp Created/ Preserved	CWPPRA Estimated Cost x $(1000)	Bon. Carre Net Acres Marsh Created/ Preserved	Bon. Carre Net Acres Swamp Created/ Preserved	Bon. Carre Estimated Cost x $(1000)	Total plan Net Acres Marsh Created/ Preserved	Total plan Net Acres 'Swamp Created/ Preserved	Total plan Percent Marsh Loss Prevented	Total plan Percent swamp Loss Prevented
Upper Basin	10	620	2,188	0	0	0	0	620	0	3
Pontch/Maur Land Bridge	970	230	13,597	130	1960	37,520	1100	2,190	83	9
Middle Basin	5,110	300	42,592	420	490	16,500	5530	790	145	8
Pontch/Borgn Land Bridge	3,790	0	11,828	420	0	7,480	4210	0	92	0
Lower Basin	5,830	0	61,873	600	0	10,500	6430	0	44	0
Pearl Basin	60	0	660	0	0	0	60	0	9	0
Total	15,770	1,150	132,738	1,570	2,450	72,000	17,330	3,600	69	7

* Bonnet Carre Diversion benefits and costs were estimated for 20 years to be comparable to CWPPRA acres and costs.

The 4,000 acres and $72,000,000 were distributed to the land bridges, the middle basin, and the lower basin.

KEY ISSUES IN PLANNING

SCIENTIFIC

Restoring proper hydroperiods to cypress swamp requires additional information which should be gained in the demonstration for spoil bank gapping (XPO-47). The Mississippi River itself is a limited resource. Freshwater and sediment diversions must be coordinated among basins so these vital resources are used in the most effective manner. Concerns exist about shoreline protection with hard structures. A demonstration (XPO-92) should indicate the most effective measure. Since the cost of hard protection is higher than most "soft" protection, in the following project descriptions, cost estimates are for hard protection. This insures that cost estimates are not unrealistically low.

The U.S. Geological Survey is embarking on a study of the Pontchartrain Basin; the results of this study must be incorporated into the long term planning for the basin. Efforts must be made to incorporate all possible facets of the Lake Pontchartrain Basin Foundation's CMP into this CWPPRA basin plan.

ENVIRONMENTAL

Since CWPPRA deals only with coastal wetlands, projects in bottomland hardwoods are not considered appropriate. Solution to most of water quality problems in the Pontchartrain Basin described earlier is beyond the authority of CWPPRA, which must focus on restoration of vegetated wetlands. Projects that create vegetated wetlands to treat stormwater are part of the plan, but may be so expensive that they will not fare well in competition with other projects. In addition, the Department of Natural Resources prefers that an alternate local sponsor be found for such projects. The artificial wetlands proposed by the Orleans Levee Board have environmental opposition.

SOCIOECONOMIC

All projects in the selected plan must be consistent with flood protection for the residential, commercial, and industrial developments in the basin. The selected plan must also support vital economic activities in this basin such as navigation, ports, oil and gas activities, and fisheries. Relocations of people and property must be minimized. Real estate concerns about ownership of project sites and public access to these sites once CWPPRA projects are built must be addressed.

PROJECT DESCRIPTIONS

CRITICAL SHORT TERM PROTECTS INTRODUCING AND MANAGING FRESH WATER

XP0-55 BONNET CARRE DIVERSION, 30,000 CFS

Location.

The freshwater diversion structure is built in St. Charles Parish at the northern end of the existing Bonnet Carre Spillway structure (see Figure 7 on page 50).

Problems and Opportunities.

Salinity problems in the basin are described previously. The Mississippi River provides an opportunity to restore fluvial processes to the basin by diverting freshwater and nutrients to reduce salinities and improve vegetative health.

Description of Features.

The proposed diversion structure would consist of a 6-barrel concrete culvert, each barrel 18-feet high by 18-feet wide, with lift gates to control the flow of water. The structure would replace the 40 northernmost needles in the existing Bonnet Carre structure. A six-mile outflow channel would connect the river with Lake Pontchartrain and a sediment trap just downstream of the culverts would collect most of the sand in the diverted water. The sediment trap and outfall channel would lie in the northern portion of the spillway. The State of Louisiana would operate the diversion with an interagency advisory group providing guidelines. Diversion would occur when salinities are too high in the basin; this condition is estimated to occur every other year on the average. Diversion would take place from March through November with maximum monthly flows varying from 30,000 cfs in April to 2,600 cfs in August. In a normal 10 year period, flows would be diverted during five years. It is highly likely that the flow regime will be revised to reflect more recent knowledge of the basin. Fall diversions could help protect cypress in the Manchac area from salinity peaks and provide needed nutrients.

Benefits and Costs.

The salinity reduction provided by the diversion would reduce loss in swamp and marsh by 10 percent so a net of 6,130 acres of swamp and nearly 3,900 acres of marsh would be preserved over 50 years. This represents a net preservation of 10,000 acres of wetlands when the 260 acres of swamp and marsh impacted during construction are considered. In 20 years, 2,450 acres of swamp and 1,560 acres of marsh are preserved.

Diversion also benefits marshes in a more subtle and unquantifiable manner. Preventing brackish marsh from becoming saline might also reduce wetland loss (Nyman et al. 1993). The slightly lower annual salinity regime and elevated nutrient transport to the area increase plant growth and species diversity, especially in the

fresh and intermediate marshes. The increased growth helps the plants to better withstand the effects of subsidence. The project allows oystermen in Louisiana to increase their income by $8 million (in 1992 dollars) and those in Mississippi by $2 million.

The Bonnet Carre Diversion is expected to cost $72 million for construction and twenty years of operation and maintenance.

Effects and Issues.

The Lake Pontchartrain Basin Foundation (LPBF) and others oppose the diversion because they feel that it would bring polluted Mississippi River water into Lake Pontchartrain in order to benefit Mississippi Sound. The 1993 USACE EA indicates that the quality of the river has improved greatly and the only possible concern is the addition of excess nutrients to Lake Pontchartrain. A study is underway to determine if nutrients would over-enrich the lake and cause algal blooms. The LPBF blames leakage from the Bonnet Carre for an algal bloom in the early summer of 1993. However, data collected in the lake indicate that the bloom was caused by nutrients coming from north shore tributaries.

The Bonnet Carre Outfall Management Plan, discussed on page 50 below, would remove many of the nutrients from the five to twenty percent of the diversion waters that can be routed through the outfall area. Recent research indicates that the cypress in the Manchac area are nutrient limited and would benefit from the nutrients brought in by the diversion (Myers 1993).

The diversion would not significantly impact the water quality of Lake Pontchartrain. The following discussion is taken from a 1993 USACE Environmental Assessment on the diversion (USACE 1993). Due to enforcement of laws and regulations by the Louisiana Department of Environmental Quality and the actions of the chemical industry, water quality in the Mississippi River is profoundly cleaner than in past. For instance, sampling stations in the river nearest the spillway now have fecal coliform counts lower than the criterion for primary contact recreation. The freshwater diversion would actually improve Lake Pontchartrain south shore water quality in terms of fecal coliforms as long as stormwater runoff problems in Orleans and Jefferson Parishes continue. Maximum diversions would cause visible turbidity as far east as the IHNC, but this turbidity is not more than is presently seen on a windy day. The diversion would not increase the concentrations of synthetic organic contaminants (DDT, chlordane, and PCB's) in the lake, sediment, or biota beyond any EPA or U.S. Food and Drug Agency criteria. Herbicides, such as atrazine and 2,4-D, are present in the Mississippi River in dilute amounts. The ongoing application of several herbicides directly to noxious aquatic weeds in waterbodies immediately surrounding lake Pontchartrain appears to be a greater threat to the Lake Pontchartrain beds of submerged aquatic vegetation than the diversion. The Mississippi River contains only low concentrations of heavy metals. Due to the tendency of these metals to adsorb onto sediment particles, the diversion would not cause elevated levels of heavy metals. With the diversion in place, the average inflow to the lake almost doubles. This additional water should prevent the formation of "dead zones" of low bottom oxygen in the lake near the IHNC according

to an analysis by the USACE.

The Coalition to Restore Coastal Louisiana is concerned about operation of the structure. The original operation plan targeted the Biloxi marshes of Louisiana and Mississippi Sound for salinity reduction in order to benefit oysters. Changes in operation to provide more benefits to Lake Pontchartrain and its surrounding wetlands and only slightly fewer benefits to areas east are definitely possible and will be seriously considered when the operational plan is finalized.

Opponents to the diversion claim that salinity reductions caused by the diversion would destroy the blue crab/shrimp fishery in Lake Pontchartrain. Data from 1991 and 1992 harvest strongly hints that this is an erroneous assumption. The heavy rainfall in 1991 made Lake Pontchartrain nearly as fresh from April through September as if a freshwater diversion had been operating. Blue crab harvest in Orleans Parish and the five north shore parishes was very high in these months in 1991, averaging over $770,000 more than comparable months in the drier year of 1992. Fresh water, such as occurred in 1991, did not lead to a zero harvest of brown shrimp. The 1991 the brown shrimp catch in Lakes Pontchartrain and Borgne was reduced by 70 percent over that of 1992. However, the white shrimp harvest in the same area was 1.32 percent higher in 1991 than in 1992.

Diversion might displace brown shrimp and spotted seatrout up to a maximum of 15-24 miles eastward in the summer. However, the gate in MRGO might displace the same species up to 18 miles eastward. Most important commercial and recreational species, such as red and black drum and blue crabs, are not displaced by either the diversion or the gate. All estuarine dependent species will increase in number over the number that would have been present without the diversion.

Status.

The diversion is part of the plan for the Pontchartrain Basin, but is not to be funded under CWPPRA.The diversion is authorized by the Water Resources Development Act of 1988; the Corps is negotiating a Local Cost Sharing Agreement with the States of Louisiana and Mississippi. There is a 1984 Final EIS on the project as well as an Environmental Assessment (EA) in 1990. The Corps received concurrence from LDNR on a 1984 Coastal Zone Consistency Determination. The State of Louisiana issued a Water Quality Certificate on 7/3/84 and a revision in May 1991 to accompany the USACE 1990 EA. A June 1993 EA discusses water quality and the reduction in impacts to wetlands during construction. A revised Section 404(b)(l) Evaluation is signed. A Coastal Zone Consistency Determination has been forwarded to LDNR. A revision to the Water Quality certificate has been requested. An NPDES permit is not necessary for this project. Endangered species coordination with both USFWS and National Marine Fisheries Service is complete.

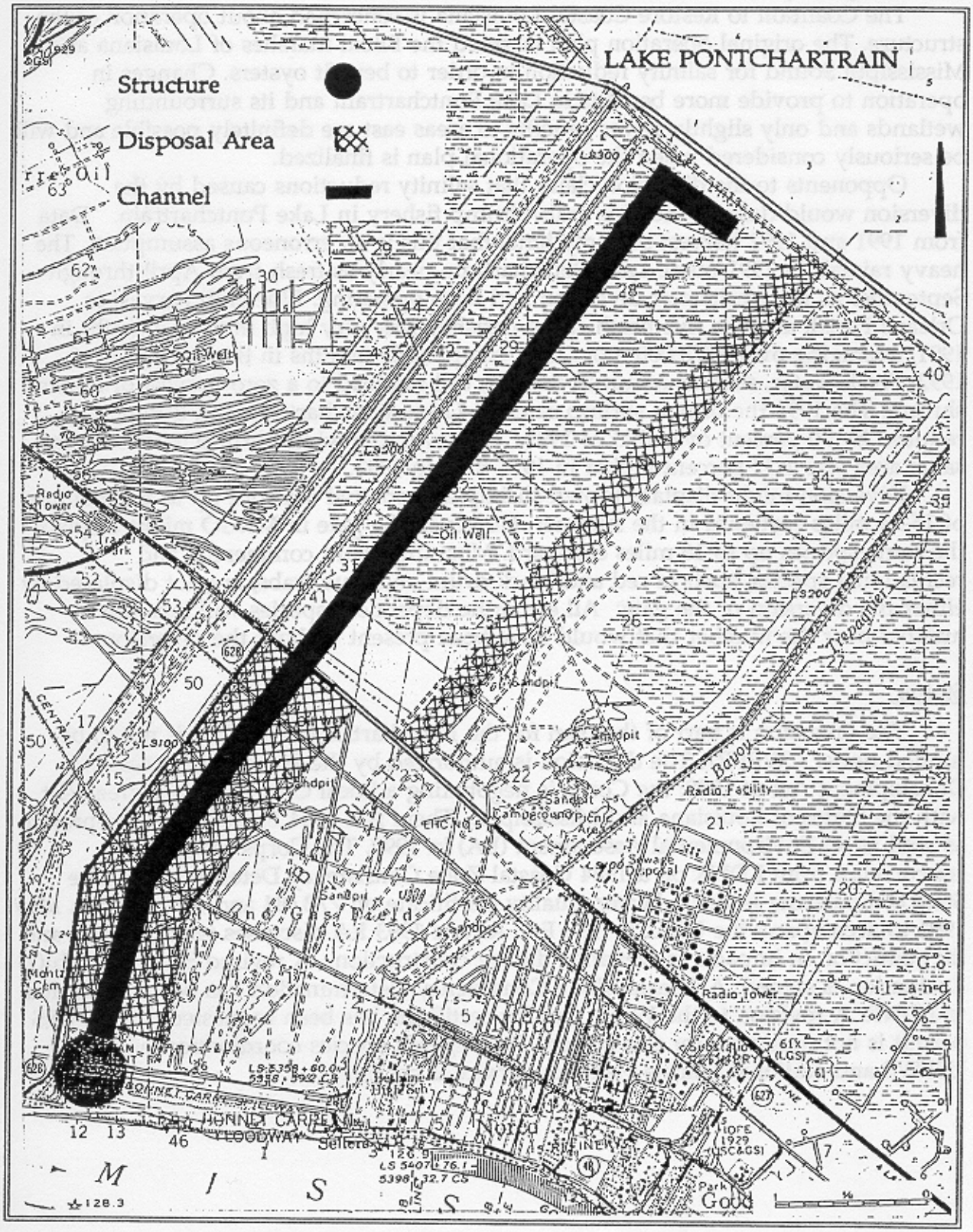


Figure 7. XPO-55 Bonnet Carre Freshwater Diversion

XPO-54 BONNET CARRE OUTFALL MANAGEMENT

Location.

This project area includes the Sarpy Swamp in the La Branche wetlands east of the Bonnet Carre Spillway (see Figure 8 on page 52 and Figure 5 on page 38).

Problems and Opportunities.

The Bonnet Carre Freshwater Diversion will funnel freshwater and a limited amount of sediments into Lake Pontchartrain via a man-made channel. It is possible to pass from 5 to 20 percent of this water through the La Branche wetlands to the east of the spillway. This opportunity provides two benefits: nutrients would be removed from the diverted water before it entered the lake and these nutrients would nourish the wetlands.

The Sarpy Swamp is an area that was once swamp, but is in transition to marsh and open water. The center of the area is now a few cypress trees standing in shallow water. The rim of the area is fairly healthy swamp with an understory of bulltongue marsh. Between 1978 and 1988, the swamp converted to open water or marsh at the rate of 480 acres per year. At even one fourth this rate, the 1,300 acre center of the swamp would convert to water in about 11 years.

Description of Features.

The plan is conceptual at the present. The Old Hammond Highway Borrow Pit channel near the lake could be enlarged to carry water from the Bonnet Carre Diversion outfall channel to the East Guide Levee of the Spillway. Culverts would be required to pass the waters through the levee and an existing channel could carry the water into the Sarpy Swamp just east of Bayou Trepagnier.

Benefits and Costs.

The nutrients brought by the outfall will allow bulltongue to spread to much of the 1,300 acres. The nutrients and limited sediments should allow cypress regeneration to occur on about one fourth of the area. Thus, at the end of 20 years, there should be an additional 1,000 acres of marsh and 300 acres of swamp.

The cost is estimated to be $8.5 million.

Effects and Issues.

There is severe pollution in the headwaters of Bayou Trepagnier. Thus, this site is unsuitable for outfall management until the polluted sediments are removed. A preliminary investigation of routing some of the outfall water into the Freniere swamp to the west indicates that ground elevations may be too high to allow the water to reach the area via gravity. The possibility of a siphon will be considered.

Status.

An ad hoc group consisting of representatives from the USACE, the Governor's

Office of Coastal Affairs, LDNR, Louisiana Departments of Wildlife and Fisheries, Environmental Quality, and Transportation and Development, the local landowners, and the academic community helped formulate this outfall management plan. This same group, with leading environmental groups, will continue to formulate sister plans to route outfall waters into the Freniere swamp and Bayou Trepagnier. This project cannot occur until the Bonnet Carre Freshwater Diversion is operating and the first lift is completed on the St. Charles Parish portion of the Lake Pontchartrain Hurricane Protection system. Thus the outfall management cannot start until FY 99.

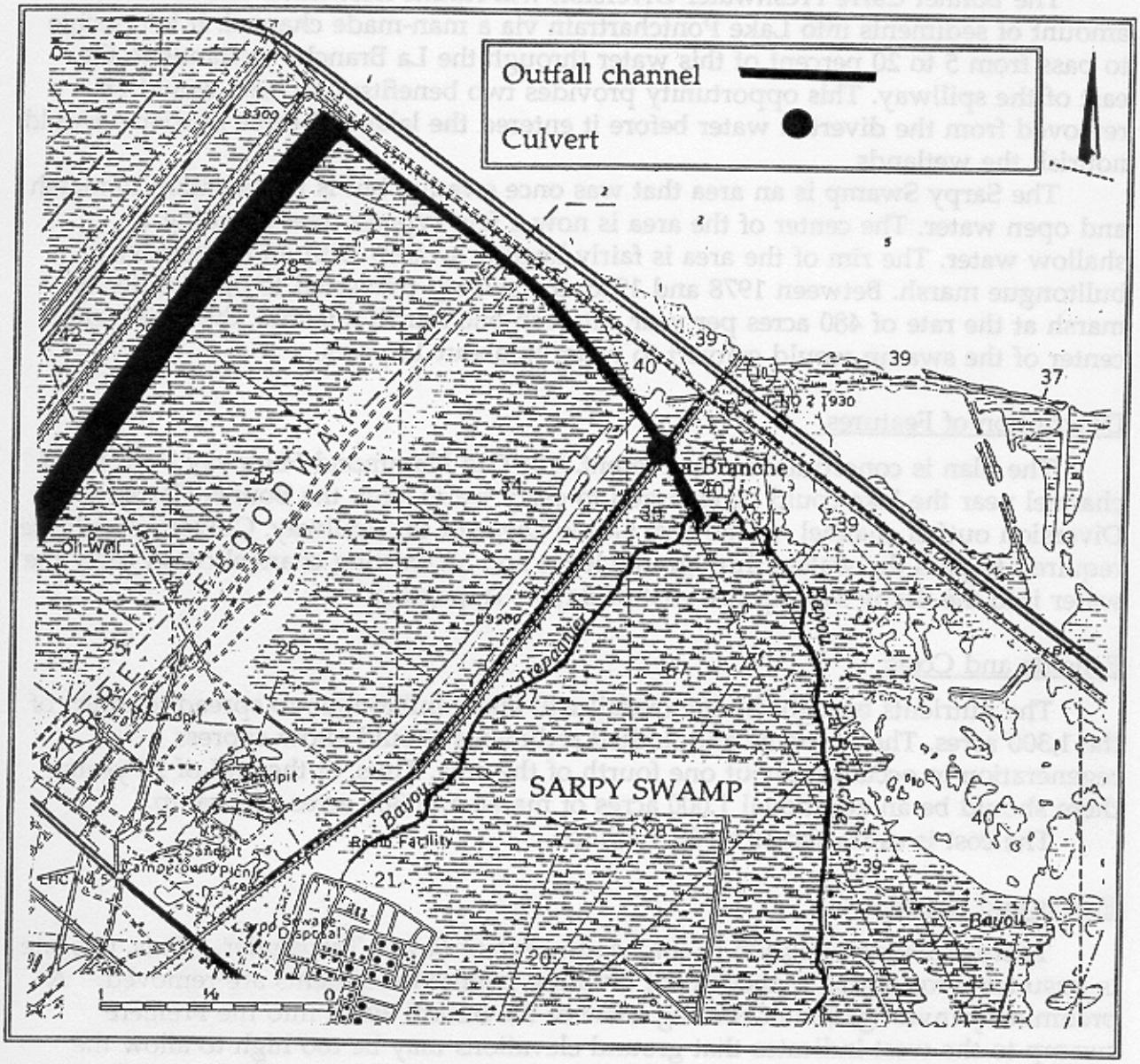


Figure 8. XPO-54 Bonnet Carre Outfall Management

CRITICAL SHORT TERM PROTECTS STABILIZING THE BANK OF THE MRGO

XF'O-38 MRGO BANK STABILIZATION / MARSH CREATION

Location.

The project extends along the north bank of MRGO from the north end of the jetties to the intersection with GIWW (see Figure 9 on page 54).

Description of Features.

A shoreline rock dike would be built on the north bank of MRGO. No dikes would be built across the 2.5 miles of channel that passes through Lake Athanasio because the lake is 15-20 feet deep. A one-half mile dike would be placed on the shoreline of the south bank just north of the jetty where some marsh erosion on the south bank is occurring. The dike would be built with a filter fabric base, a shell or aggregate core, and a 3-foot blanket of armor stone and maintained as necessary to keep it functional.

Dredged material from each maintenance dredging would be placed in small shallow ponds, eroding marshes, and abandoned canals adjacent to the MRGO. The material would be placed at a height conducive to marsh creation. If necessary, low earthen dikes are planned to confine turbidity. Once the Bonnet Carre Diversion is operational and the oyster leases in western Lake Borgne are over-freshened, the shallow western lobes of the lake will be filled to create marsh.

Benefits and Costs.

The project would preserve approximately 4,220 acres of marsh over the next 20 years. The rock dike reduces annual maintenance dredging by about $600,000. This is factored into the cost of the plan. The bank stabilization / marsh creation is estimated to cost $54.5 million if maintained for 20 years.

Effects and Issues.

Benthos would be destroyed during placement of the rock dike and the dredged material. Most fish and shellfish would be able to escape the rocks or dredged material. Some groups want to close the MRGO instead of stabilize its banks. As described under Plan Formulation above, the most cost effective alternative is bank stabilization.

Status.

The bank stabilization / marsh creation project described above is a proposal. At the present time, three miles of rock dike is built and marshes behind it are nourished. The USACE is preparing a Reconnaissance Report on prevention of bank erosion along MRGO. The report is scheduled to be completed in Februarv 1994. For the present, the plan proposed above is selected. If a different plan emerges from the Reconnaissance Report and a subsequent Feasibility Study, that plan will be selected.

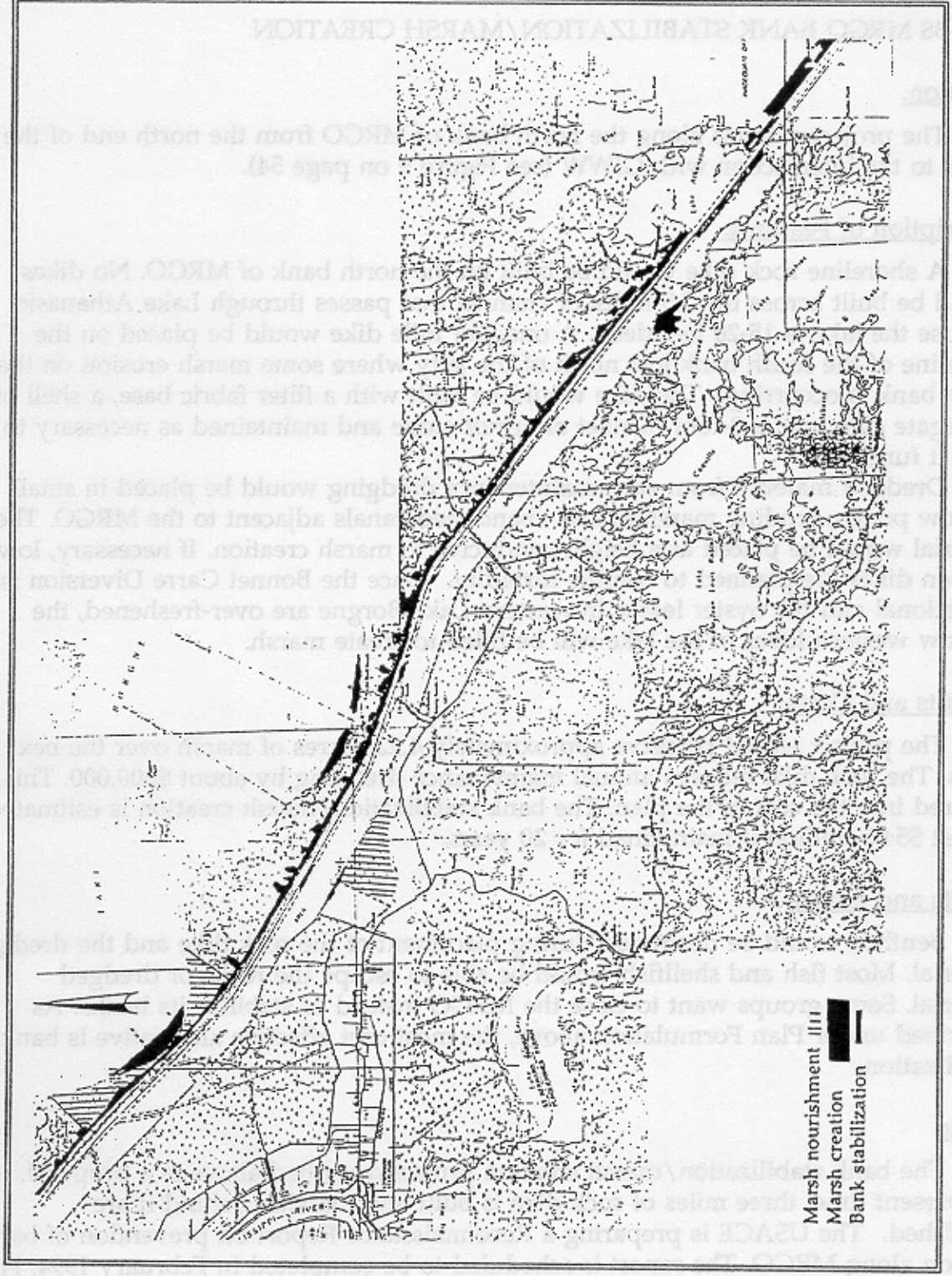


Figure 9. XPO-38 MRGO Bank Stabilization/Marsh Creation

CRITICAL SHORT TERM PROTECTS PRESERVING THE PONTCHARTRAIN/ BORGNE LAND BRIDGE

PO-11 CUTOFF BAYOU HYDROLOGIC RESTORATION

Location

This 3,915 acre project lies the brackish marshes and ponds in eastern Orleans Parish south of the GIWW and north of Bayou Bienvenue and Lake Borgne (see Fig. 10 below and Figure 5 on page 38).

Problems 'and Opportunities.

Construction of the GIWW, MRGO, and several canals has totally altered the area's hydrology. Marshes are stressed by salinity intrusion from MRGO and rapid tidal fluctuations. The loss rate from 1974-1990 was .19 percent per year.

Description of Features.

Breaches along the GIWW and MRGO will be closed at five sites, and an existing rock plug and earthen dam will be restored.

Benefits and Costs.

The loss rate will be reduced by 60 percent. Over 20 years, approximately 103 acres of marsh should be preserved, SAV will cover an additional 220 acres and 180 acres will be enhanced for a total of 503 acres benefitted. The reconnaissance level cost is estimated to be $722,000. The estimated cost per benefitted acre is $1,436. The Bonnet Carre Freshwater Diversion will enhance this project.

Effects and Issues.

The plugs and weir will not significantly impede ingress and egress of marine organisms. The shoreline of Lake Borgne will be left unaltered to allow sediment to enter the area.

Status.

This project is on the Restoration Plan. It was a candidate for Priority List #2, but did not make the list because it had a lower cost effectiveness than most projects that were placed on the list. It will remain in the Restoration Plan and will be a candidate for future Priority Lists.

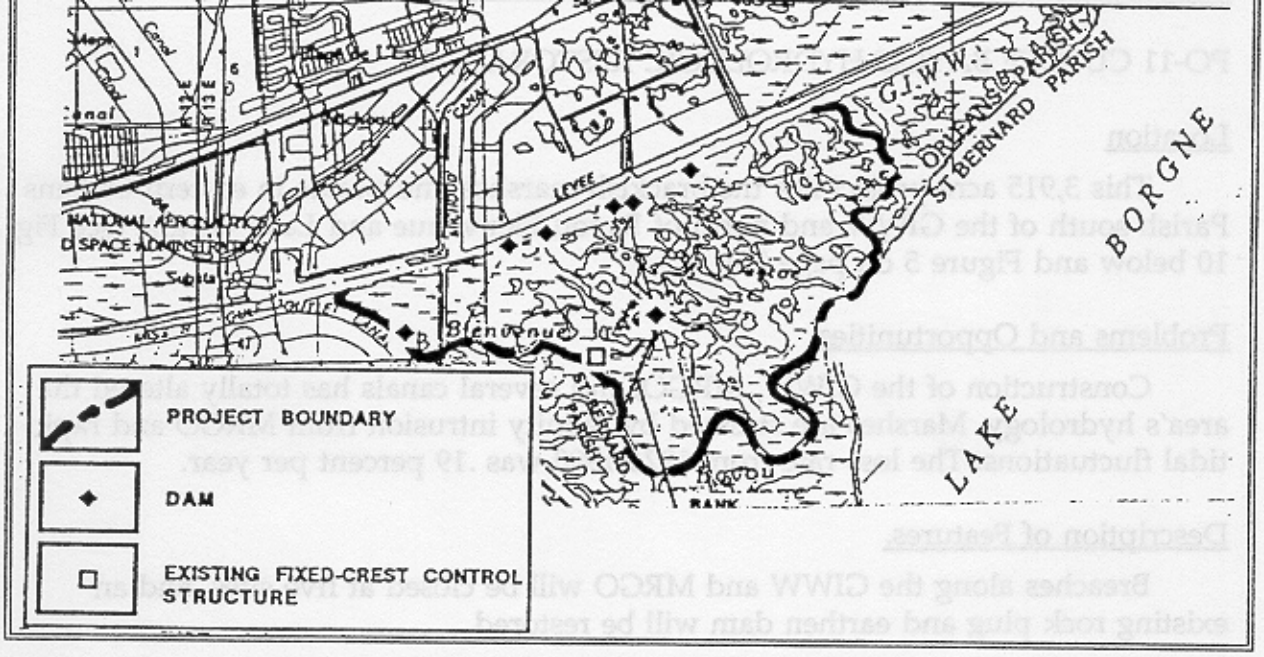
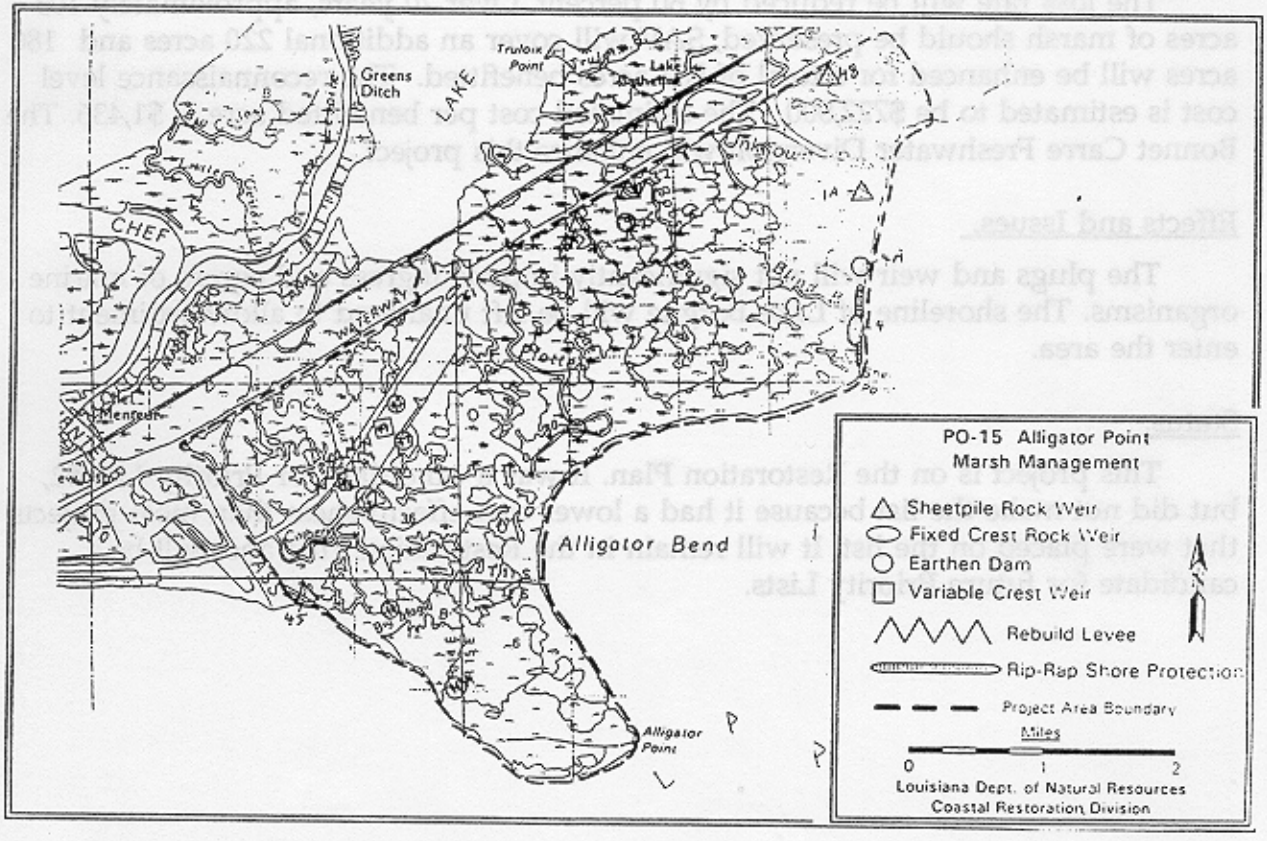


Figure 10. PO-11 Cutoff Bayou Hydrologic Restoration



PO-15 ALLIGATOR POINT MARSH RESTORATION

Location.

The project area is a 15,578 acre tract of brackish marsh and ponds in eastern Orleans Parish, extending from Chef Menteur Pass to Lake St. Catherine to Big Deedee Lake (See Figure 11 above and Figure 5 on page 38).

Problems and Opportunities.

Marsh loss is occurring in this area at a rate of 0.146 percent per year because of bank erosion along the GIWW and shoreline erosion in Lake Borgne and extensive tidal fluctuations in ponds and bayous. The purpose of the plan is 1) to re-establish water flow into natural bayous, 2) reduce rapid water level fluctuations and intrusion of salt water into the area and hold fresh water longer, and 3) reduce shoreline erosion along the GIWW and Lake Borgne.

Description of Features.

Eight earthen dams, three variable crest weirs, and five timber or sheetpile/rock weirs and one rock weir will be built in waterways coming off the GIWW or Lake Borgne. Approximately 4,000 feet of earthen levee will be built along the shore of the GIWW Bypass to protect two ponded areas which are rich in submerged aquatics. Two areas on the shore of Shell Point will be protected with 1,200 feet of riprap.

Benefits and Costs.

Marsh loss in the area should be reduced by 50 percent. This will preserve 219 acres over 20 years. SAV will cover an additional 528 acres. Approximately 742 acres will be enhanced. Thus, a total of 1,489 acres of wetlands will be benefitted. The reconnaissance level cost is estimated to be $1,951,000. The estimated cost per benefitted acre is $1,310.

Effects and Issues.

The water control structures will slightly impede the ingress and egress of marine organisms in some portions of the project area. Numerous natural routes into the marsh will be left untouched. Sediment will still enter the area from Lake Borgne and the GIWW.

Status.

This is in the Restoration Plan and is a candidate for Priority List #3. It is part of the State Plan and the landowner has a Coastal Use Permit and a Section 404 Permit.

PPO-2a LAKE BORGNE SHORE PROTECTION, RIGOLETS TO CHEF

Location.

This 168 acre project area extends along the shoreline of the brackish marsh adjacent to Lake Borgne from the Rigolets to Bayou Dupre in Orleans Parish (see Figure 12 below and Figure 5 on page 38).

Problems and opportunities.

Louisiana Geological Survey data indicates that the area just west of the Rigolets has an erosion rate of up to 15 feet per year. Along Shell Point and on the northwestern curve of Alligator Bend the loss rate is up to 10 feet per year. A total of 13,600 feet of shoreline protection will stop this loss.

Description of Features.

The seriously eroding areas will be protected, possibly with two feet of armor stone on a geotextile base. The shoreline protection will extend 1,600 feet near the Rigolets, 4,000 feet on Shell Point and 8,000 feet at Alligator Bend. None of this work will conflict with that proposed for the Alligator Point or Cutoff Bayou Hydrologic Restoration projects.

Benefits and Costs.

A rough appraisal of the area indicates that the shoreline protection will not reduce interior marsh loss. The shoreline protection will prevent the loss of 65 acres of marsh over 20 years. Approximately three feet of sediment will accrete each year behind the shoreline protection which will create 19 additional acres of marsh over 20 years. SAV will cover an additional 4 acres and approximately 6 acres will be enhanced. Thus, a total of 94 acres will be benefitted. This project will be enhanced by the Bonnet Carre Freshwater Diversion. The reconnaissance level cost is estimated to be $1,421,000. The estimated cost per benefitted acre is $15,177.

Effects and Issues

The shore protection will cover about two acres of water bottoms.

Status.

This project is part of the Restoration Plan. It has a low cost effectiveness in terms of dollars per acre of marsh preserved. As time goes by, if less expensive shoreline protection is developed, this project will be implemented. A detailed study is necessary to determine if a shorter shoreline protection will be more cost effective.

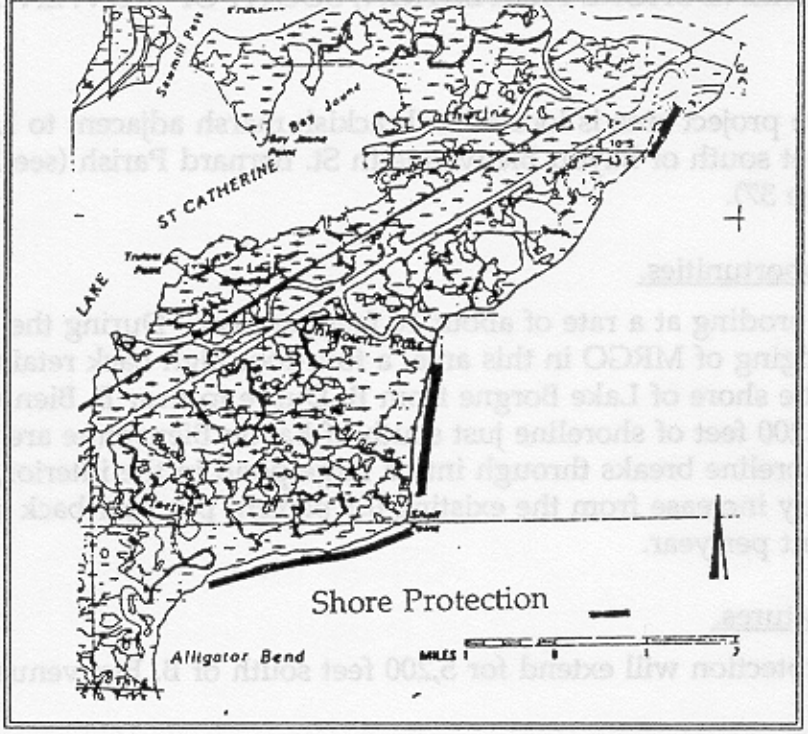


Figure 12. PPO-2a Lake Borgne Shore Protection, Rigolets to Chef

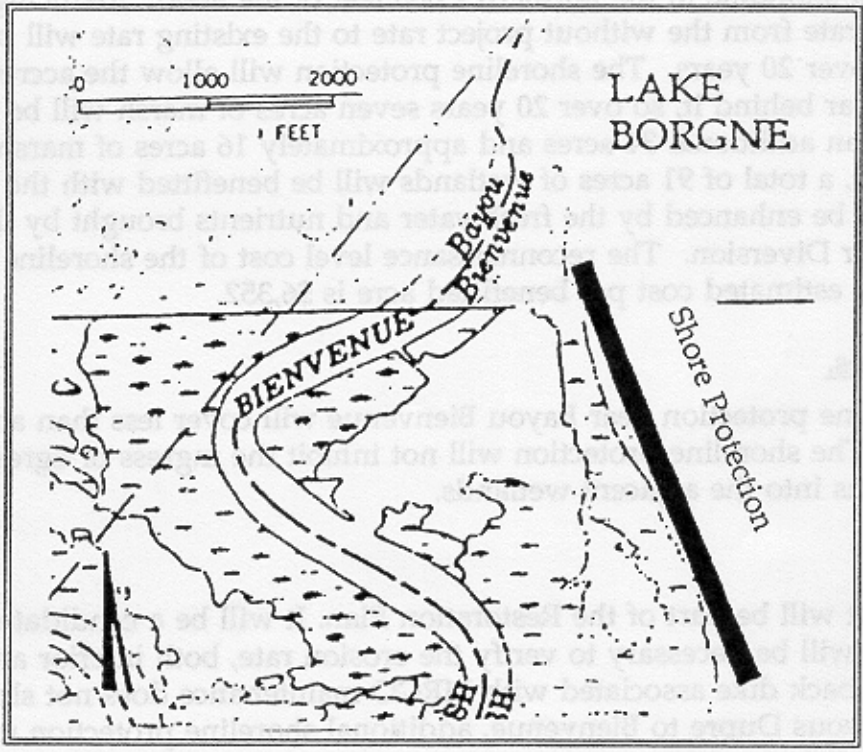


Figure 13. PPO-2b Lake Borgne Shore Protection, South of Bienvenue

PPO-2b LAKE BORGNE SHORE PROTECTION, SOUTH OF BIENVENUE

Location.

This 274-acre project area is located in brackish marsh adjacent to Lake Borgne in a strip 5,200 feet south of Bayou Bienvenue in St. Bernard Parish (see Fig. 13 above and Fig. 5 on page 37).

Problems and Opportunities.

This area is eroding at a rate of about 10 feet per year. During the 1992-93 maintenance dredging of MRGO in this area, a four-foot high back retaining levee was built along the shore of Lake Borgne from B. Dupre to near B. Bienvenue. Approximately 5,200 feet of shoreline just south of Bayou Bienvenue are subject to erosion. If the shoreline breaks through into a large pond in the interior, the rate of erosion will greatly increase from the existing 0.1 percent per year back to the 1974-83 rate of 0.95 percent per year.

Description of Features.

Shoreline protection will extend for 5,200 feet south of B. Bienvenue.

Benefits and Costs.

Reducing the erosion by 10 feet per year will preserve 11 acres of marsh (there is only 20 feet of shoreline in the northern 2,600 feet of the area). Reducing the interior erosion rate from the without project rate to the existing rate will preserve 23 acres of marsh over 20 years. The shoreline protection will allow the accretion of three feet per year behind it, so over 20 years seven acres of marsh will be created. SAV will cover an additional 34 acres and approximately 16 acres of marsh will be enhanced. Thus, a total of 91 acres of wetlands will be benefitted with the project. This project will be enhanced by the freshwater and nutrients brought by the Bonnet Carre Freshwater Diversion. The reconnaissance level cost of the shoreline protection is $578,000. The estimated cost per benefitted acre is $6,352.

Effects and Issues.

The shoreline protection near Bayou Bienvenue will cover less than an acre of water bottoms. The shoreline protection will not inhibit the ingress or egress of marine organisms into the adjacent wetlands.

Status.

This project will be part of the Restoration Plan. It will be a candidate for future Priority Lists. It will be necessary to verify the erosion rate, both interior and shoreline. If the back dike associated with MRGO maintenance does not slow the erosion from Bayous Dupre to Bienvenue, additional shoreline protection may be necessary in the future.

PPO-2G LAKE BORGNE SHORE PROTECTION, CHEF TO GIWW BY-PASS

Location

This 200 acre project area extends along the Lake Borgne shoreline of the brackish marsh from Chef Menteur Pass westward to the GIWW By-Pass in Orleans Parish (See Figure 14 below and Figure 5 on page 38).

Problems and Opportunities

Data furnished by the USFWS indicates that the shoreline is eroding at 7.5 feet per year in this area.

Description of Project Features

This eroding area will be preserved with 16,000 feet of shoreline protection.

Benefits and Costs

The shoreline protection will prevent the loss of 59 acres of marsh over 20 years. Approximately three feet of sediment will accrete each year behind the shoreline protection which will create 22 additional acres of marsh over 20 years. SAV will cover an additional 6 acres and approximately 9 acres will be enhanced. Thus, a total of 94 acres will be benefitted. This project will be enhanced by the Bonnet Carre Freshwater Diversion. The reconnaissance level cost is estimated to be $1,708,000. The estimated cost per benefitted acre is $17,791.

Effects and Issues

The shoreline protection will cover about two acres of water bottoms.

Status.

This project will be part of the Restoration Plan. It will be a candidate for future Priority Lists. It will be necessary to verify the erosion rate, both interior and shoreline.

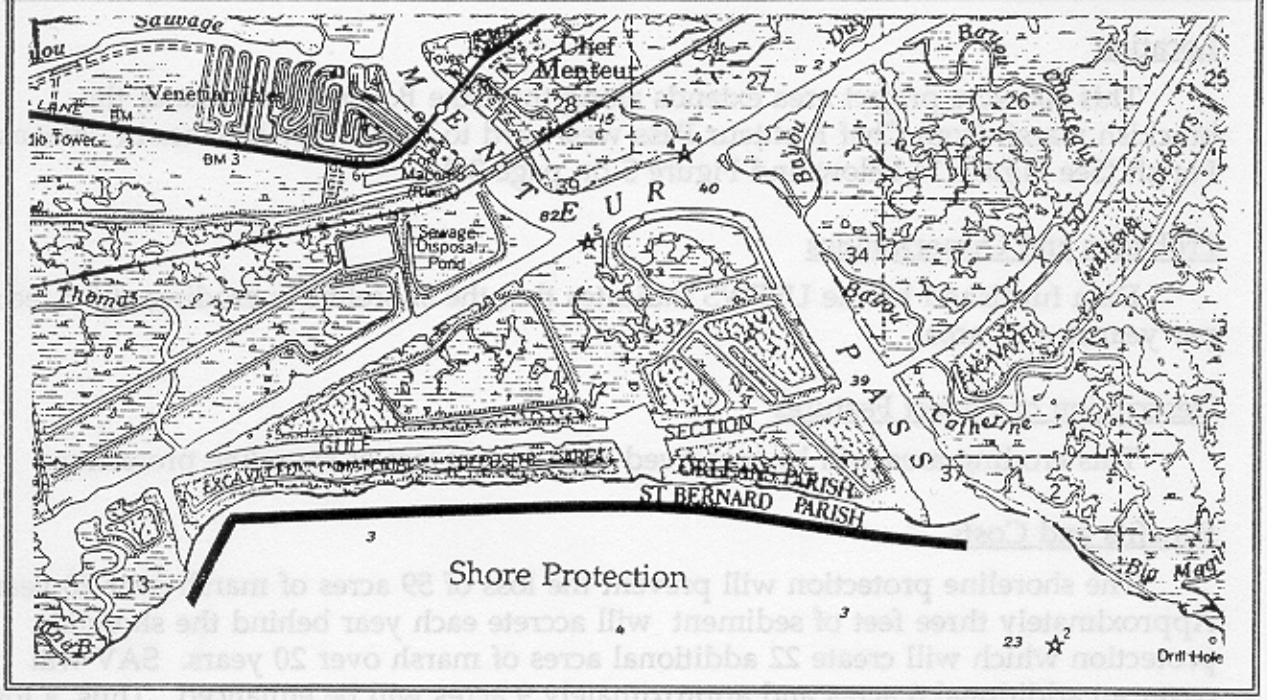


Figure 14. PPO-2g Lake Borgne Shore Protection, Chef to GIWW Bypass

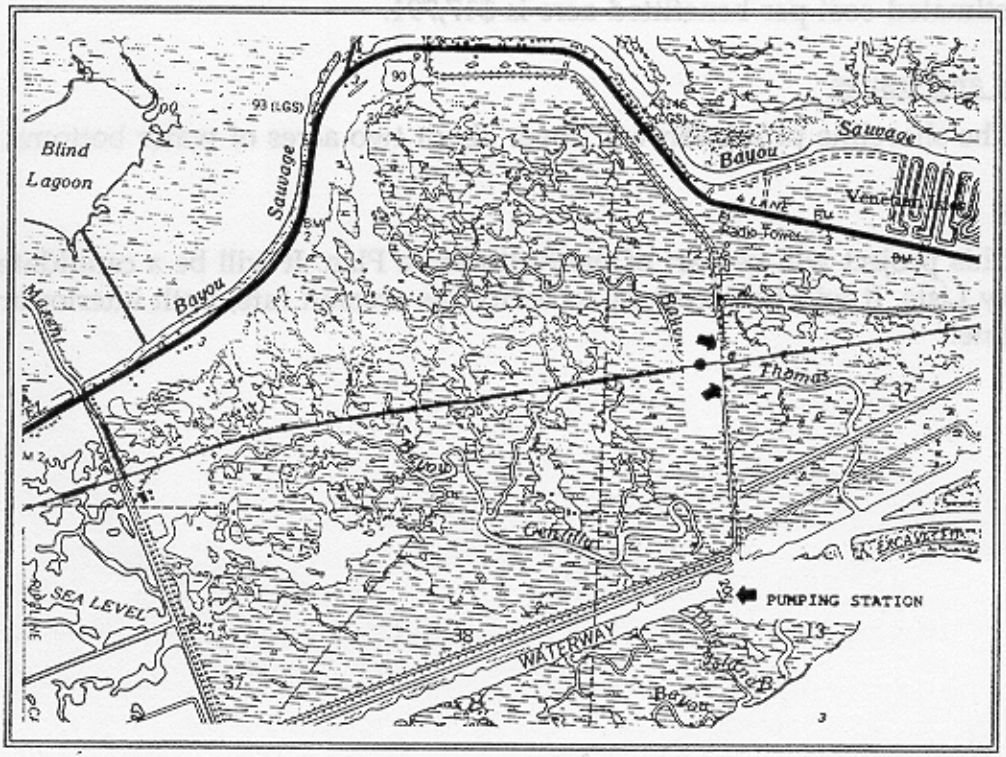


Figure 15. XPO-52a Bayou Sauvage NUWR Hydrologic Restoration, Highway 90 to GIWW

XPO-52a BAYOU SAUVAGE NATIONAL URBAN WILDLIFE REFUGE (NUWR) HYDROLOGIC RESTORATION, HIGHWAY 90 TO GIWW.

Location

This 3,800 acre project consisting of fresh marsh and ponds is located on the Bayou Sauvage NUWR in Orleans Parish between U.S. Highway 90 and the GIWW on the north and south (see Figure 15 above and Figure 5 on page 38).

Problems and Opportunities

Levees impound 1,800 acres of fresh marsh interspersed with 2,000 acres of shallow open water. Rainfall cannot be removed in a timely manner and the elevated water levels have caused significant deterioration of the marsh.

Description of Project Features

Two 48-inch pumps located in the South Point to GIWW levee would allow water to be pumped out of this area. They would be operated to draw water down in spring and summer to expose the marsh soil so wetland plants could start to grow. The area could be flooded for waterfowl in the fall and winter and not harm marsh.

Benefits and Costs

The pumps would prevent the loss of 500 acres of marsh and restore an additional 1050 acres according the Priority List # 1Report. SAV's would cover an additional 264 acres and 139 acres would be enhanced. Thus, a total of 1953 acres would be benefitted. The reconnaissance level cost is $1,713,000. The estimated cost per benefitted acre is $877.

Effects and Issues

There will be no negative impacts caused by this project. The water removed from the refuge will be pumped out into canals and will not induce flooding on any development. Marsh preservation on the public land in the largest metropolitan area in the state will enhance public appreciation of the value of marsh and support of marsh restoration throughout the state.

Status

This project is part of the Restoration Plan and was on Priority List #1. It is sponsored by the U.S. Fish and Wildlife Service (USFWS) which has signed a Local Cost Sharing Agreement with the Louisiana Department of Natural Resources (LDNR). Detailed plans are completed and bids were let in late 1993.

XPO-52B BAYOU SAUVAGE NUWR HYDROLOGIC RESTORATION, HIGHWAY 90 TO I-10.

Location

This 5,500 acre project area consisting of fresh and intermediate marsh and ponds is located on the Bayou Sauvage NUWR in Orleans Parish between I-10 and U.S. Highway 90 on the north and south and the Maxent Canal Levee and the South Point to GIWW levee on the west and east (see Figure 16 below and Figure 5 on page 38).

Problems and Opportunities

Levees impound 2,800 acres of fresh and intermediate marsh interspersed with 2,700 acres of shallow open water. Levees surrounding the area have caused severe subsidence and rainfall cannot be removed in a timely manner.The elevated water levels have caused significant deterioration of the marsh. Installation of pumps would relieve the situation.

Description of Project Features

One 48-inch and one 36-inch pump located in the South Point to GIWW levee would allow water to be pumped out of this area. They would be operated to draw water down in the spring and summer to expose the marsh soil so wetland plants could grow. The area could be flooded for waterfowl in the fall and winter and not harm the new marsh.

Benefits and Costs

The pumps would prevent the loss of 530 acres of marsh due to continued subsidence over the next 20 years. In addition, pumping would allow the creation of 750 acres of new marsh in what is ponds now. Thus, according to the report for Priority List #2, a total of 1,280 acres would be created / preserved over 20 years. SAV's would cover an additional 541 acres and 256 acres would be enhanced. Thus, a total of 2077 acres of wetlands would be benefitted. The reconnaissance level cost is $1,463,000. The estimated cost per benefitted acre would be $704.

Effects and Issues - There will be no negative impacts caused by this project. The water removed from the refuge will be pumped out into canals that run through open marsh, and will not induce flooding on any development.

Status

This project is part of the Restoration Plan and was on Priority List #2. It is sponsored by the U.S. Fish and Wildlife Service (USFWS) which is negotiating a Local Cost Sharing Agreement with the Louisiana Department of Natural Resources (LDNR).

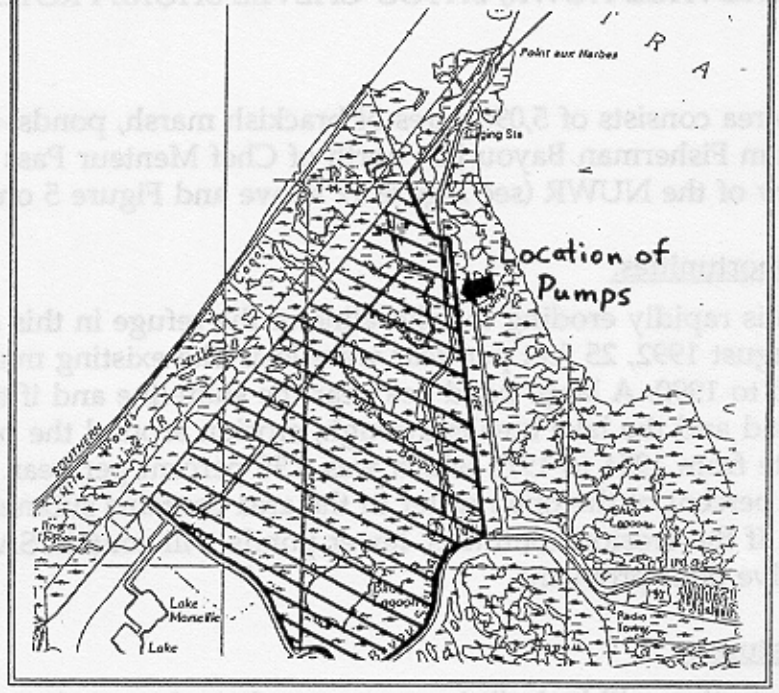


Figure 16. XPO-52b Bayou Sauvage NUWR Hydrologic Restoration, Highway 90 t
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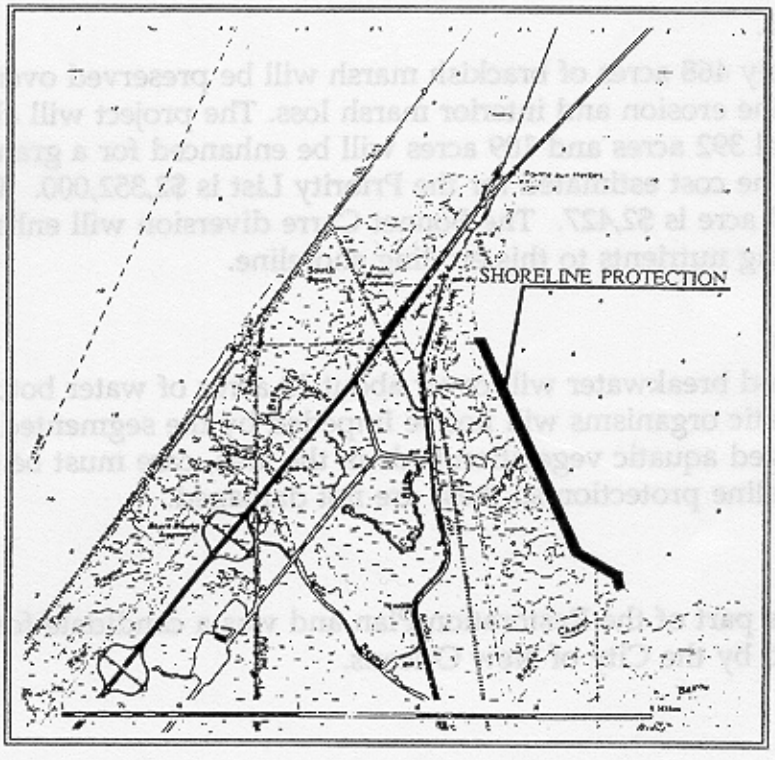


Figure 17. XPO-69 Bayou Sauvage NUWR, Bayou Chevee Shore Protection

XPO-69 BAYOU SAUVAGE NUWR, BAYOU CHEVEE SHORE PROTECTION

Location.

The project area consists of 5,098 acres of brackish marsh, ponds, and shallow lake extending from Fisherman Bayou just north of Chef Menteur Pass to the northern boundary of the NUWR (see Figure 17 above and Figure 5 on page 38).

Problems and Opportunities.

Wave action is rapidly eroding the shoreline of the refuge in this area. Between June 1990 and August 1992, 25 feet per year were lost. The existing marsh loss rate was 0.1 from 1983 to 1990. A large pond lies near the shoreline and if the thin strip separating the pond and the lake breaks through, erosion around the pond will increase to the rate from 1954 to 1978 which was 0.58 percent per year. At the present, about 75 percent of the open water in the area contains submerged aquatic vegetation (SAV). If the erosion continues, fewer ponds will contain SAV. Shoreline protection will solve both problems.

Description of Features.

Shoreline protection will be built in one to two feet of water from the north end of the pond by the town of Irish Bayou to Fisherman's Bayou. Intermittent breaks in the shore protection may be required for proper water circulation.

Benefits and Costs.

Approximately 468 acres of brackish marsh will be preserved over 20 years by preventing shoreline erosion and interior marsh loss. The project will allow SAV to cover an additional 392 acres and 109 acres will be enhanced for a grand total of 969 acres benefitted. The cost estimated for the Priority List is $2352,000. The estimated cost per benefitted acre is $2,427. The Bonnet Carre diversion will enhance this project by providing nutrients to this eroding shoreline.

Effects and Issues.

The segmented breakwater will cover about 12 acres of water bottoms. Ingress and egress of aquatic organisms will not be impeded by the segmented breakwater. There are submerged aquatic vegetation beds in the area, care must be taken in planning the shoreline protection so these are not damaged.

Status.

The project is part of the Restoration Plan and was a candidate for Priority List # 3. It is supported by the City of New Orleans.

XPO-81 POINT AUX HERBES SHORE PROTECTION

Location.

The 450 acre project area of brackish marsh and ponds is located in Orleans Parish, in the vicinity of Point aux Herbes in Lake Pontchartrain (see Figure 18 below and Figure 5 on page 38).

Problems and Opportunities.

Erosion rates are approximately 15 feet per year in the area from the point west to the junction of the levee and the railroad. Since there is a large open pond in the center of the marsh,there is an extensive amount of shoreline subject to erosion. Shoreline protection will prevent further erosion.

Description of Features.

Approximately 5,400 feet of shoreline protection will be built from the point to the junction of the levee and railroad.

Benefits and Costs.

It is estimated that 75 percent of the erosion will be prevented over approximately 10,600 feet, which will preserve 37 acres of marsh over the next 20 years. The pond is so large that not all erosion will be prevented by a shoreline protection at the lake. Sediment will accrete between the shoreline protection and the marsh at a rate of two feet per year which will create five acres of marsh. SAV will cover an additional 4 acres and approximately 3 acres of marsh will be enhanced. The total acres of marsh benefitted will be 49. The reconnaissance level cost of the project is $590,000. The estimated cost per benefitted acre is $12,041. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The shoreline protection will cover nearly two acres of water bottoms. Ingress and egress of aquatic organisms will not be interfered with.

Status.

This project is part of the Restoration Plan and will be considered for future priority lists. A short feasibility study must be done to verify the erosion rate, the benefits, and to choose the best route for the shoreline protection.

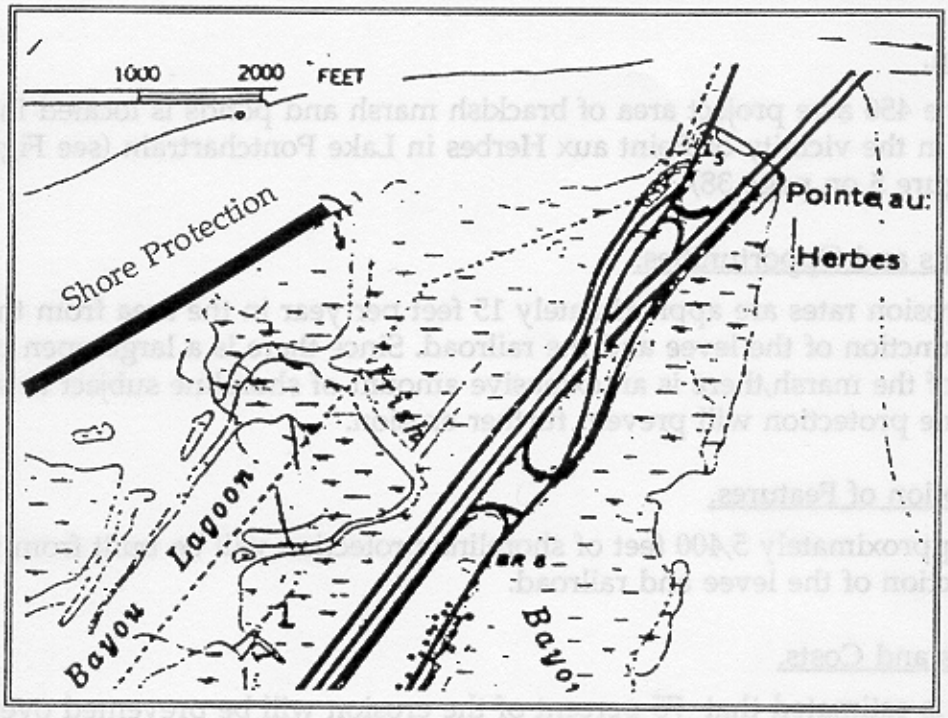


Figure 18. XPO-81 Point aux Herbes Shore Protection

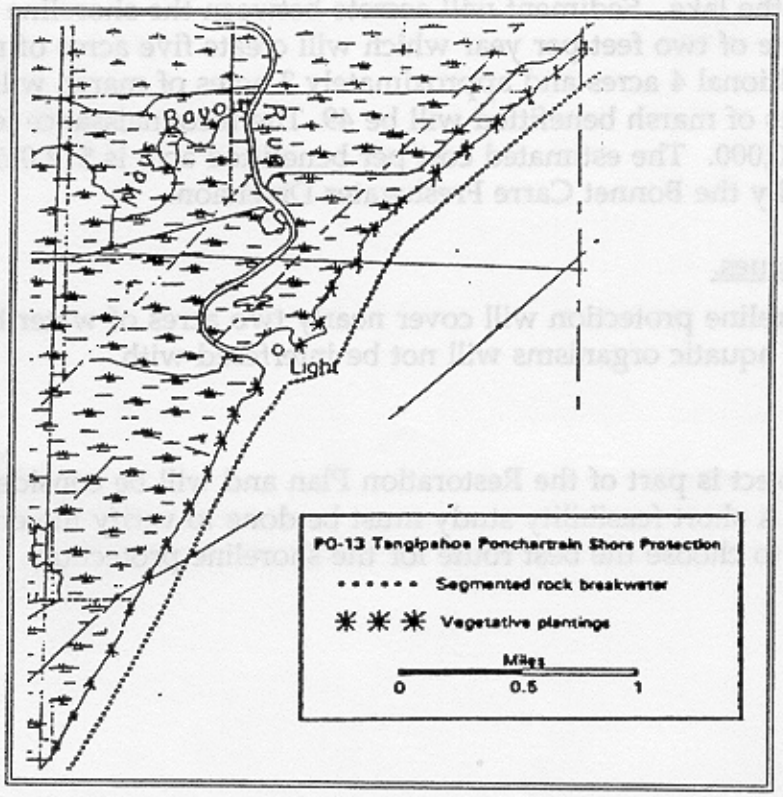


Figure 19. PO-13 Tangipahoa/Pontchartrain Shore Protection

CRITICAL SHORT-TERM PROTECTS PROTECTING THE PONTCHARTRAIN/ MAUREPAS LAND BRIDGE

PO-13 TANGIPAHOA/PONTCHARTRAIN SHORE PROTECTION

Location.

This 868 acre project area consisting of fresh/intermediate marsh and shallow lake bottoms is located in Tangipahoa Parish where the Tangipahoa River enters Lake Pontchartrain. The area contains approximately 723 acres of shallow water. The area extends from the Tangipahoa/St. Tammany Parish line to Pass Manchac on the south (see Figure 19 above and Figure 5 on page 38)

Problems and Opportunities.

The shoreline is eroding at a rate of about 5 feet per year for about 3 miles west of the river and about 10 feet per year for the 2.7 miles east of the river mouth.

Description of Features.

Limestone breakwaters will be built in four feet of water about 1,000 feet offshore. These will be 1018 feet long, 21 feet wide at the base, and 3 feet wide at the crown. Approximately 30 shoreline protection segments will be built 50 feet apart which will protect the 5.7 miles of shoreline. Approximately 31,500 feet of shoreline will be planted with giant cutgrass.

Benefits and Costs.

The breakwater will protect 101 acres from erosion, will accrete three feet per year which will create an additional 41 acres of marsh, will allow SAV to cover an additional 464 acres, and will enhance 21 acres of marsh. Thus, a total of 627 acres of marsh will be benefitted over 20 years. The project is estimated to cost $4850,000. The estimated cost per benefitted acre is $7,735. The project will be enhanced by the freshwater and nutrients provided by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The breakwater will cover about 5 acres of water bottoms. The breakwater will not inhibit the ingress or egress of marine organisms into the adjacent wetlands. Some groups expressed opposition to hard shore protection. However, LDNR engineers believe that the limestone is the best method of shore protection at this site. If and when the Tangipahoa River bar channel is dredged again, consideration will be given to placing the material behind the breakwater to create marsh.

Status.

This project is part of the state of Louisiana Coastal Restoration Plan. It is also part of the CWPPRA Restoration Plan will be a candidate for future Priority Lists.

PPO-19 HIGHWAY 51/RR CULVERTS

Location.

The 2,917 acre project area of cypress, marsh, and shallow water lies in St. John the Baptist Parish east of I-55, south of the Manchac WMA, and west of L. Pontchartrain. Approximately 222 acres are water. (See Figure 5 on page 38).

Problems and Opportunities.

Continuous high water levels were reported in the area and cypress regeneration is limited north of Ruddock. The swamp is being replaced with marsh due to subsidence and salinity increases or is subsiding into open water. There are at least 30 multiculvert connections under old Highway 51 which was built on grade (this is one every 1/2 miles). The railroad rides on several trestles in the area. If the culverts were cleaned out, water levels should drop. The land loss from 197490 rate was .21 percent per year.

Description of Project Features.

The culverts under Old Highway 51 should be cleaned out. The area will receive benefits from the proposed Bonnet Carre Diversion which will reduce salinities in the area and should help reduce stress on cypress.

Benefits and Costs.

The existing loss rate will be reduced by 60 percent, so over 20 years, 73 acres will be preserved, SAV will cover an additional 71 acres, and 139 acres will be enhanced for a total wetland benefit of 283 acres. The cost of cleaning out the culverts is estimated to be $500 each. If 30 culverts must be done every 5 years, the total project cost will be $342,000, which includes extensive monitoring. The estimated cost per benefitted acre is $1,208. Cypress regeneration on 2,900 acres will also be benefitted. The Bonnet Carre Diversion will enhance this project by providing freshwater and nutrients.

Effects and Issues.

It is not certain that cleaning the culverts will reduce flooding in this area. The problem needs more study. If the culverts prove to be a problem, it is possible that the La. Department of Transportation and Development or St. John Parish will perform the work.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists.

XPO-50B LAKE MAUREPAS SHORE PROTECTION, W. JONES ISLAND

Location.

This 300 acre project area consists of fresh marsh, cypress swamp, and shallow water in Tangipahoa Parish on the west end of Jones Island in Lake Maurepas. About 77 acres are water. (See Figure 5 on page 38).

Problems and Opportunities.

The shoreline of the lake is eroding the fresh marsh on Jones Island at a rate of 10 feet per year according to data furnished by LGS. This can be prevented by shoreline protection.

Description of Features.

Approximately 20,000 feet of intermittent shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

The shoreline protection will stop the 10 foot per year erosion and should accrete three feet per year behind it. Thus, 91 acres of marsh will be protected, 27 acres of marsh created, SAV will cover an additional 34 acres, and 12 acres will be enhanced over 20 years, for a total benefit to 164 acres of wetlands. This project is estimated to cost $2,044,000. The estimated cost per benefitted acre is $12,463. The Bonnet Carre Diversion will significantly enhance this project by providing freshwater and nutrients, but the benefits have not been calculated.

Kev Issues.

Approximately ten acres of water bottoms will be covered with the shoreline protection. There will be no interference with ingress and egress of aquatic organisms.

Status.

This is in the Restoration Plan and will be a candidate for future Priority Lists. A short feasibility study must be done to determine the exact erosion rate, length of shoreline protection, and the benefitted area.

XPO-51 MANCHAC WMA MARSH MANAGEMENT

Location.

The project area is located in St. John the Baptist Parish south of Pass Manchac, and east of the Central Gulf Railroad. It includes the 8,000-acres of intermediate marsh and swamp on the WMA (see Figure 20 below and Figure 5 on page 38).

Problems and Opportunities.

There is no regeneration of cypress on the WMA and mature cypress are confined to banks of canals, Pass Manchac and the Lake rim. Marsh has been lost at a rate of .419 percent per year from 1958-74. Recently the loss rate has been less. The hydrology of the area has been severely altered by logging canals which have increased tidal scour and allow water with salinities of up to 5 ppt to enter the area in the fall. Erosion can be severe in the fragile organic soil that forms the core of the WMA. This area is indicated as highly broken marsh according to USFWS mapping data. If nothing is done, the loss rate in this broken marsh will revert to the .419 percent per year. The objective of the project is to reduce salinities and tidal scour.

Description of Features.

Weirs with stoplogs and two-way flapgates will be installed where Galva and Cecil's Canals leave Pass Manchac. Variable crest, flapgatted weirs will be placed where Red Louis and Schneider's Canals leave the Pass. Gapping canal banks would allow freshwater from the Bonnet Carre Diversion to flush out soil salinities.

Benefits and Costs.

The marsh loss rate on the WMA will be reduced by 75 percent so over 20 years, it is estimated that 454 acres will be preserved by reducing erosion and tidal scour. SAV will cover an additional 198 acres, and another 510 acres of marsh will be enhanced for a total benefitted area of 1,163 acres. The estimated cost of this project is The estimated cost per benefitted acre is $878. These benefits do not include the significant enhancement achieved by the Bonnet Carre Diversion.

Effects and Issues.

The control structures will slightly inhibit the ingress and egress of marine organisms and reduce the amount of sediment entering the area. They should not stop the fresh water from the Bonnet Carre diversion from reducing salinities.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be done to determine the best site for the weirs and the best management plan for the freshwater from Bonnet Carre.

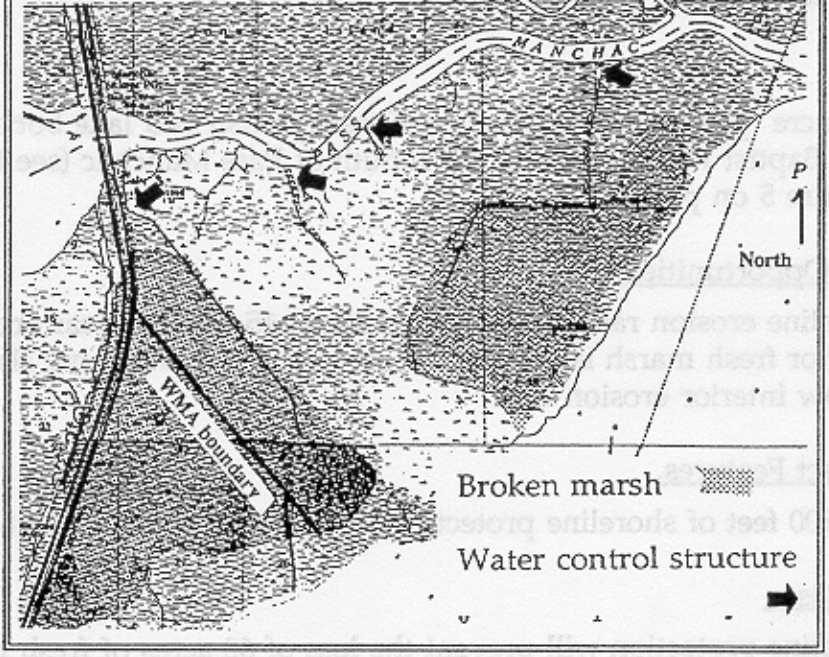
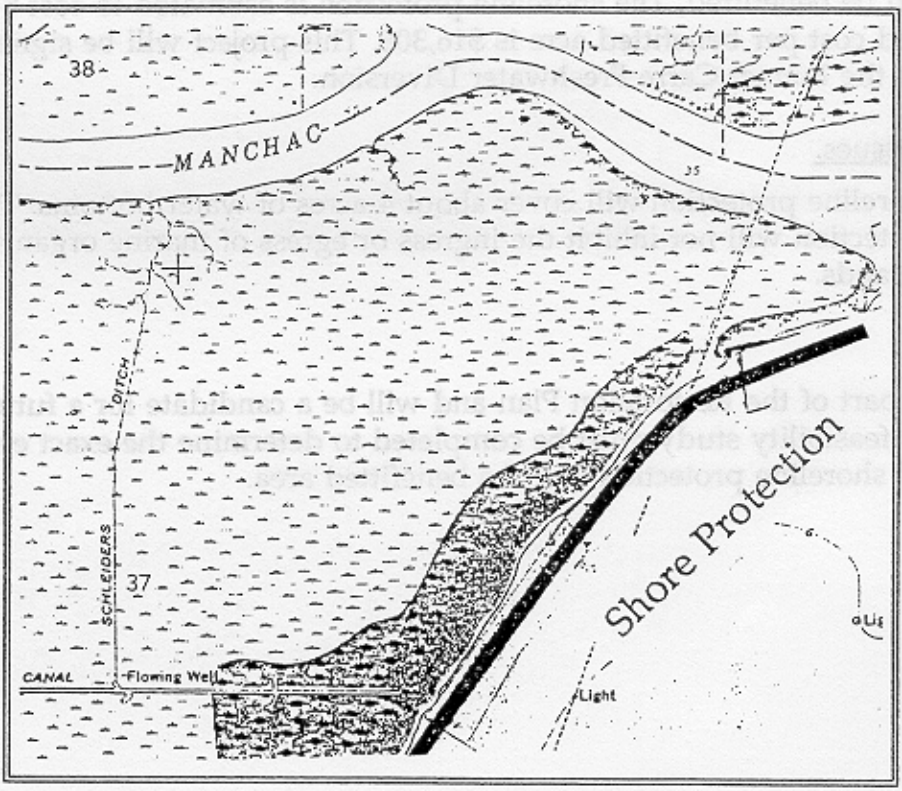


Figure 20. XPO-51 Manchac WMA Marsh Management



XPO-58 PASS MANCHAC SHORE PROTECTION

Location.

This 192 acre project area consisting of fresh marsh and lake bottom is located in St. John the Baptist Parish south of the mouth of Pass Manchac (see Figure 21 above and Figure 5 on page 38).

Problems and Opportunities.

The shoreline erosion rate in this area is about 15 feet per year according to LGS data. The interior fresh marsh is quite stable, so protecting the shore should not decrease the low interior erosion rate.

Proposed Project Features.

About 8,800 feet of shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

The shoreline protection will prevent the loss of 60 acres of fresh marsh over 20 years, will accrete three feet per year so 12 additional acres of marsh will be created, will increase SAV over 27 acres and will enhance 7 acres, Thus, a total of 107 acres of marsh will be benefitted. The shoreline protection is estimated to cost $1,745,000. The estimated cost per benefitted acre is $16,308. This project will be significantly enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The shoreline protection will cover about 4 acres of water bottoms. The shoreline protection will not inhibit the ingress or egress of marine organisms into the adjacent wetlands.

Status.

This is part of the Restoration Plan and will be a candidate for a future Priority List. A short feasibility study must be completed to determine the exact erosion rate, the length of shoreline protection and the benefitted area.

XPO-70 LAKE PONTCHARTRAIN SHORE PROTECTION, BONNET CARRE TO RUDDOCK

Location.

This 397 acre project area consisting of cypress and lake bottoms is located in St. John the Baptist Parish along the shore of Lake Pontchartrain from the north end of the Bonnet Carre Spillway to the area of Ruddock (see Figure 22 below and Figure 5 on page 38).

Problems and Opportunities.

According to LGS data, the loss rate over about 18,000 feet of this shoreline is 15 feet per year. The land adjacent to the shore is a mainly of swamp and with some intermediate marsh.

Description of Features.

Approximately 18,000 feet of shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

Approximately 124 acres, mostly cypress swamp, will be preserved over 20 years. Three feet of sediment will accrete each year behind the shoreline protection, so 25 acres of marsh will be created. An additional 20 acres will have SAV and approximately 18 acres of swamp will be enhanced. Thus, a total of 188 acres of wetlands will be benefitted by this project. The cost of this project is estimated to be $1,867,000. The estimated cost per benefitted acre is $9,931. The Bonnet Carre Freshwater Diversion will significantly enhance this project by providing freshwater and nutrients.

Effects and Issues.

The shoreline protection will cover about 12 acres of water bottoms. The shoreline protection will not inhibit the ingress or egress of marine organisms into the adjacent wetlands.

Status.

This is in the Restoration Plan and will be a candidate for future Priority Lists, A short feasibility study must be done to determine the exact erosion rate, any hot spots where benefits might be centered, the length of shoreline protection, and the benefitted area.

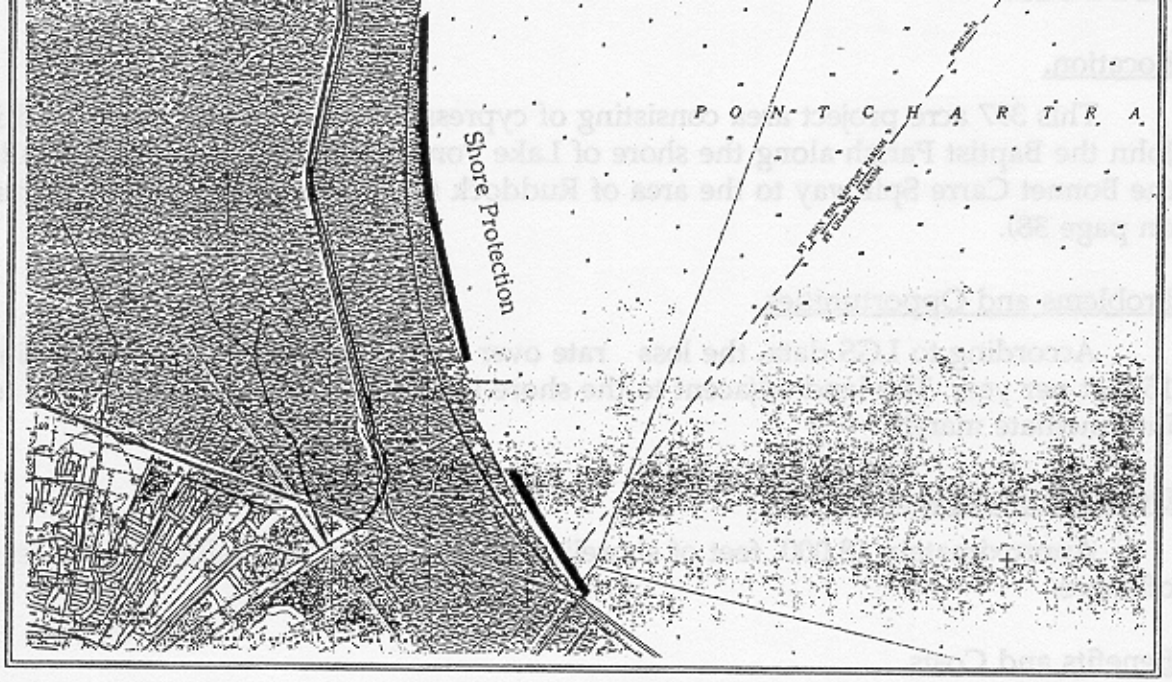


Figure 22. XPO-70 Lake Pontchartrain Shore Protection, Bonnet Carre to Ruddock

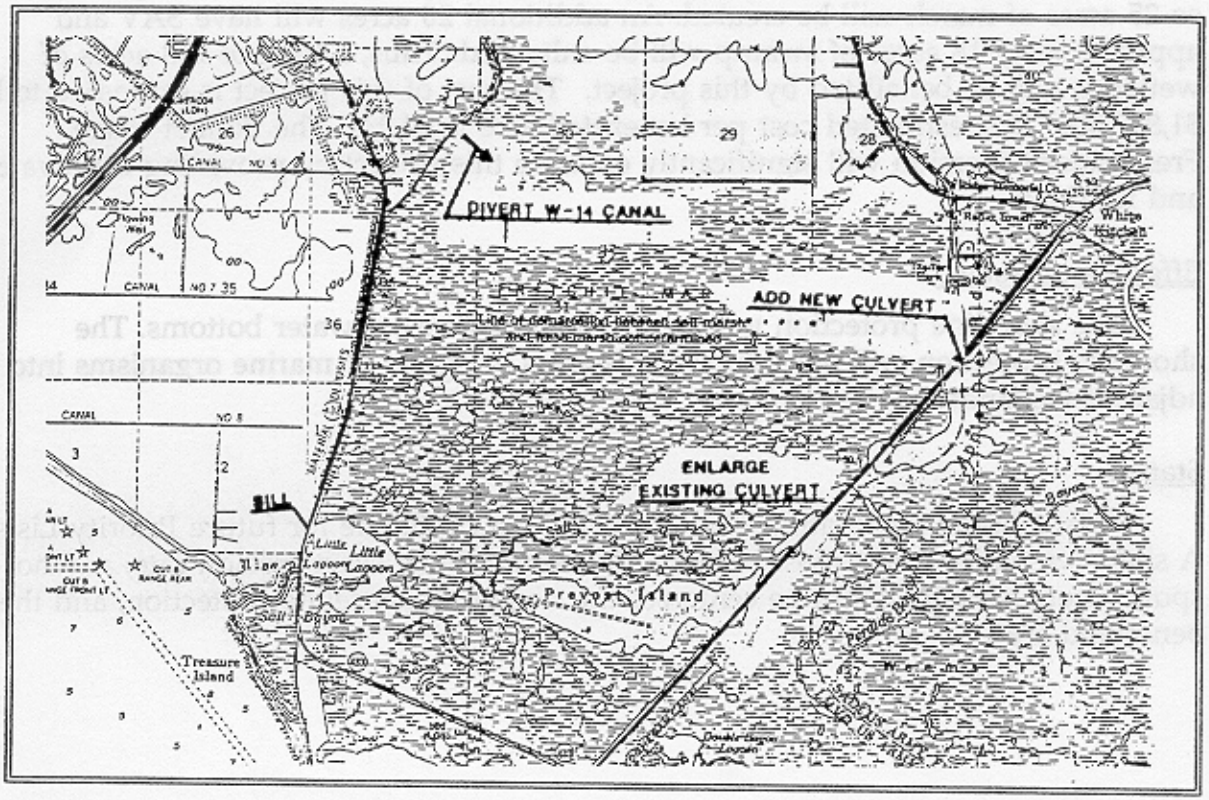


Figure 23. PO-6 Fritchie Wetland Hydrologic Restoration

CRITICAL SHORT-TERM PROTECTS PROTECTING AREAS WHERE MARSH LOSS IS IMMINENT

PO-6 FRITCHIE WETLAND HYDROLOGIC RESTORATION

Location

This 5,924 acre area of fresh and intermediate marsh and ponds is located in eastern St. Tammany Parish west of U.S. Highway 90, north and east of Louisiana Highway 433, and south of the Prairie Terrace (see Figure 23 above and Figure 5 on page 38).

Problems and Opportunities

This marsh has suffered loss because of reduced sediment and nutrients from the Pearl River due to impoundment by highways. Reintroduction of freshwater is possible in this area adjacent to the Pearl River.

Description of Project Features

Freshwater, sediment and nutrients would be restored into the area by diverting water from the West Pearl River through two culverts under Highway 90. Water and nutrients from Slide11 stormwater runoff would be introduced into the area via the W14 Diversion Canal. A weir would be placed at the south end of this canal to prevent encroachment of saltwater.

Benefits and Costs

The loss rate would be reduced over 20 years, so 520 acres of brackish marsh and 520 acres of intermediate marsh would be preserved, SAV's would occur on an additional 423 acres, and 223 acres would be enhanced for a total benefitted acreage of 1,686. The estimated cost of this project is $2,748,000. The estimated cost per benefitted acre is $1,603.

Effects and Issues

At the present there is highly restricted ingress and egress of marine organisms. It would be slightly more restricted by project features. Recent investigations indicate that it may be difficult to allow input of Pearl River water via the proposed drainage canal. Further study is necessary. It will be necessary to coordinate with city officials of Slide11 since it is proposed to use their drainage waters. Flooding of developed areas, especially along Apple Pie Ridge, must be avoided.

Status

This project is on Priority List #2 and an LCA is being negotiated between Soil Conservation Service and LDNR.

PO-14 GREEN POINT/GOOSE POINT MARSH RESTORATION

Location.

This 5,600 acre project area is located in southern St. Tammany Parish between Green Point and Point du Chien (see Figure 24 below and Figure 5 on page 38).

Problems and Opportunities.

Between 1978 and 1988 the amount of intermediate marsh increased according to Chabreck. The loss rate was an extremely high 0.8 percent per year from 1958-74. It has now decreased to 0.2 percent per year from 1983-90. Nutria herbivory is a factor and shoreline erosion is about 8 feet per year according to DOTD data.

Description of Features.

Brush fencing, coupled with planting of bulrush and smooth cordgrass on both sides of the fence is planned for four miles of the interior shoreline. Limestone revetments 15 feet wide on filter fabric are proposed to be placed along 9.6 miles of shoreline from Green Point to Point du Chien.

Benefits and Costs.

Without the project, 182 acres of marsh will be lost along the 9.6 miles of shore and 156 acres will be lost in the interior. The brush fence with plantings behind it, will allow the accretion of two feet of sediment per year on either side. This will create 36 acres of new marsh over 20 years. The brush fence will decrease interior loss by 20 percent which will preserve 31 acres over 20 years. Shoreline erosion will be stopped so the total marsh preserved will be 213 acres. SAV coverage will increase over 380 acres. In addition, 397 acres will be enhanced. Thus, a total of 1,026 acres of brackish marsh will be benefitted over the life of the project. The cost of this project is $3,252,700. The estimated cost per benefitted acre is $3,170. This project will protect the State Game Preserve. This project will be enhanced by the freshwater and nutrients provided by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

There is local opposition to the limestone revetments because people fear that the revetment will cover some of the seagrass beds that line the shore from the beach to the minus six foot contour. LDNR is seriously considering other methods of shoreline protection to alley these concerns. “Super” Christmas tree fences are a possible alternative, but they may not withstand the wave action. If Bayou Lacombe is maintenance dredged in the future, consideration will be given to using the material to create marsh within some of the ponds that do not contain SAV’s.

Status.

This project is part of the Louisiana Coastal Restoration Plan and also is recommended as part of the CWPPRA Restoration Plan. It will be a candidate for future Priority Lists and plans are being developed by LDNR.

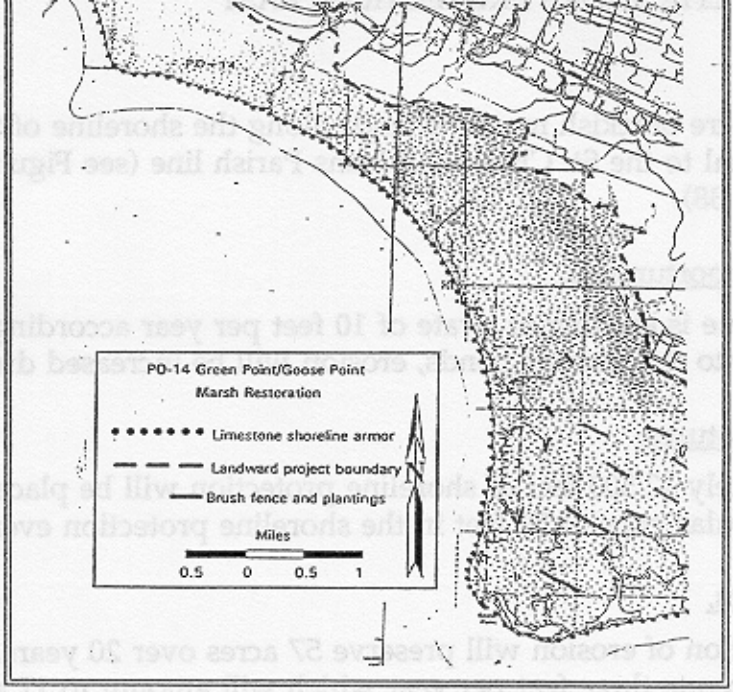


Figure 24. PO-14 Green Point/Goose Point Marsh Restoration

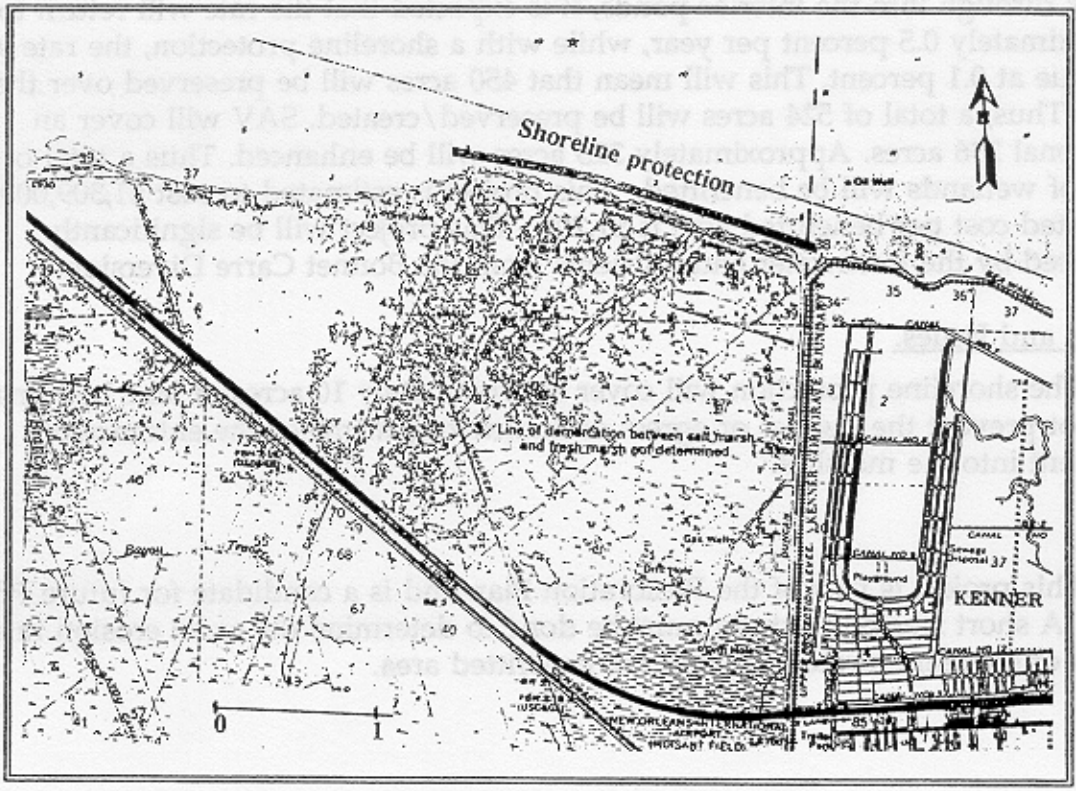


Figure 25. La Branche Shore Protection, East

PO-7 LA BRANCHE SHORE PROTECTION, EAST

Location.

This 4,650 acre brackish marsh extends along the shoreline of St. Charles Parish from Walker Canal to the St. Charles/Orleans Parish line (see Figure 25 above and Figure 5 on page 38).

Problems and Opportunities.

This shoreline is eroding at a rate of 10 feet per year according to LGS data. If the lake breaks i-nto the interior ponds, erosion will be increased due to tidal scour.

Description of Features.

Approximately 12,500 feet of shoreline protection will be placed 60 feet offshore. There will be regular gaps of 50 feet in the shoreline protection every 500 feet.

Benefits and Costs.

The prevention of erosion will preserve 57 acres over 20 years. The shoreline protection will accrete three feet per year which will amount to 17 acres of marsh created over 20 years. The interior loss rate was 0.7 percent per year until Walker Canal was plugged when it dropped to 0.1 percent from 1983-90. If the shoreline breaks through into the interior ponds, it is expected that the rate will return to approximately 0.5 percent per year, while with a shoreline protection, the rate should continue at 0.1 percent. This will mean that 450 acres will be preserved over the 20 years. Thus, a total of 524 acres will be preserved/created. SAV will cover an additional 236 acres. Approximately 323 acres will be enhanced. Thus a total of 1,083 acres of wetlands will be benefitted. This project is estimated to cost $1,309,000. The estimated cost per benefitted acre is $1,209. This project will be significantly enhanced by the freshwater and nutrients from the Bonnet Carre Diversion.

Effects and Issues.

The shoreline protection will cover approximately 10 acres of lake bottoms. It will not prevent the ingress or egress of marine organisms or the entrance of sediment into the marshes.

Status.

This project is part of the Restoration Plan and is a candidate for future Priority Lists. A short feasibility study must be done to determine the exact erosion rate, the length of shoreline protection, and the benefitted area.

PPO-10 LA BRANCHE MARSH CREATION, WEST

Location

This project is located in St. Charles Parish in the open ponds between I-10 and Lake Pontchartrain (see Figure 26 below and Figure 5 on page 38).

Problems and Opportunities

This area was marsh until the 1920's when it was leveed, pumped, and farmed. It subsided and has been a series of ponds since the levees failed. It is an ideal site for creating marsh by dredging material from Lake Pontchartrain.

Description of Project Features

Dredged material will be pumped into these ponds from a dredge in Lake Pontchartrain. The material will be placed at a height conducive to marsh creation.

Benefits and Costs

Approximately 205 acres of brackish marsh would be created in the shallow ponds. SAV's would cover an additional 29 acres and 32 acres would be enhanced. Thus a total of 266 acres would be benefitted. The reconnaissance level cost of the project is estimated to be $4,327,000. The estimated cost per benefitted acre is $20,936. This project would be significantly enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues

Marsh creation would fill the shallow ponds which would no longer be available as aquatic habitat. Since much of the La Branche marsh has been lost due to increased salinities, highway construction and subsidence, this project would replace lost marsh.

Status

This project is on Priority List #1 and an LCA between LDNR and the Corps of Engineers is signed. Construction started in November 1993.

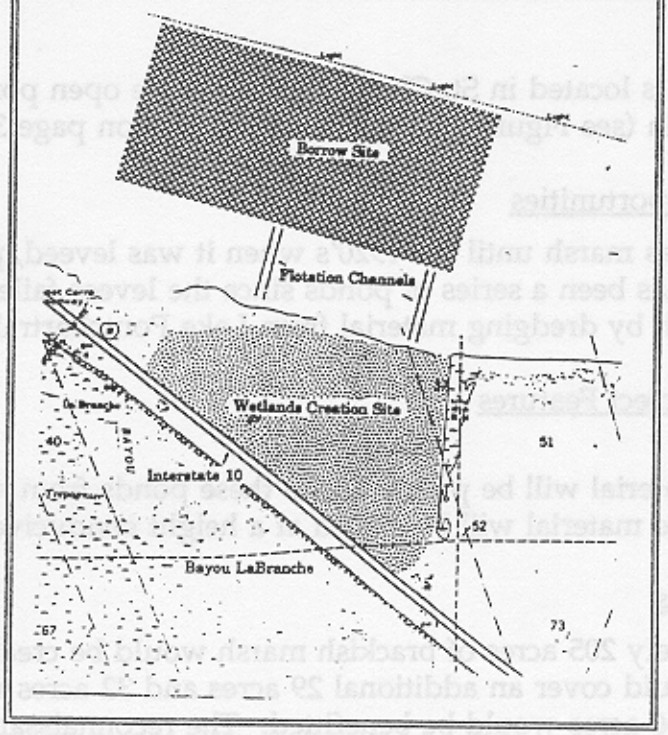


Figure 26. PPO-10 La Branche Marsh Creation, West

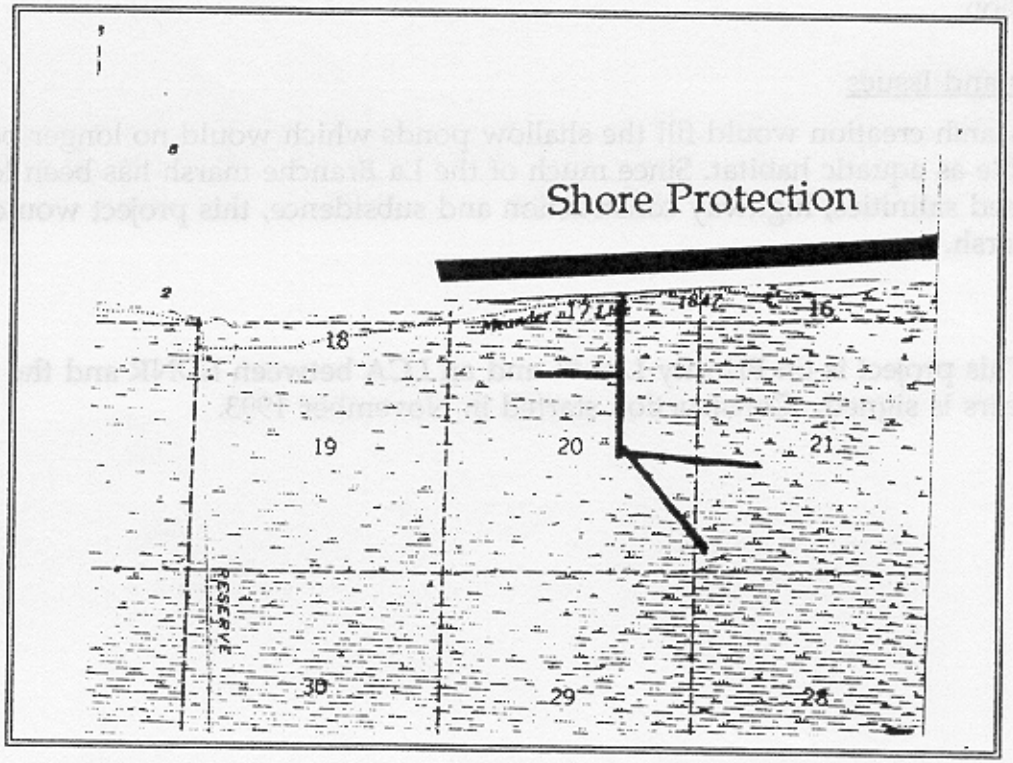


Figure 27. XPO-50a Lake Maurepas Shore Protection, Blayhut Canal

XPO-50a LAKE MAUREPAS SHORELINE PROTECTION, BLAYHUT CANAL AREA

Location.

This project area is 2,698 acres of fresh marsh and ponds located in St. John the Baptist Parish on the south shore of Lake Maurepas in the vicinity of Blayhut Canal (see Figure 27 above and Figure 5 on page 38).

Problems and Opportunities.

The shoreline of the lake is eroding at a rate of 10 feet a year according to LGS data. This area shown as an extensively broken marsh according to USFWS mapping data. The existing shore has some cypress, but inland is a fresh marsh on highly organic soil. Once the swamp rim breaks through, the interior erosion rate which was 0.08 percent per year from 1974 -90 will revert to an earlier rate of 0.14 percent per year. This will be prevented by shoreline protection.

Proposed Project Features

Approximately 17,000 feet of intermittent shoreline protection will be built about 60 feet offshore. The shoreline protection will consist of filter fabric with two feet of armor stone.

Benefits and Costs.

Over a 20 year period, approximately 76 acres of marsh will be saved along the shore and another 63 acres in the interior. The shoreline protection should accrete three acres per year behind it, so 23 additional acres of marsh will be created. SAV will cover an additional 290 acres, and 180 acres of marsh will be enhanced for a total benefitted area of 631 acres of wetlands. This is estimated to cost $1,728,000. The estimated cost per benefitted acre is $ 2,739.

Effects and Issues.

Approximately 5 acres of water bottoms will be covered with the shoreline protection. There will be no interference with ingress and egress of aquatic organisms.

Status.

This is in the Restoration Plan and will be a candidate for future Priority Lists. A short feasibility study must be completed to determine the exact erosion rate, length of shoreline protection, and the benefitted area.

CRITICAL SHORT-TERM PROTECTS

XP071 MRGO DISPOSAL AREA MARSH PROTECTION

Location.

This project is located in St. Bernard Parish on the existing south bank disposal area for MRGO, south of the La Loutre Ridge (see Figure 28 below and Figure 6 on page 39).

Problems and Opportunities.

When MRGO was built in the early 1960's, all the construction material was placed in 4,000 foot wide diked areas on the south bank. During maintenance dredging, only the 2,000 feet nearest the waterway have been used. The back 2,000 feet has often reverted to marsh, especially south of the La Loutre ridge. However, it is a high fresh marsh, perched above the adjacent marshes. It is very valuable for waterfowl. The original back dike is in poor condition in several places, and is breached at one site. If it breaches more, the perched marshes will drain and become vegetated with upland plants.

Description of Features.

The back dike of the MRGO disposal area will be repaired south of the La Loutre ridge. Culverts will be placed in the levees to control water levels within the units.

Benefits and Costs.

Repairing the dikes will preserve 755 acres of marsh that will be lost within 10 years is nothing is done. Thus, over 20 years, there will be 755 more acres of marsh present. There will be no increase in SAV's nor will any marsh be enhanced. This project is estimated to cost $434,000. The estimated cost per benefitted acre is $575.

Effects and Issues.

None.

Status.

This project is part of the Restoration Plan and is on Priority List #3. A project similar to this was recommended in support of the Gulf Coast Joint Venture, a feature of the North American Waterfowl Management Plan (NAWMP). It was jointly proposed by the USFWS, Soil Conservation Service, the Biloxi Marsh Lands, Inc, the Lake Eugenie Land and Development Corporation, and the Thomas Favalora Family.

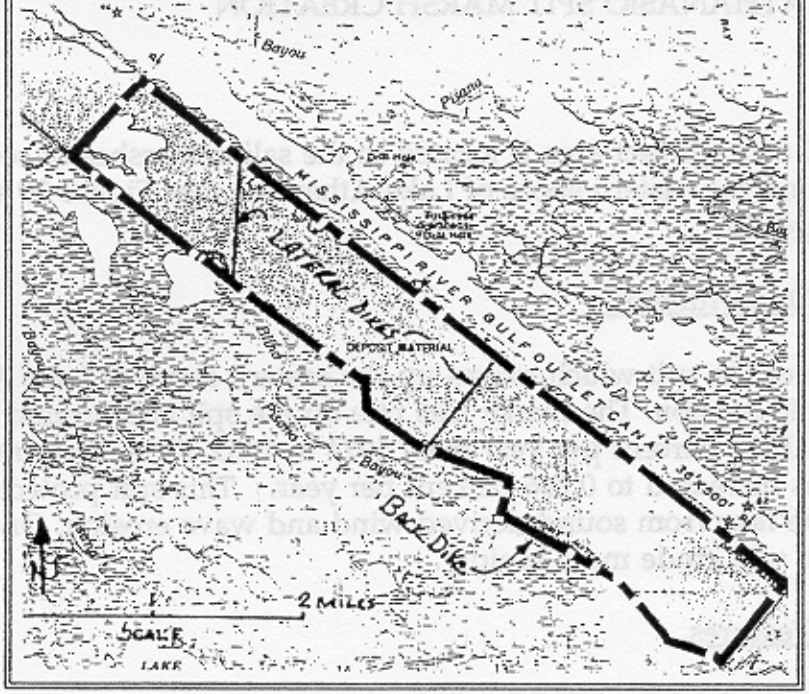


Figure 28. XPO-71 MRGO Disposal Area Marsh Protection

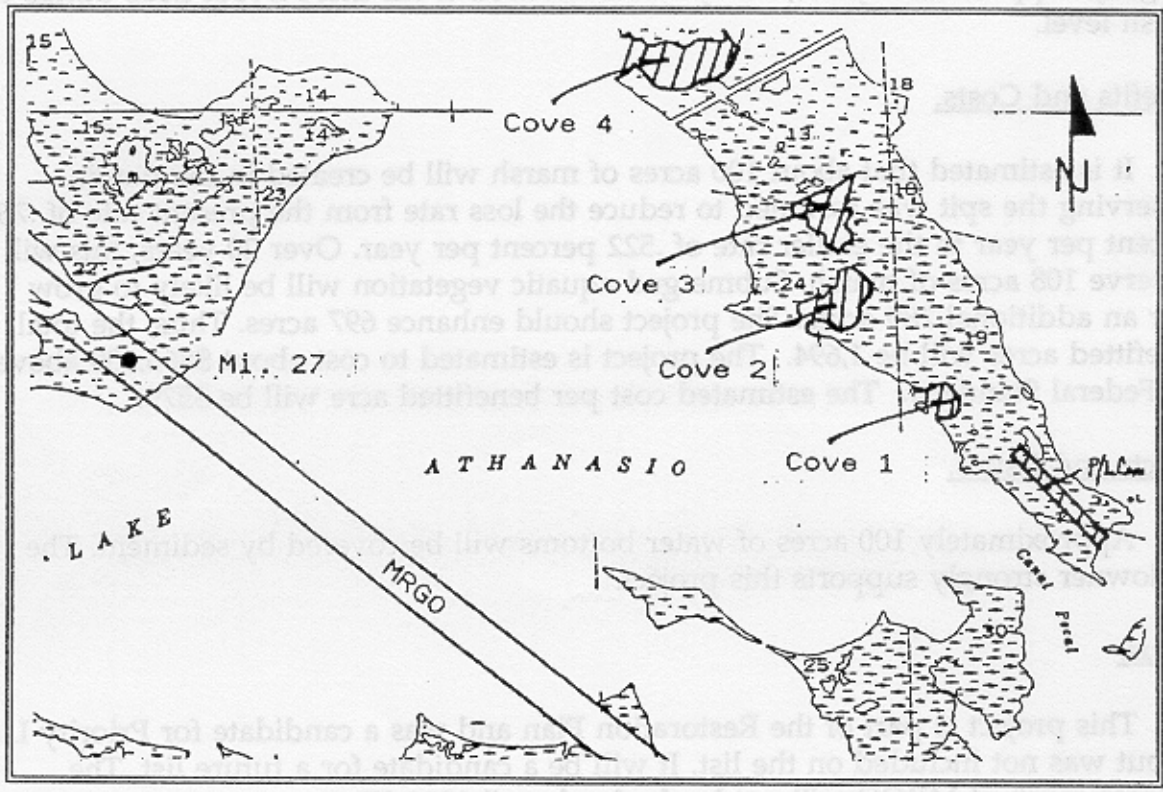


Figure 29. XPO-83 Lake Athanasio Spit Marsh Creation

XPO-83 LAKE ATHANASIO SPIT MARSH CREATION

Location.

This 6,360 acre project area is located in the saline marshes of southern St. Bernard Parish on the eastern shore of Lake Athanasio (see Figure 29 above and Figure 6 on page 39).

Problems and Opportunities.

The shore of the spit which makes up the eastern shore of Lake Athanasio is undergoing rapid erosion. The marsh loss rate on the spit and around Lake Athanasio was 0.522 percent per year from 1974 to 1983. From then until the present, the loss rate has increased to 0.766 percent per year. This spit protects the interior shorelines of the lake from sound-derived wind and wave erosion. Once this spit erodes, the lake will erode more rapidly.

Description of Features.

Dredged material from MRGO will be pumped the two miles to the spit and used to fill four ponds/bays along the western edge of the spit to improve its integrity. Approximately 380,000 cy will be needed to fill these 2-foot deep ponds to marsh level.

Benefits and Costs.

It is estimated that about 100 acres of marsh will be created in the ponds. Preserving the spit was assumed to reduce the loss rate from the present rate of .766 percent per year to the earlier rate of .522 percent per year. Over 20 years, this will preserve 108 acres of marsh. Submerged aquatic vegetation will be likely to grow over an additional 789 acres. The project should enhance 697 acres. Thus, the total benefitted acres will be 1,694. The project is estimated to cost about $866,000 above the Federal Standard. The estimated cost per benefitted acre will be $579.

Effects and Issues.

Approximately 100 acres of water bottoms will be covered by sediment. The landowner strongly supports this project.

Status.

This project is part of the Restoration Plan and was a candidate for Priority List #3, but was not included on the list. It will be a candidate for a future list. The adjacent reach of MRGO will not be dredged until 1996-97.

XPO-84 ST. MALO HYDROLOGIC RESTORATION

Location.

This 2,089 acre project area is located in the brackish marshes of east central St. Bernard Parish between Bayou La Loutre and Magnolia Lagoon (see Figure 30 below and Figure 6 on page 39).

Problems and Opportunities.

Landowners attempted to drain this area for farming in the 1930's. The canals that were excavated have become an avenue for salt water intrusion and rapid water level fluctuations.

Description of Project Features.

The current proposal is to install plugs in four small canals and two plugs in the large canal that connects Bayou St. Malo and Bayou La Loutre.

Benefits and Costs.

The land loss rate in this area was only 0.006 percent per year between 1974 and 1990. There was no loss from 1983-90. The plugs will prevent the loss of about 2 acres over the next 20 years. There will be submerged aquatic vegetation on an additional 31 acres and wetland functions on 98 acres will be enhanced. The total benefitted acreage will be 131. The reconnaissance level cost is $658,000. The estimated cost per benefitted acre is $5,397

Effects and Issues.

Plugging Bayou St. Malo is likely to be opposed by fishermen and hunters who use the St. Malo area since many gain access via Bayous La Loutre and St. Malo. The landowner strongly supports this project. The project will be replanned prior to the next priority list.

Status.

This project is part of the Restoration Plan and will be a candidate for a future Priority List.

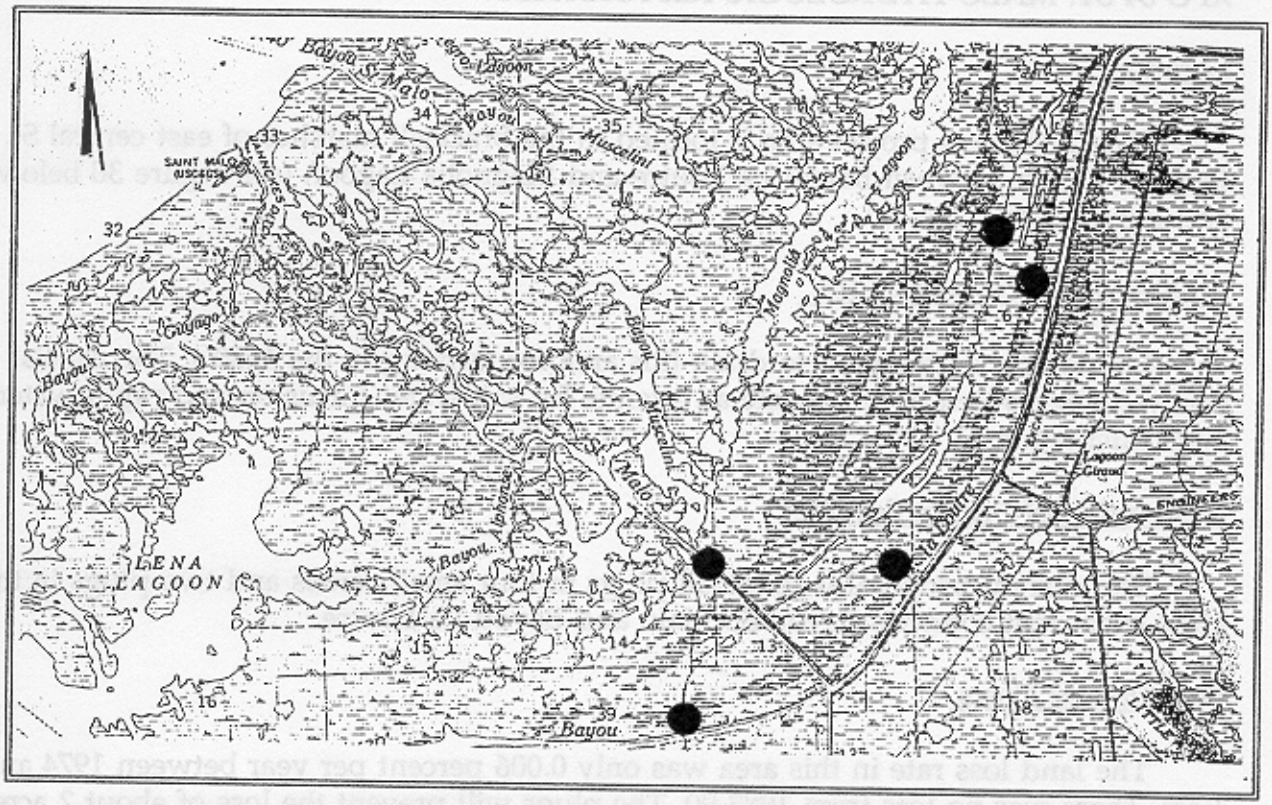


Figure 30. XPO-84 St. Malo Hydrologic Restoration

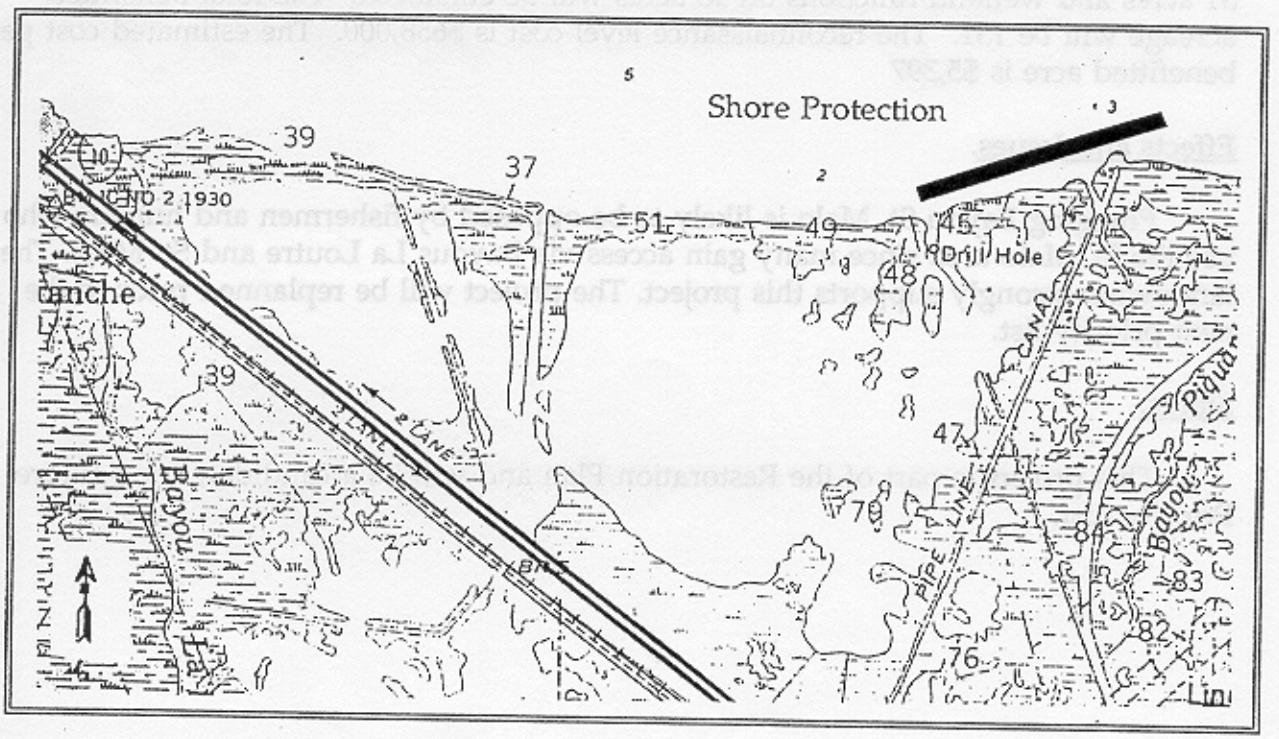


Figure 31. XPO-91 La Branche Shore Protection, Walker Canal to Blowhole

XPO-91 LA BRANCHE SHORE PROTECTION, WALKER CANAL TO THE BLOWHOLE

Location.

This 180 -acre project area extends along the shoreline of St. Charles Parish from Walker Canal to the "Blowhole" (see Figure 31 above and Figure 5 on page 38).

Problems and Opportunities.

This shoreline is eroding at a rate of 10 feet per year according to LGS data. If the lake breaks into the interior ponds, erosion will be increased due to tidal scour.

Description of Features.

Approximately 3,000 feet of shoreline protection will be placed 60 feet offshore. There will be regular gaps of 50 feet in the shoreline protection every 500 feet.

Benefits and Costs.

The prevention of erosion will preserve 14 acres over 20 years. The shoreline protection will accrete three feet per year which will amount to 5 acres of marsh created over 20 years. If the shoreline breaks through into the interior ponds, it is erosion will increase there. It is expected that about 6 will be preserved over the 20 years. Thus, a total of 25 acres will be preserved/created. SAV will cover an additional 36 acres. Approximately 12 acres will be enhanced. Thus a total of 37 acres of wetlands will be benefitted. This project is estimated to cost $351,000. The estimated cost per benefitted acre is $9,498. This project will be significantly enhanced by the freshwater and nutrients from the Bonnet Carre Diversion.

Effects and Issues.

The shoreline protection will cover approximately one acre of lake bottoms. It will not prevent the ingress or egress of marine organisms or the entrance of sediment into the marshes.

Status.

This project is part of the Restoration Plan and is a candidate for future Priority Lists. A short feasibility study must be completed to determine the exact erosion rate, length of shoreline protection, and the benefitted area.

CRITICAL LONG-TERM PROTECTS THAT IMPORT SEDIMENT

PPO-45 UPPER/MIDDLE BASINS SEDIMENT PUMPING

Location.

This diversion could occur anywhere in the upper basin from White Hall to Kenner. Garyville and the southern La Branche area are possible sites (see Figure 32 below and Figure 4 on page 37).

Problems and Opportunities.

The Upper and Middle Basins need sediment to restore the natural gradient from the river to the swamp so water will drain more effectively and so cypress will regenerate.

Description of Features.

Sediment will be pumped out of the Mississippi River with a dedicated dredge and distributed into the swamp through a series of moveable pipelines. The disposal sites will be specific areas where standing water is a problem and other approaches do not appear feasible.

Benefits and Costs.

The sediment diversion will raise the swamp floor over an unknown number of acres and hopefully increase cypress regeneration. The cost is unknown, but this will be an expensive project.

Effects and Issues

Turbidity should not be increased on a large areas since this will be a more site specific solution than a sediment diversion. This solution will mimic historic hydrologic patterns of the Mississippi River before levees were built. Pumping will bring in less water than a 5,000 cfs sediment diversion, so there will be less chance of induced flooding of developed areas. Pumping and distribution of sediment require techniques that are still in the development stage and are logistically complex.

Status

This is a concept at the present, but is an important element in the long-term phase of the plan. As technology for pumping sediment is improved, more details will be developed.

XPO-90 SEDIMENT IMPORT IN LOWER BASIN

Location.

The bays in the outer saline marshes in St. Bernard Parish are a highly probable site for marsh creation via dedicated dredging.

Problems and Opportunities.

The basin is eroding at the rate of 1,250 acres per year. If large-scale marsh creation by dedicated dredging could be implemented, this loss rate could be greatly reduced.

Description of Features.

Sediment could be removed from bays and sounds in three ways: a high capacity dredge feeding a submerged high density slurry pipeline; a high-capacity dredge loading a fleet of specialized shallow-draft unloaders; or a fleet of specialized shallow-draft hopper dredged which can dredge sediment, transport it, and place it by dumping or pump-out. Any pipelines would need to be moved/extended to provide marsh in desired locations.

Benefits and Costs.

Enough sediment could be pumped to create several hundred acres of marsh per year. Project costs have not been estimated, but the project would be expensive using todays technology and costs.

Effects and Issues.

The project would create large amounts of marsh. Costs are unknown at the present time. Cost-effectiveness and the need for technological advances to increase the practicality of transporting large volumes of sediment through pipelines are major considerations for this project.

Status.

This is a concept at the present time. Because of the high cost and modifications of existing technology required, feasibility studies and demonstrations would be necessary prior to implementing this project.

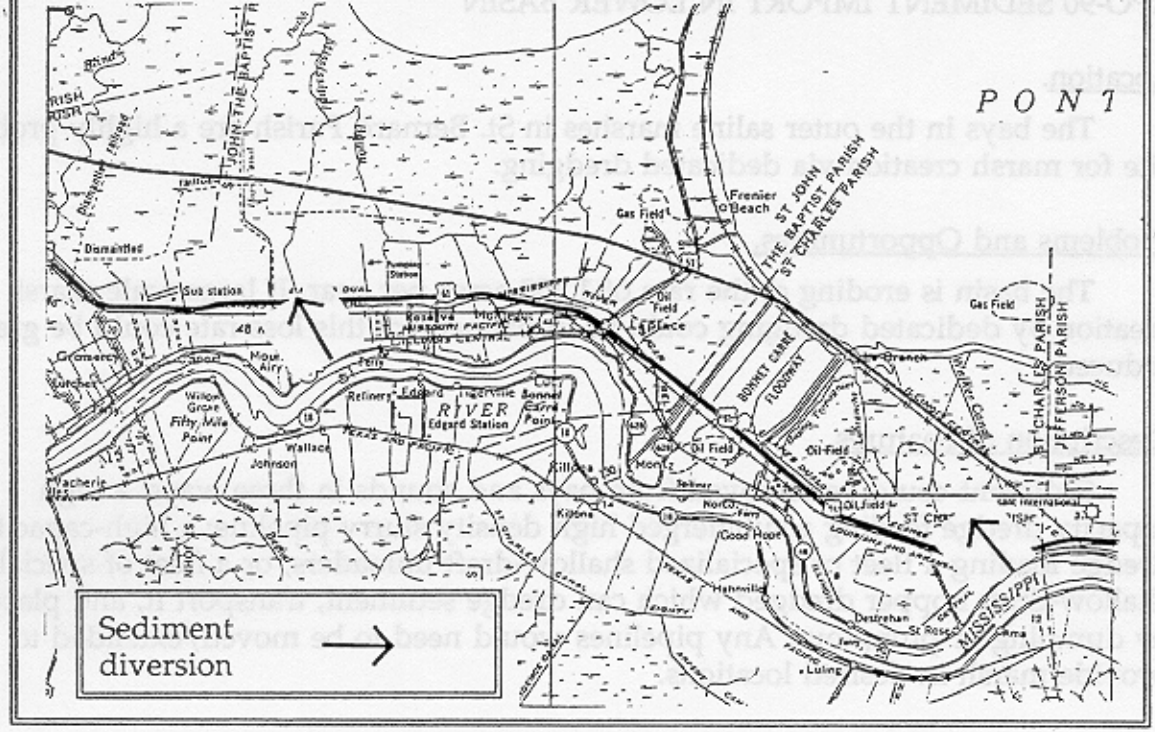


Figure 32. Upper/Middle Basins Sediment Pumping

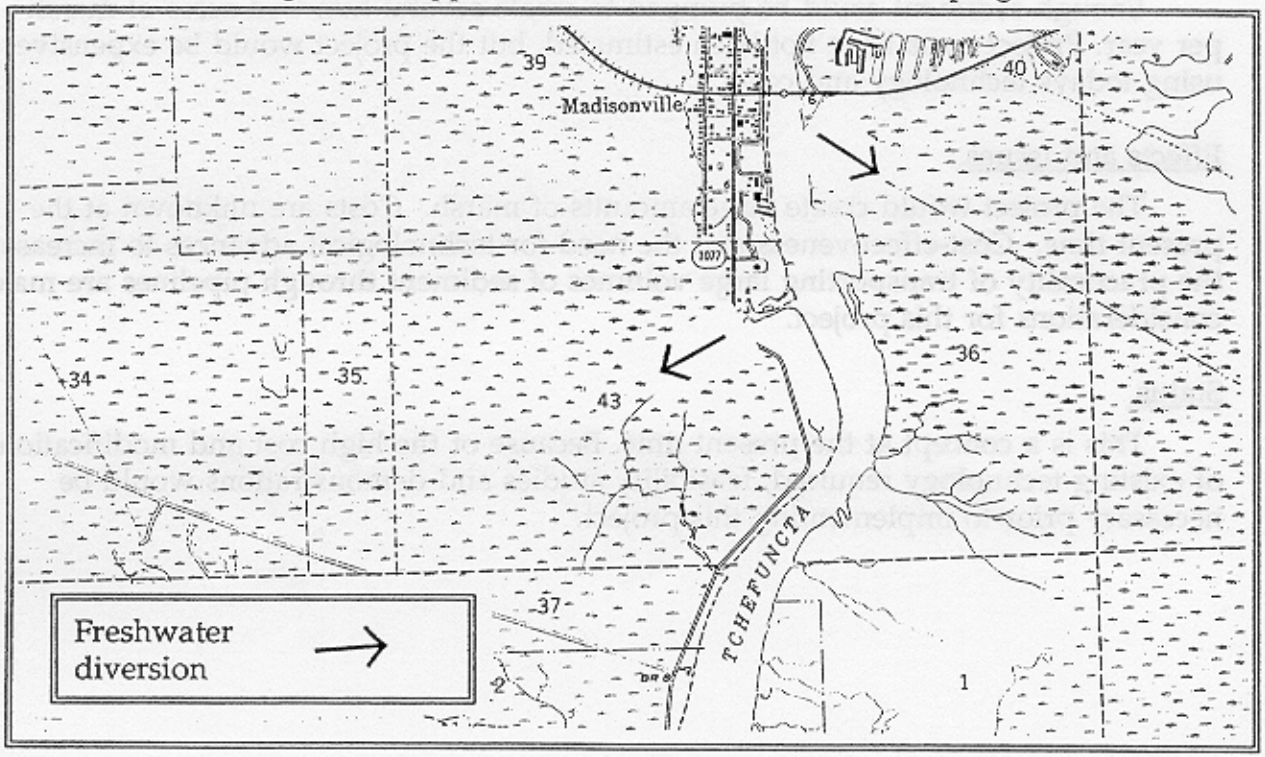


Figure 33. PPO-27 and 28 Tchefuncte Freshwater Diversions

CRITICAL LONG-TERM PROTECTS - SMALL FRESHWATER DIVERSIONS

PPO-27 TCHEFUNCTE FRESH WATER DIVERSION, WEST

Location.

This 1,900 acre area fresh marsh is located in St Tammany Parish just west of the Tchefuncte River and south of the Prairie Terrace (see Figure 33 above and Figure 5 on page 38).

Problems .and Opportunities.

This marsh has a very low loss rate which could increase slightly in the future. The ponds have extensive beds of SAV. The marsh and will be benefitted by diversion of fresh water and sediment from the Tchefuncte River.

Description of Features.

A diversion structure has been proposed in the Tchefuncte River about 1.5 miles north of the mouth. It will bring water into the marsh and let it filter south through natural bayous. A total of four water control structures will be placed in canals and bayous leading off the St. Louis Canal to keep the fresh water in the marsh longer.

Costs and Benefits.

The project is estimated to cost $2,058,000. It is estimated that the freshwater, sediments, and nutrients will totally reduce the marsh loss in this area and perhaps even build some marsh.

Effects and Issues.

There should be only minor adverse effects from the diversion; the additional turbidity might affect the SAV. St. Tammany Parish has a contractor preparing plans for this project. At the present time, the project does not appear cost effective compared to other projects. The Parish may not find it acceptable to delay this project.

Status.

This project is part of the Restoration Plan.

PPO-28 TCHEFUNCTE FRESHWATER DIVERSION, EAST

Location.

This 3,200 acre area of fresh marsh lies just east of the Tchefuncte River in St. Tammany Parish (see Figure 33 above Figure 5 on page 38)

Problems and Opportunities.

There has been very little loss in this marsh; since 1932 only 100 acres have been lost. There was no recorded loss from 1983-90. Future loss is estimated to be 0.007 percent per year as it was from 1932-58. However, the loss will be higher because 20 to 30 percent of this marsh is indicated as highly broken according to USFWS mapping. The ponds are filled with SAV. It is possible that the marsh will benefit from diversion of water and sediment from the Tchefuncte River.

Description of Features.

A diversion structure has been proposed in the Tchefuncte River about 1.5 miles north of the mouth. It will bring water into the marsh and let it filter south through natural bayous.

Benefits and Costs.

It is estimated that the freshwater, sediments, and nutrients will reduce the marsh loss in this area by 50 percent. Thus, over 20 years, two acres will be protected. SAV will cover an increased 33 acres and another 95 acres will be enhanced for a total of 130 acres benefitted. The estimated cost per benefitted acre is 11,308. This project will be enhanced by the Bonnet Carre Freshwater Diversion. Costs. The project is estimated to cost $1,470,000.

Status.

St. Parish has a contractor preparing plans for this project. It is in the Restoration Plan.

XPO-46 TICKFAW FRESHWATER DIVERSION

Location.

The proposed project covers a 24,000 acre area located along the drainage of the Tickfaw River from I-12 south to Lake Maurepas (see Figure 34 below and Figure 4 on page 37).

Problems and Opportunities.

The area probably suffers from salinity stress in addition to an artificially increased hydroperiod. Studies will need to be made to determine any possible salinity and hydroperiod problems. Freshwater diversion will provide the hydraulic head to force the isohalines out of the area. In addition, the Tickfaw has sediments that will help raise the swamp floor. If there are extended hydroperiods, a hydrologic restoration project is necessary. Herbivory control will probably also be necessary.

Costs and Benefits.

The costs of such a study and project are not known at this time. Cypress regeneration will be improved in the 24,000 acre swamp adjacent to the Tickfaw River.

Effects and Issues.

None at this time.

Status.

This project is part of the Restoration Plan. A short Feasibility Study will be necessary prior to implementation.

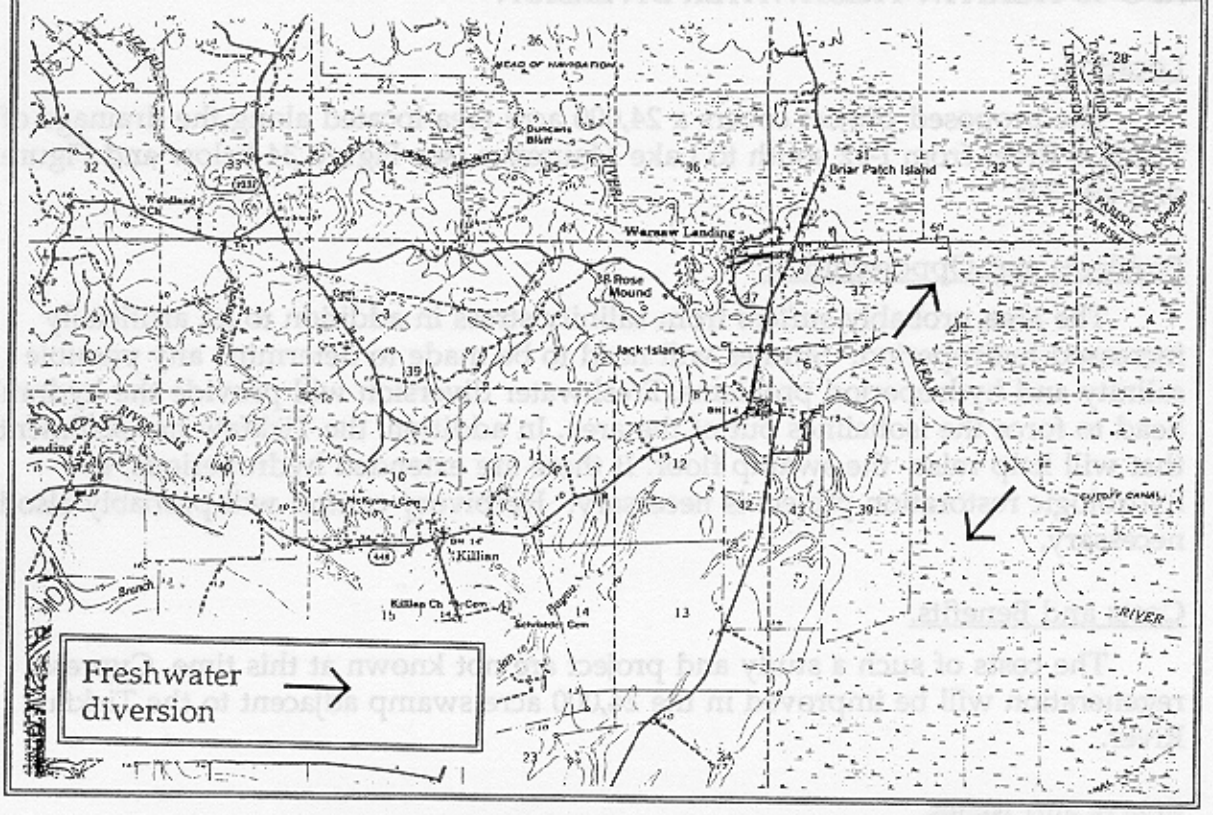
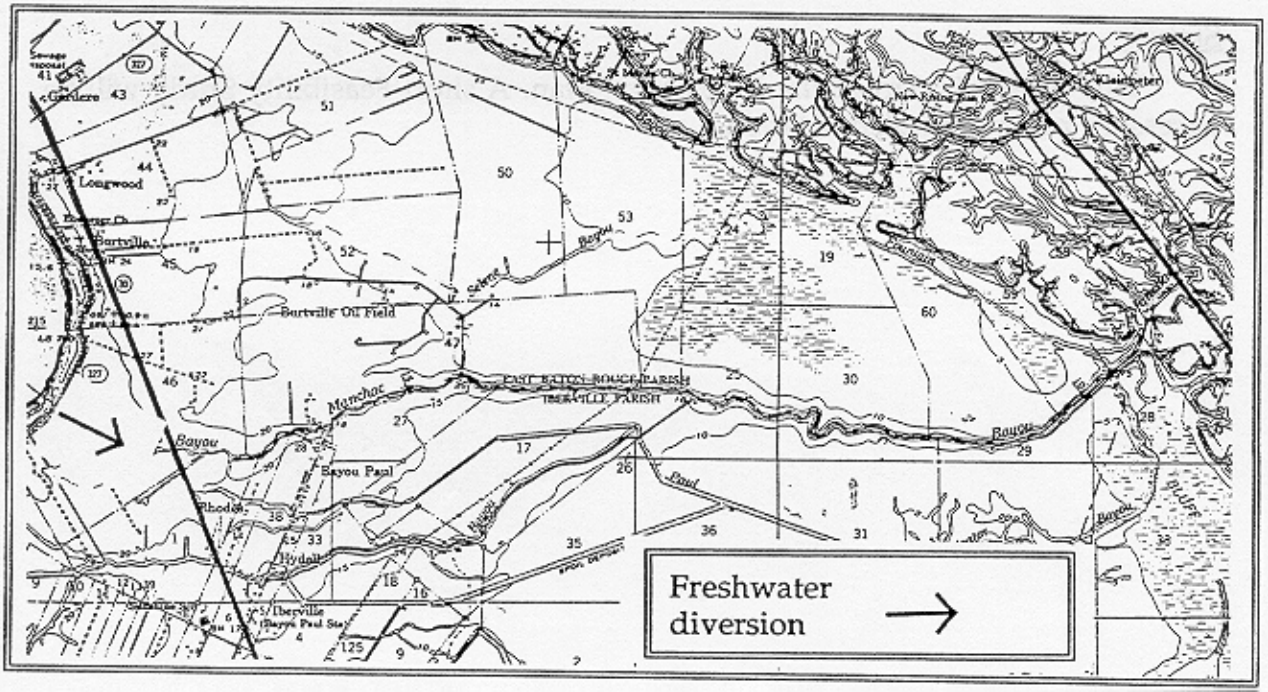


Figure 34. Tickfaw Freshwater Diversion



XPO-85 BAYOU MANCHAC DIVERSION

Location.

Bayou Manchac forms the southern boundary of East Baton Rouge Parish. The diversion will be over the left descending bank of the Mississippi River south of Burtville (see Figure 35 above).

Problems and Opportunities.

Bayou Manchac was a distributary of the Mississippi until closed by man in the early 1880's. As a consequence of the closure, the whole Bayou Manchac Basin, especially the upper swamps are stressed due to reductions in freshwater flushing and nutrient input.

Description of Features.

A siphon-type diversion structure will be built over the Mississippi River levee. Discharge will be controlled with a maximum flow of 2,000 cfs.

Cost and Benefits.

The reconnaissance level cost is estimated at $1,600,000. Approximately 3,000 acres of swamp near Bayou Fountain and Spanish Lake will benefit from the flushing out of stagnant waters and the introduction of nutrients. The 3,000 acres will show increased growth and production of fish and wildlife. Swamps and marshes along the Amite from Head of Island to Lake Maurepas will benefit from the through flow, especially during periods of dry weather and in the summer. The average discharge of 1,500 cfs throughout the year will aid in salinity reduction in Lake Pontchartrain.

Effects and Issues.

A management plan will have to be formulated to ensure that the diversion does not operate when the Amite River or any of the Bayous draining Baton Rouge are in flood. The estimated cost appears high.

Status.

This project is part of the Restoration Plan. A Feasibility Study will be necessary prior to implementation.

XPO-89 BLIND RIVER FRESHWATER DIVERSION

Location.

The project area lies in St. James Parish near the town of Romeville (see Figure 36 below and Figure 4 on page 37). The area extends north and east through Lake Maurepas the Pontchartrain/Maurepas land bridge.

Problems and Opportunities.

The Pontchartrain Basin needs more fresh water to counter the salinity increase brought about by subsidence and construction of the MRGO. Restoring fluvial precesses to the basin will not only reduce salinities and increase nutrients, but also slightly increase sediments.

Description of Features.

A small control structure with a capacity of 5,000 cfs would be built in the Mississippi River near Romeville. An outflow channel would pass through the developed area, across the St. James Canal and into an unnamed canal that connects with the headwaters of Blind River. The canal and the headwaters might have to be enlarged to accommodate 5,000 cfs.

Costs and Benefits.

The costs are unknown at this time. The fresh water would reduce salinities in portions of the upper basin, on the Pontchartrain/Maurepas land bridge, and in the western portion of the middle basin. Stress on cypress would be reduced and regeneration would probably increase. Marshes on the land bridge and in western Lake Pontchartrain would receive fresh water and nutrients that would make them healthier.

Effects and Issues.

The diversion must be planned so no flooding occurs in developed areas. This diversion may be expensive because of the large number of relocations that would be necessary. Care would be necessary to avoid toxic chemical dump sites.

Status.

This project is part of the Restoration Plan. A Feasibility Study will be necessary prior to implementation.

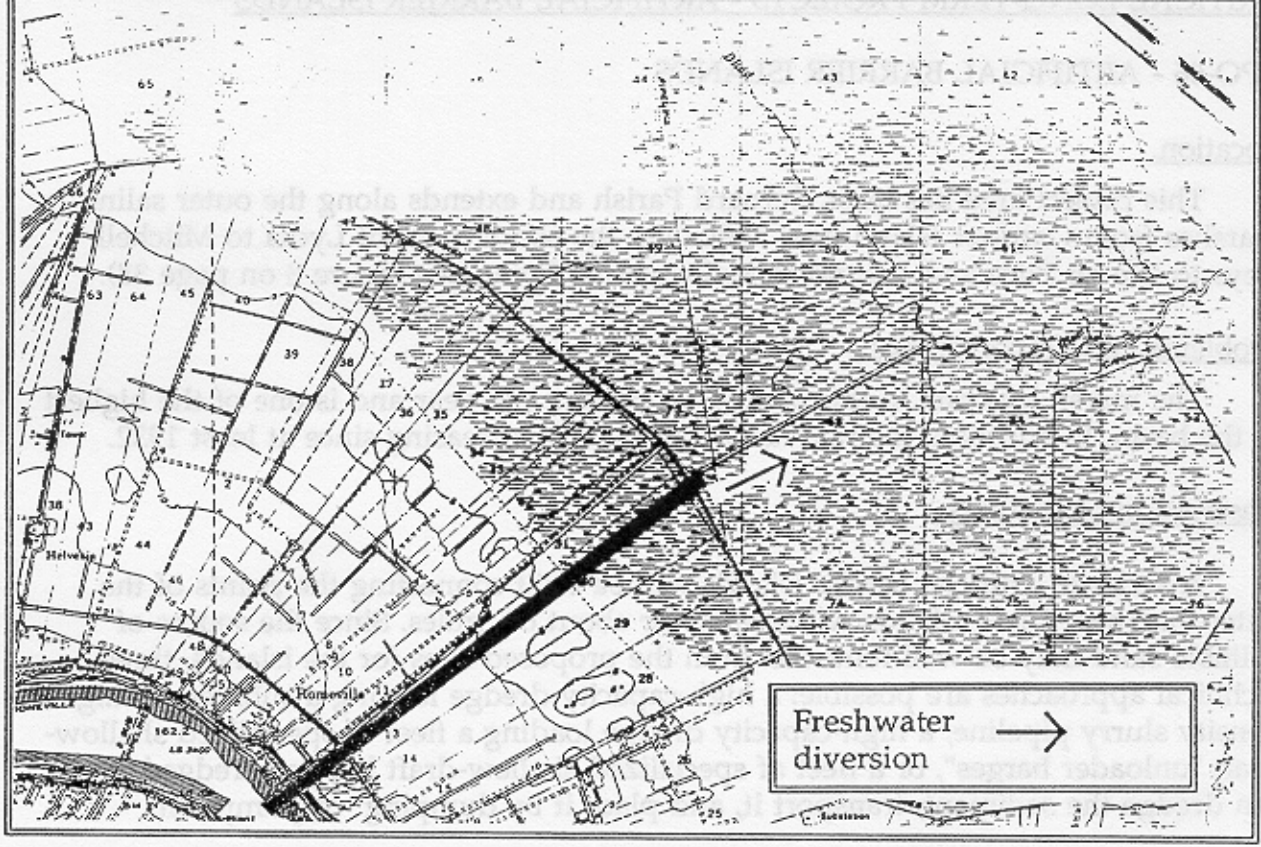


Figure 36. XPO-89 Blind River Freshwater Diversion

CRITICAL LONG-TERM PROTECTS - ARTIFICIAL BARRIER ISLANDS

XPO-66 - ARTIFICIAL BARRIER ISLANDS

Location.

This project area lies in St. Bernard Parish and extends along the outer saline marshes from Gardner Island near MRGO in the south to Point Lydia to Mitchell Keys to Isle au Pitre and around to Malheureaux Point (see Figure 8 on page 38).

Problems and Opportunities.

The marsh loss rate in this area is .94 percent per year and is one of the highest in the basin. In addition, the rate has been steadily increasing since at least 1932.

Description of Features.

A series of artificial barrier islands will be built connecting the points of the outer marshes. These islands will stretch for about 60 miles. Since the source of suitable sand may be well removed from the proposed sites for the islands, three technical approaches are possible: a high-capacity dredge feeding a submerged high-density slurry pipeline; a high-capacity dredge loading a fleet of specialized shallow-draft “unloader barges”, or a fleet of specialized shallow-draft hopper dredged which can dredge the sediment, transport it, and place it by dumping or pump-out.

Benefits and Costs.

If the loss rate is reduced by 75 percent from the existing rate .94 percent per year to 0.24 per cent, nearly 4,900 acres of marsh will be saved over 20 years. The cost estimate for a barrier island on the Second Priority List was $10,000,000 per mile. Thus, using existing technology, the 60-mile series of barriers around these marshes will cost at about $600,000,000. This is a cost of $122,500 per acre at existing costs, an extremely expensive project.

Effects and Issues.

Cost-effectiveness and technological advances are necessary for this project to become competitive. This project will prevent some of the most severe land loss in the basin, but the costs are extremely high at this time. Deposition for the barrier islands will cover about 1,500 acres of shallow water bottoms and dredging will deepen an equal acreage. The existing benthos on this 3,000 acres will be destroyed. Within a year, however, the borrow area will recover. The islands will basically replace the islands that are being lost naturally, so the net adverse impacts to the benthos should not be significant. All natural passes will be left open so as to minimize impacts to fisheries. Care will need to be taken to map and avoid impacts to oil and gas pipelines.

Status.

This project is part of the Restoration Plan. A Feasibility Study will be necessary prior to implementation.

SUPPORTING SHORT-TERM PROTECTS

XPO-48a TENNESSEE WILLIAMS CANAL BANK MODIFICATION

Location.

This project is located in St. James Parish approximately 5 miles NNW of Grammercy (see Figure 37 below and Figure 4 on page 37).

Problems and Opportunities.

The swamp south of Tennessee Williams Canal is impounded by the canal bank.

Description of Features.

Gaps with a width of 50 feet will be cut every 500 feet in the north bank of the canal - about 14 gaps will be necessary.

Benefits and Costs.

Approximately 70 acres of swamp will be preserved and an additional 52 acres will be enhanced for a total of 122 benefitted acres. The total cost of the project is estimated to be $269,000. The cost per benefitted acre is #2,204.

Effects and Issues.

The gapping of the bank should not induce any flooding in the Grammercy area which is much higher than the swamp. The information gained when the Amite River Diversion Canal Bank Modification Project is implemented and monitored will be used in planning this project.

Status.

This is a concept only, bank gapping has not been tested as a method of encouraging cypress regeneration. It is part of the Restoration Plan and be a candidate for future Priority Lists.

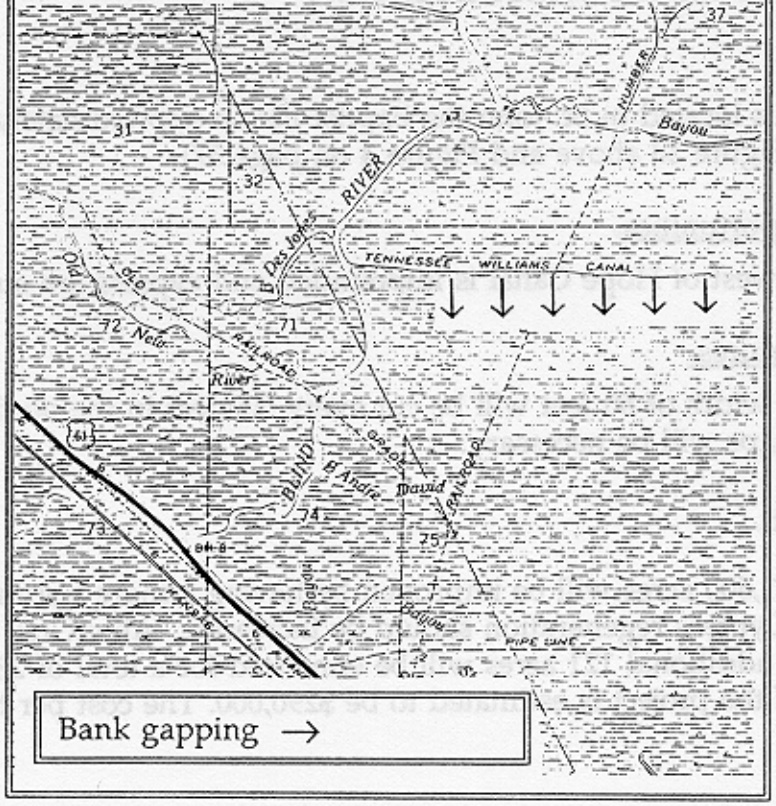


Figure 37. XPO-48a Tennessee Williams Canal Bank Modification

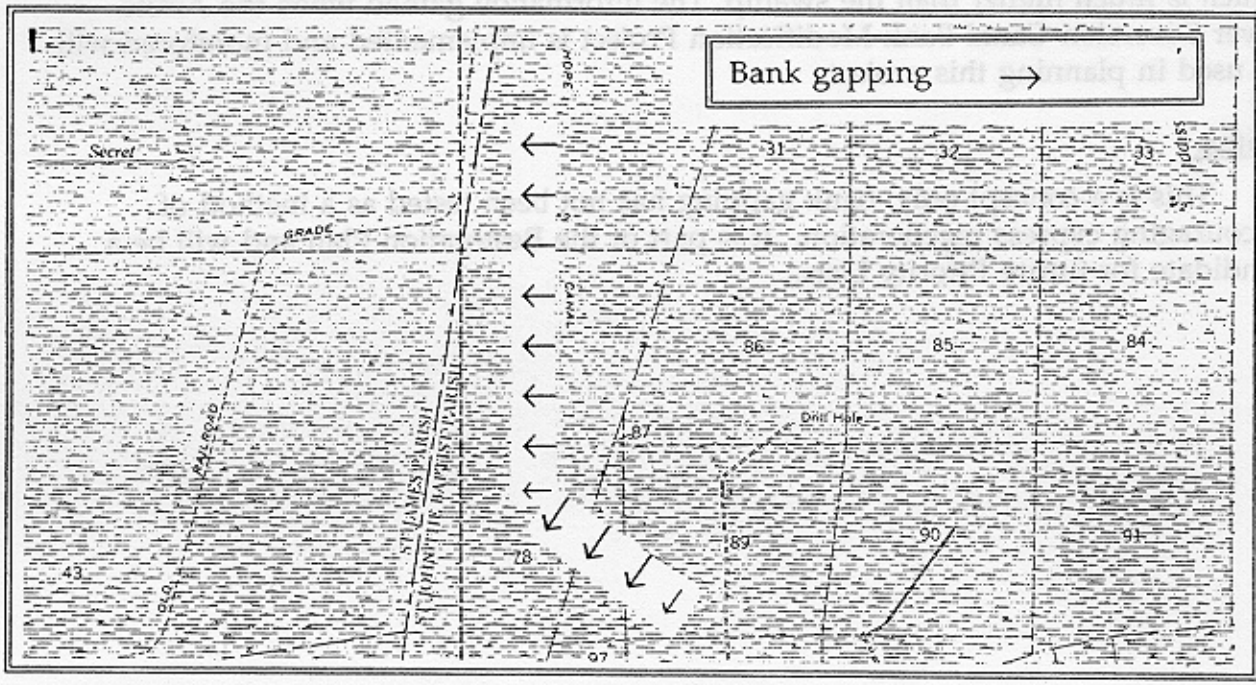


Figure 38 XPO-48b Hope Canal Bank Modification

XPO-48b HOPE CANAL BANK MODIFICATION

Location.

This project is located in St. John the Baptist Parish approximately 5 miles NE of Grammercy (see Figure 38 above and Figure 4 on page 37).

Problems and Opportunities.

The swamp west of Hope Canal is impounded and cypress are stressed.

Description of Features.

Gaps with a width of 50 feet will be cut every 500 feet in the north bank of the canal - about 30 gaps will be necessary.

Benefits and Costs.

As much as 1,600 acres will be improved by having a more normal hydrologic regime restored. Cypress regeneration should be increased. About 160 acres will be preserved and an additional 121 acres will be enhanced for a total of 281 benefitted acres. The cost of the project is estimated to be $290,000. The cost per benefitted acre is $1.032.

Effects and Issues.

The gapping of the bank should not induce any flooding in the Grammercy area which is much higher than the swamp. The information gained when the Amite River Diversion Canal Bank Modification Project is implemented and monitored will be used in planning this project.

Status.

This is a concept only, bank gapping has not been tested as a method of encouraging cypress regeneration. It is part of the Restoration Plan and will be a candidate for future Priority Lists.

XPO-63 LAKE MAUREPAS SHORE PROTECTION, MOUTH OF BLIND RIVER

Location.

This project area of 158 acres of cypress is located in Livingston Parish north of the entrance of Blind River into Lake Maurepas (see Figure 4 on page 37).

Problems and Opportunities.

The shoreline of the lake is eroding swamp at a rate of 10 feet per year in this area according to data furnished by Louisiana Geological Survey (LGS). This can be prevented by shoreline protection.

Description of Features.

Approximately 10,400 feet of intermittent shoreline protection will be built about 60 feet offshore. The shoreline protection will consist of filter fabric topped with two feet of armor stone.

Benefits and Costs.

The shoreline protection will stop the 10 foot per year erosion, should accrete three feet per year behind it. Thus, a total of 48 acres of swamp will be protected, 14 acres of marsh will be created, SAV will cover an additional 3 acres, and 7 acres of swamp should be enhanced over 20 years, for a total benefit to 73 acres of wetlands. This project is estimated to cost $1,096,000. The estimated cost per benefitted acre is $15,014.

Effects and Issues.

Approximately five acres of water bottoms will be covered with the shoreline protection. There should be no impact to the ingress and egress of aquatic organisms.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists. A short feasibility study must be completed to determine the exact erosion rate, length of shoreline protection, and the benefitted area.

PO-7 NORTH SHORE WETLAND SEDIMENT TRAPPING

Location.

This 3,800 acre project consisting of brackish marsh and ponds is located in St. Tammany Parish (see Figure 39 below and Figure 5 on page 38).

Problems and Opportunities

This marsh had a high loss rate of 1 percent per year from 1958-74 when large interior ponds formed. This may have been caused by increased salinities due to the construction of MRGO and nutria herbivory of the sawgrass marsh. Recently the loss rate has been only 0.074 percent per year from 1983-90. The loss is probably due to a combination of subsidence and herbivory.

Description of Features.

About 2.4 miles of brush fence will be built in interior ponds, coupled with the planting of California bulrush and smooth cordgrass on either side of the fence.

Benefits and Costs.

The brush fence and plantings will trap sediments so there will be 22 acres of marsh around the fence in 20 years. SAV coverage will increase on 473 acres and another 718 acres will be enhanced, so a total of 1,213 acres of wetlands will be benefitted. This project is estimated to cost $488,000. The estimated cost per benefitted acre is $403. This project will be enhanced by the freshwater and nutrients brought by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The brush fence will cover approximately 2 acres of lake water bottoms. It will not hinder the ingress or egress of marine organisms. Consideration will be given to beneficial use of dredged material when Bayou Bonfuca is maintenance dredged in the future.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists. It is part of the Louisiana Coastal Restoration Plan.

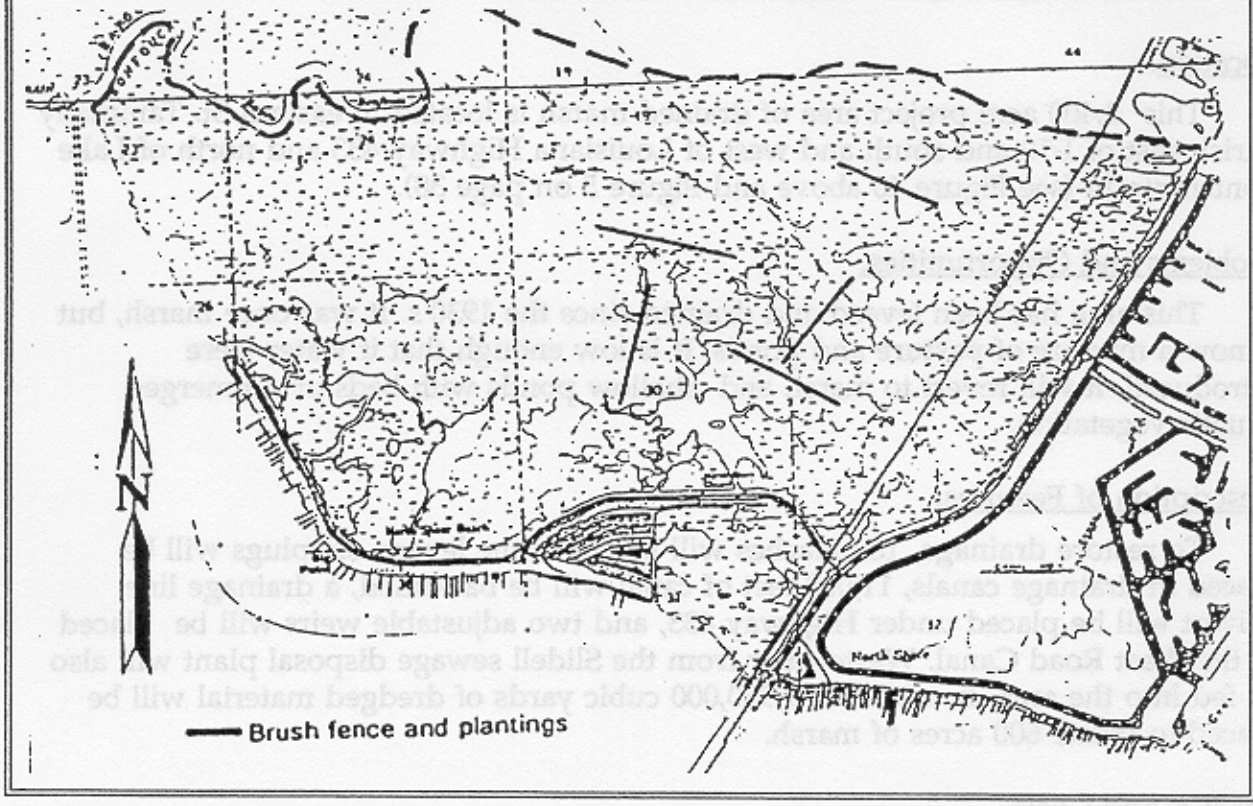


Figure 39. PO-7 North Shore Wetland Sediment Trapping

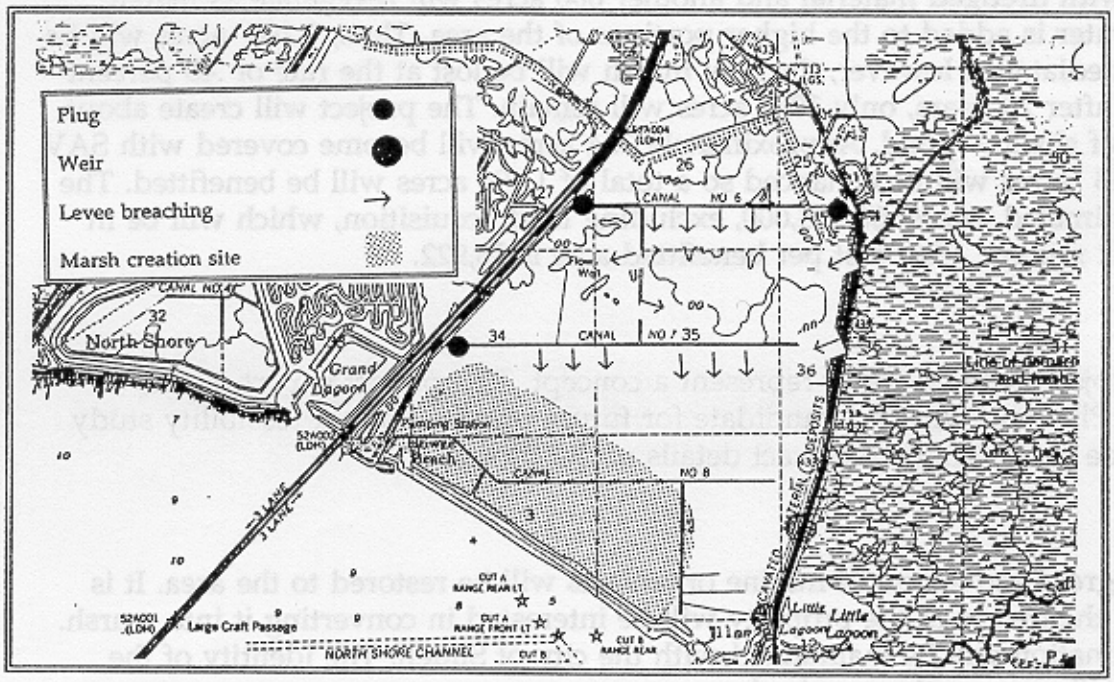


Figure 40. PPO-4 Eden Isles East Marsh Restoration

PPO-4 EDEN ISLES EAST MARSH RESTORATION

Location.

This 2,400 acre project area of drained marsh is located in eastern St. Tammany Parish east of I-10 and south and west of Louisiana Highway 433 and north of Lake Pontchartrain (see Figure 40 above and Figure 5 on page 38).

Problems and Opportunities.

This area has been leveed and drained since the 1930's. It was once marsh, but is now a mixture of pasture and ponds. It is low enough that if water were introduced, it will revert to marsh and shallow ponds with beds of submerged aquatic vegetation.

Description of Features.

To restore drainage, 18 breaches will be cut in the levees, six plugs will be placed in drainage canals, 11,000 feet of canal will be backfilled, a drainage line culvert will be placed under Highway 433, and two adjustable weirs will be placed in the West Road Canal. Wastewater from the Slide11 sewage disposal plant will also be fed into the area. In addition, 1,950,000 cubic yards of dredged material will be placed to create 600 acres of marsh.

Benefits and Costs.

An initial rough estimate indicates that approximately 600 acres of marsh will be created with dredged material and another 600 acres will revegetate as marsh when the water is added to the higher portions of the area. Thus, 1,200 acres will be created immediately. However, the new marsh will be lost at the rate of .45 percent per year so after 20 years, only 1092 acres will remain. The project will create about 1,200 acres of shallow pond. Approximately 334 acres will become covered with SAV and about 68 acres will be enhanced so a total of 1,494 acres will be benefitted. The project is estimated to cost $8848,000, excluding land acquisition, which will be in excess of $12 million. The cost per benefitted acre is $5,922.

Status.

The project features above represent a concept. This project is part of the Restoration Plan and will be a candidate for future priority lists. A feasibility study must be done to determine the exact details of the project.

Kev Issues.

The ingress and egress of marine organisms will be restored to the area. It is unknown if the owner of the property will be interested in converting it into marsh. Close coordination will be maintained with the city of Slidell. The identity of the entity that will manage the area is also a concern.

PPO-9 LA BRANCHE MARSH CREATION, EAST

Location.

This project is located in St. Charles Parish between I-10 and Lake Pontchartrain, just east of PPO9A and west of the Pipeline Canal (see Figure 41 below and Figure 5 on page 38).

Problems and Opportunities.

These are similar to PPO10 described on page 80 above.

Description of Features.

Similar to PPO10 above. Lessons learned during the creation of the marsh just to the west will be incorporated.

Benefits and Costs.

Approximately 720 acres of brackish marsh will be created immediately in these 900 acres of shallow ponds. Over 20 years, marsh will erode at the rate of .01 percent per year, so at the end of project life, there will be 718 acres remaining in the created area and 399 in the original marsh. Without the project, the original 400 acres of marsh will be lost at a rate of 0.2 percent per year, so at the end of 20 years there will be 384 acres remaining. There will be a net gain of 733 acres of marsh. SAV will cover an additional 27 acres and 70 acres will be enhanced. Thus a total of 830 acres will be benefitted. This project is estimated to cost $9,937,000. The estimated cost per benefitted acre is $11,972. This project will be significantly enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

Marsh creation will fill the shallow ponds which will no longer be available as aquatic habitat. Since much of the La Branche marsh has been lost due to increased salinities, highway construction and subsidence, this project will replace lost marsh.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists.

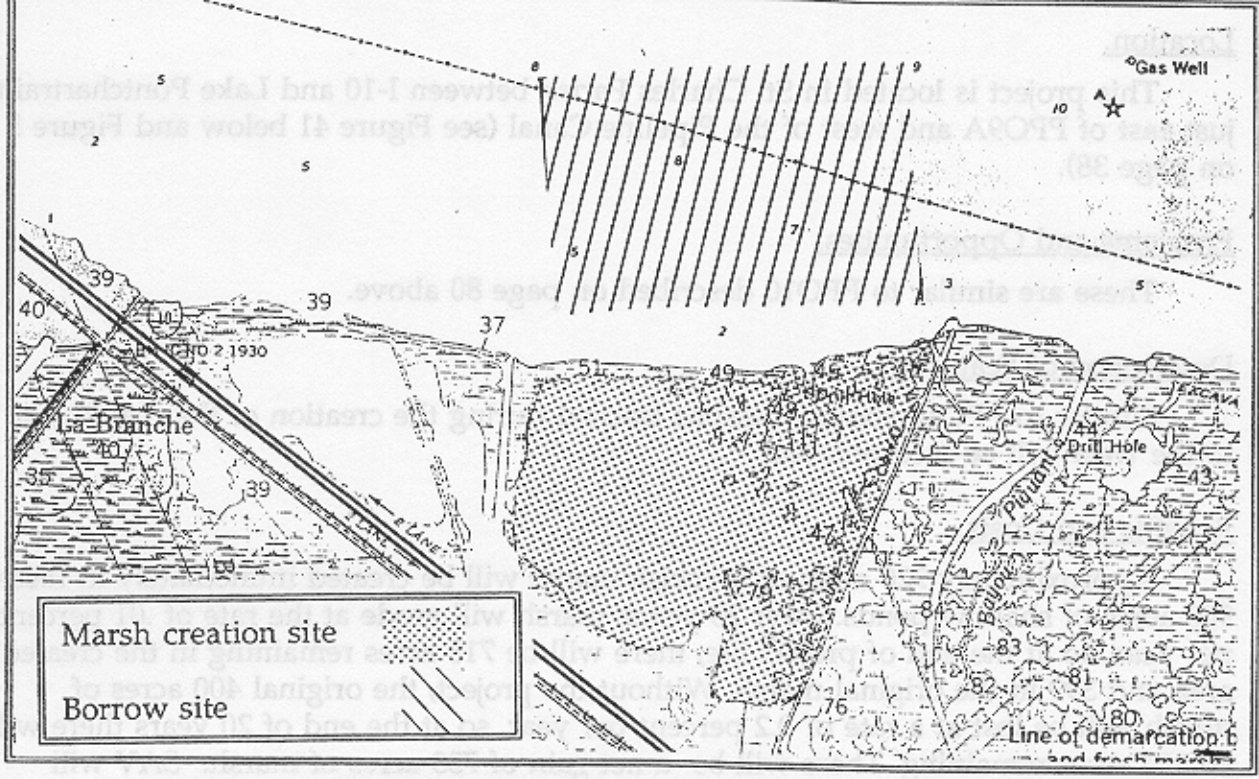


Figure 41. PPO-9 La Branche Marsh Creation, East

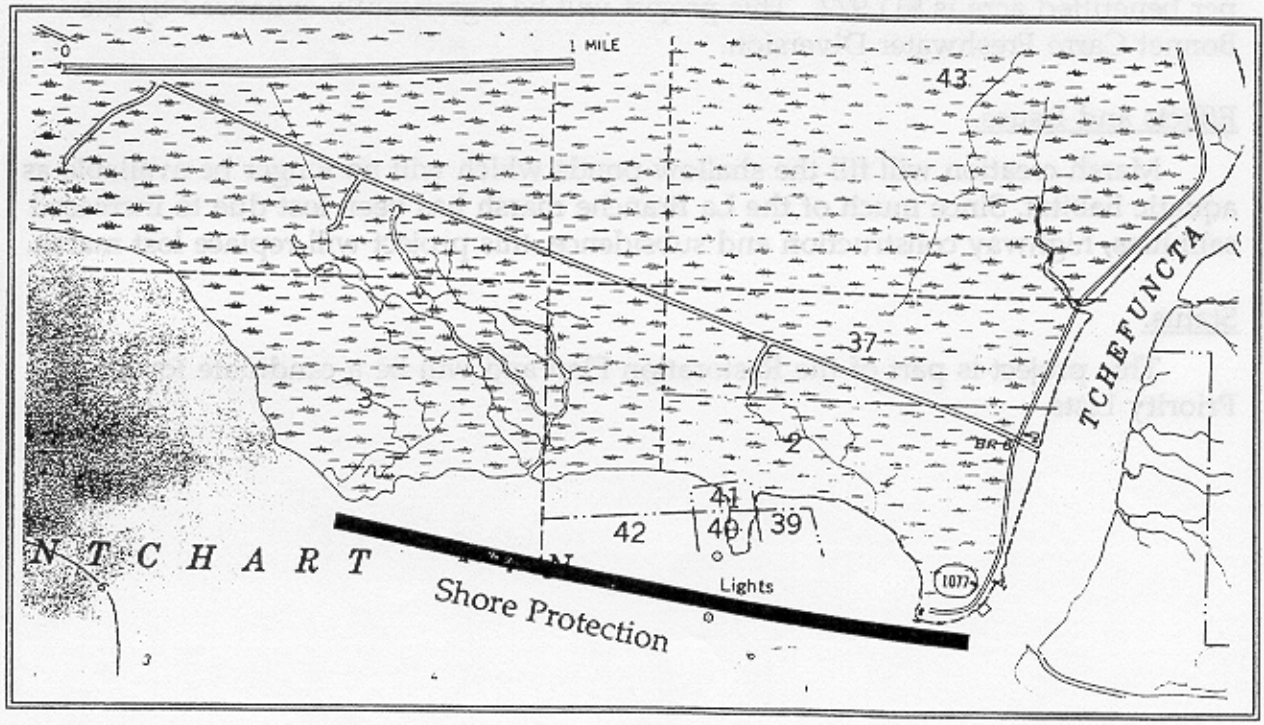


Figure 42. PPO-12 Tchefuncte Marsh Shore Protection

PPO-12 TCHEFUNCTE MARSH SHORE PROTECTION

Location.

This 311 acre area of fresh marsh and shallow lake bottom lies in St. Tammany Parish just west of the mouth of the Tchefuncte River (see Figure 42 above and Figure 5 on page 38).

Problems and Opportunities.

The shoreline is eroding here at a rate of about 20 feet per year according to LGS data..

Description of Features.

Placement of about 6,000 feet of filter fabric with a topping of two feet of armor stone will protect 8,000 feet of shoreline between the two points just west of the river mouth.

Benefits and Costs.

The shoreline protection will prevent the loss of 73 acres of marsh over 20 years. Another 8 acres of marsh will accrete behind the shoreline protection over 20 years. SAV will cover an additional 57 acres and approximately 14 acres will be enhanced. Thus, a total of 152 acres of wetlands will be benefitted. The project is estimated to cost $854,000. The cost per benefitted acre is $5,618. This project will be enhanced by the freshwater and nutrients provided by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The shoreline protection will cover approximately 5 acres of lake water bottoms. It will not prevent the ingress or egress of marine organisms or the entrance of sediment into the marshes.

Status.

This project is part of the Restoration Plan and will be a candidate for a future priority list. A short feasibility study must be completed to determine the exact erosion rate, the length of the shoreline protection and the benefitted area.

SUPPORTING SHORT-TERM PROJECTS

PPO-13 BAYOU CHINCHUBA MARSH SHORE PROTECTION

Location.

This 106 acre area of fresh marsh and shallow water is located along Lake Pontchartrain in St. Tammany Parish from the Lewisburg area to the Tchefuncte River (see Figure 43 below and Figure 5 on page 38).

Problems and Opportunities.

Despite a rim of shell, the shoreline in this area is eroding at a rate of 5-10 feet per year according to LGS. Recently, most of the erosion has been along the eastern portion of the area.

Description of Project features.

Approximately 7,000 feet of shoreline protection will be built about 60 feet from shore.

Benefits and Costs.

Loss of approximately two acres per year will be prevented and the shoreline protection will allow the accretion of three feet per year. Thus, the project will protect/create approximately 42 acres of marsh, will increase SAV coverage over an additional 17 acres and will enhance 4 acres over 20 years. The total benefitted area will be 63 acres of wetlands. The cost of this project is estimated to be $752,000. The estimated cost per benefitted acre is $11,937. The Bonnet Carre Freshwater Diversion will enhance this project.

Effects and Issues.

The shoreline protection will not interfere with the ingress or egress of marine organisms or sediment since there is presently a two foot shell rim in the vicinity.

Status.

This project is part of the Restoration Plan and will be a candidate for a future priority list. A short feasibility study must be completed to determine the exact erosion rate, any hot spots where benefits might be centered, the length of shoreline protection, and the benefitted area.

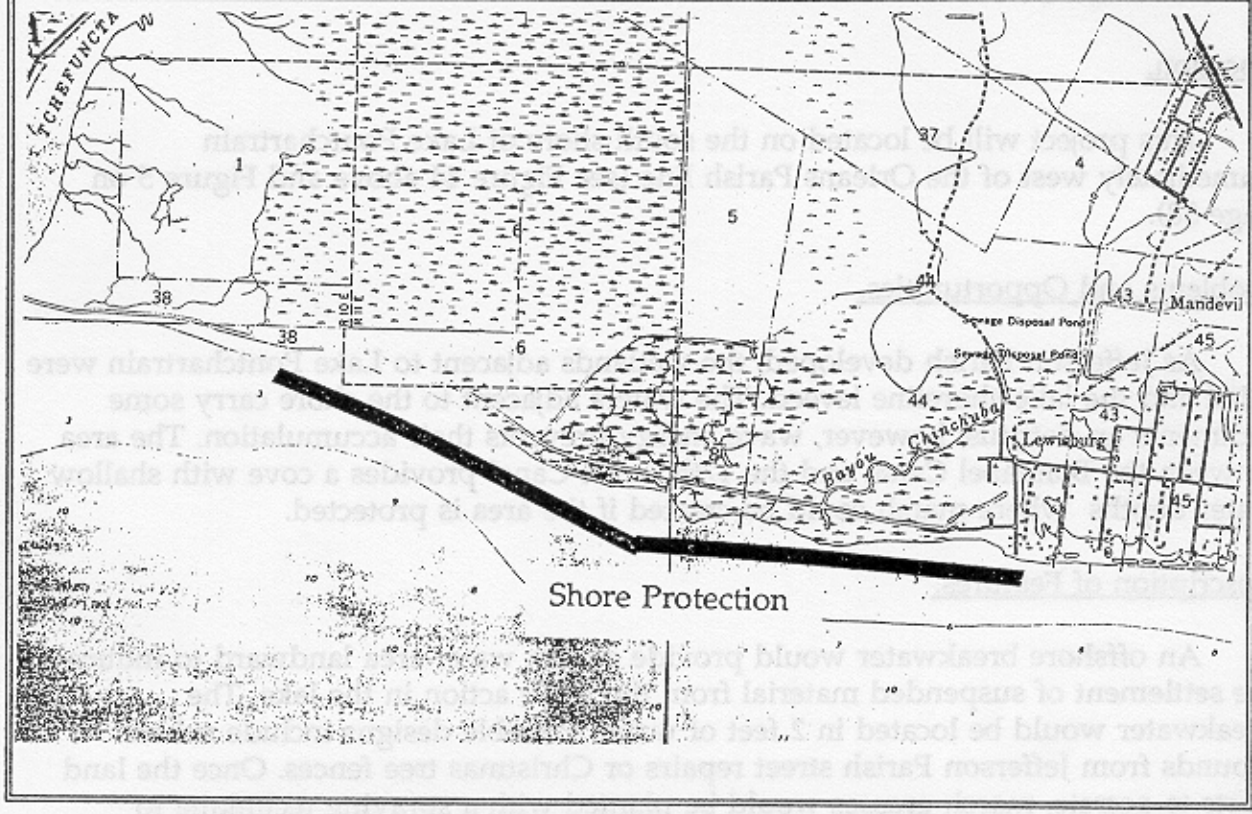


Figure 43. PPO-13 Bayou Chinchuba Marsh Shore Protection

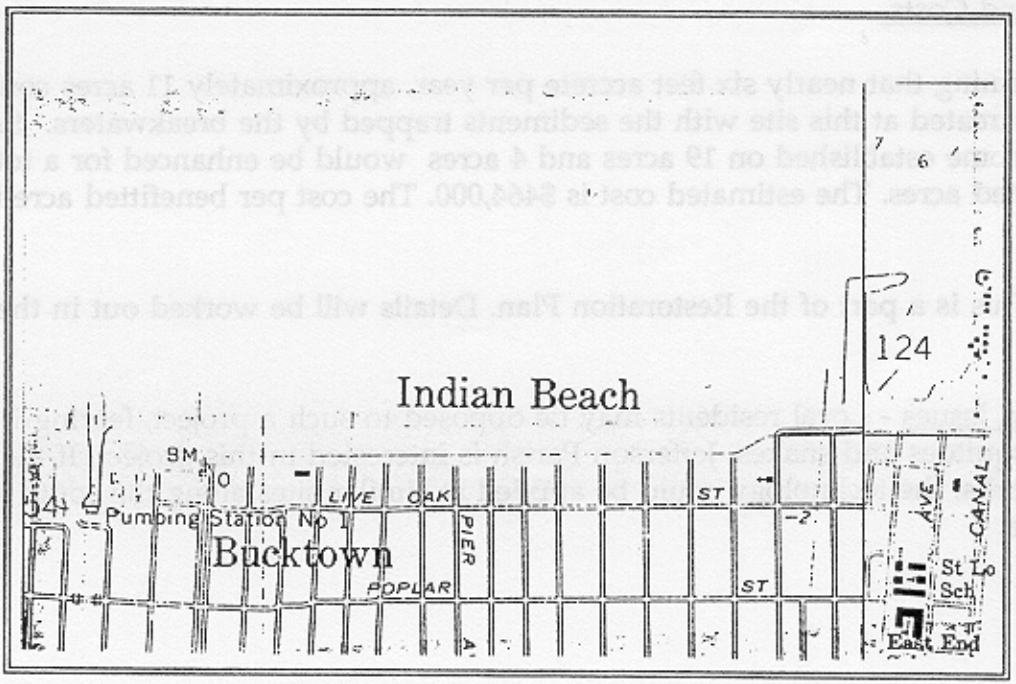


Figure 44. PPO-31 Indian Beach Marsh Creation

2PPO-31 INDIAN BEACH MARSH CREATION

Location.

This project will be located on the south shore of Lake Pontchartrain immediately west of the Orleans Parish line (see Figure 44 above and Figure 5 on page 38).

Problems and Opportunities.

As Jefferson Parish developed, the wetlands adjacent to Lake Pontchartrain were filled and the lake shoreline leveed. The waters adjacent to the shore carry some sediments an detritus; however, wave energy prevents their accumulation. The area between the Bonnabel Canal and the 17th Street Canal provides a cove with shallow water depths where marsh could be created if the area is protected.

Description of Features.

An offshore breakwater would provide a calm water area landward to induce the settlement of suspended material from the wave action in the lake. The breakwater would be located in 2 feet of water. Possible designs include rubble mounds from Jefferson Parish street repairs or Christmas tree fences. Once the land starts to accrete, marsh grasses would be planted with a spraying technique to stabilize the area.

Benefits and Costs.

Assuming that nearly six feet accrete per year, approximately 11 acres could be passively created at this site with the sediments trapped by the breakwaters. SAV would become established on 19 acres and 4 acres would be enhanced for a total of 34 benefitted acres. The estimated cost is $464,000. The cost per benefitted acre is $13,654.

Status. - This is a part of the Restoration Plan. Details will be worked out in the future.

Effects and Issues - Local residents may be opposed to such a project, fearing it will bring mosquitoes and snakes. Jefferson Parish is interested in this project. If the project works, the technology could be applied at similar sites along the south shore of the lake.

XPO-82 FONTAINBLEAU STATE PARK SHORE PROTECTION

Location.

This 52 acre project area consisting of intermediate marsh and ponds is located in St. Tammany Parish on the western portion of Fontainbleau State Park (see Figure 45 below and 5 on page 37).

Problems and Opportunities.

The shoreline is only eroding about five feet per year in this area according to LGS data. However, the lake is very close to breaking through into two of the ponds in the small marsh to the north. If this occurs, the loss rate will return to the loss rate in 1974-83 when the ponds formed.

Description of Features.

Approximately 2,000 feet shoreline protection will be built 60 feet offshore.

Benefits and Costs.

The loss of approximately 5 acres will be prevented along the shoreline and the shoreline protection will accrete 2 acres of marsh. The protection will prevent the loss of 13 acres of interior marsh, will increase SAV coverage on 10 acres, and will enhance 2 acres. Thus, a total of 28 acres will be benefitted. The estimated cost of this project is $246,000. The estimated cost per benefitted acre is $8,786. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

This project must be coordinated with the Louisiana Department of State Parks.

Status.

This is part of the Restoration Plan and will be a candidate for future priority lists. A short feasibility study must be done to determine the exact erosion rate, length of the shoreline protection and the benefitted area.

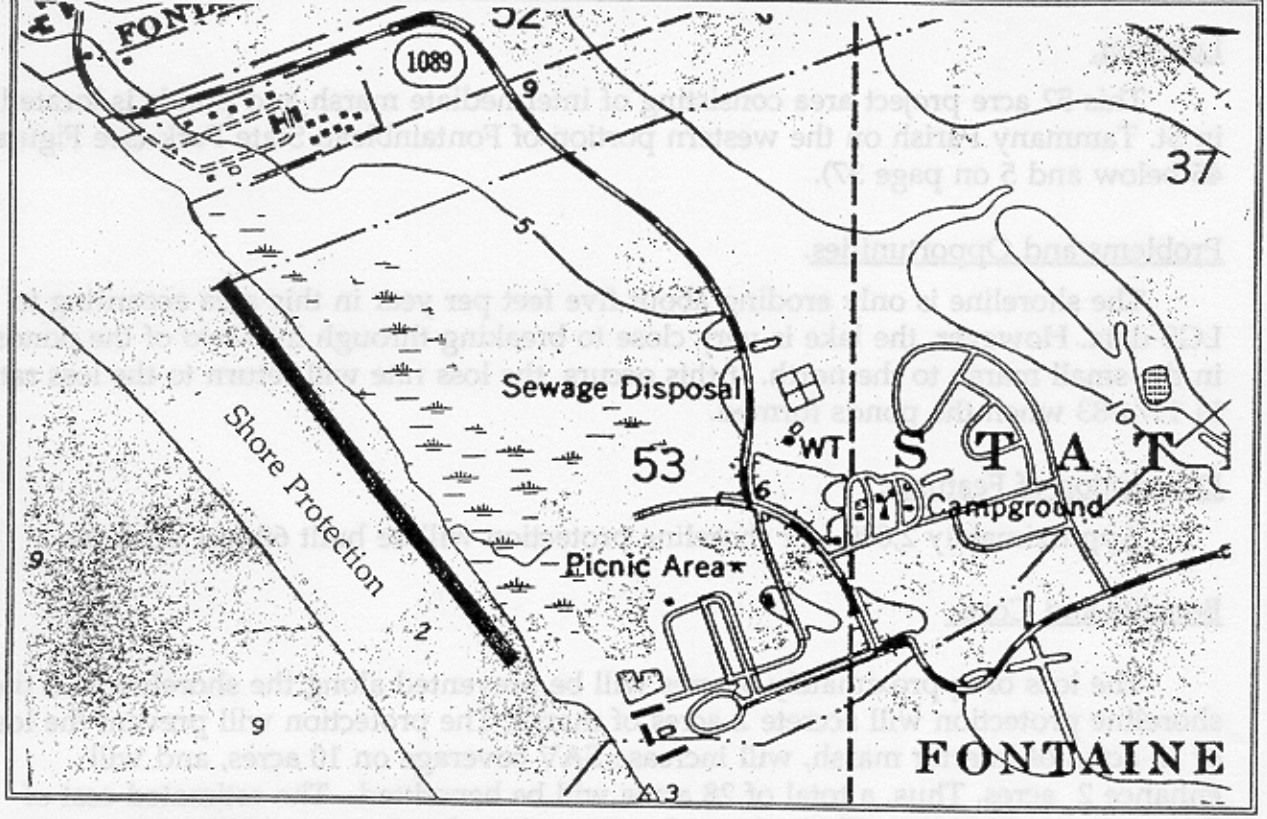


Figure 45. XPO-82 Fountainbleau Shore Protection

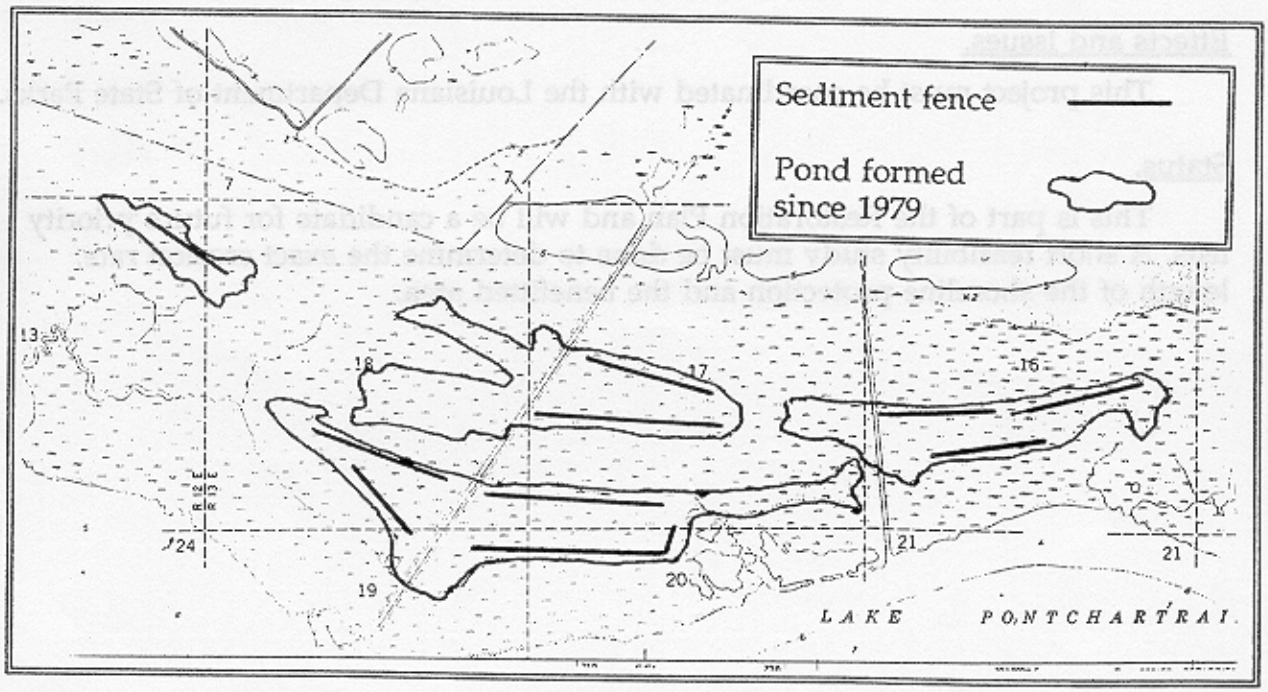


Figure 46. XPO-88 Point Platt Sediment Trapping

XPO-88 POINT PLATT SEDIMENT TRAPPING

Location.

This 3,800 area of intermediate and brackish marsh and ponds is located in St. Tammany Parish between Bayous Lacombe and Bonfuca (See Figure 46 above and Figure 5 on page 38).

Problems and Opportunities.

This area opened up into ponds during the 1958-74 period showing a loss rate of .6 percent per year. Since then, the loss rate has been only .14 percent per year from 1974-90. However, it is possible that Lake Pontchartrain will break through into the central ponds in the near future and the loss rate will return to that of the past.

Description of Features.

Approximately six miles of brush fencing will be placed near the perimeters of the extensive pond system to slow erosion and to create marsh. California bulrush and smooth cordgrass will be planted around the fences.

Benefits and Costs.

The brush fence and plantings will trap sediments so 55 acres of marsh will be created around the fences in 20 years. If the breakthrough of the lake into the central 1,100 area of marsh and ponds is prevented, 19 acres will be saved over 20 years. SAV will cover an additional 439 acres and 723 acres will be enhanced for a total of 1,236 acres benefitted. This project is estimated to cost $1,199,000. The estimated cost per benefitted acre is $969. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

None.

Status.

This project is in the Restoration Plan and will be a candidate for future Priority Lists. A short Feasibility Study will be necessary prior to implementation.

XPO-94 LAKE PONTCHARTRAIN GRASSBEDS

Location.

Submerged aquatic vegetation would be reestablished at three sites in Lake Pontchartrain: Old Lincoln Beach, South Point, and Fountainbleau State Park (see Figure 47 below).

Problems and Opportunities.

The SAV cover declined 56 percent in Lake Pontchartrain from 1973 (1950 acres) to 1985 (860 acres). The beds declined another 17 percent by 1991 (Burns et al. 1993). There are numerous reasons for this loss such as urban runoff and shoreline alternation. Sediment fences in Chef Menteur Pass allowed establishment of SAV on both sides of the fences, apparently by buffering wave energy.

Description of Features.

Sediment fences will be built at three sites with sandy substrate and historic records of SAV: Old Lincoln Beach on the south shore near Little Woods, South Point, and Fountainbleau State Park on the north shore. Between 500 and 2,000 feet of fencing would be built at each site. The layout of the fences will be determined at a later date.

Benefits and Costs.

SAV should accrete on both sides of the fences. The cost of such a project is unknown until a decision is made on the length of sediment fencing.

Effects and Issues.

This is a technique which could encourage the re-establishment of SAV at several sites in the lake. If the cause for loss is something other than wave energy, the project may not be successful. The sediment fences at the Chef Pass are further from urban runoff than the Old Lincoln Beach and Fountainbleau sites.

Status.

This project is part of the Restoration Plan. It needs more detailed development before implementation. University of New Orleans researchers have expressed interest in helping plan and monitor this project.

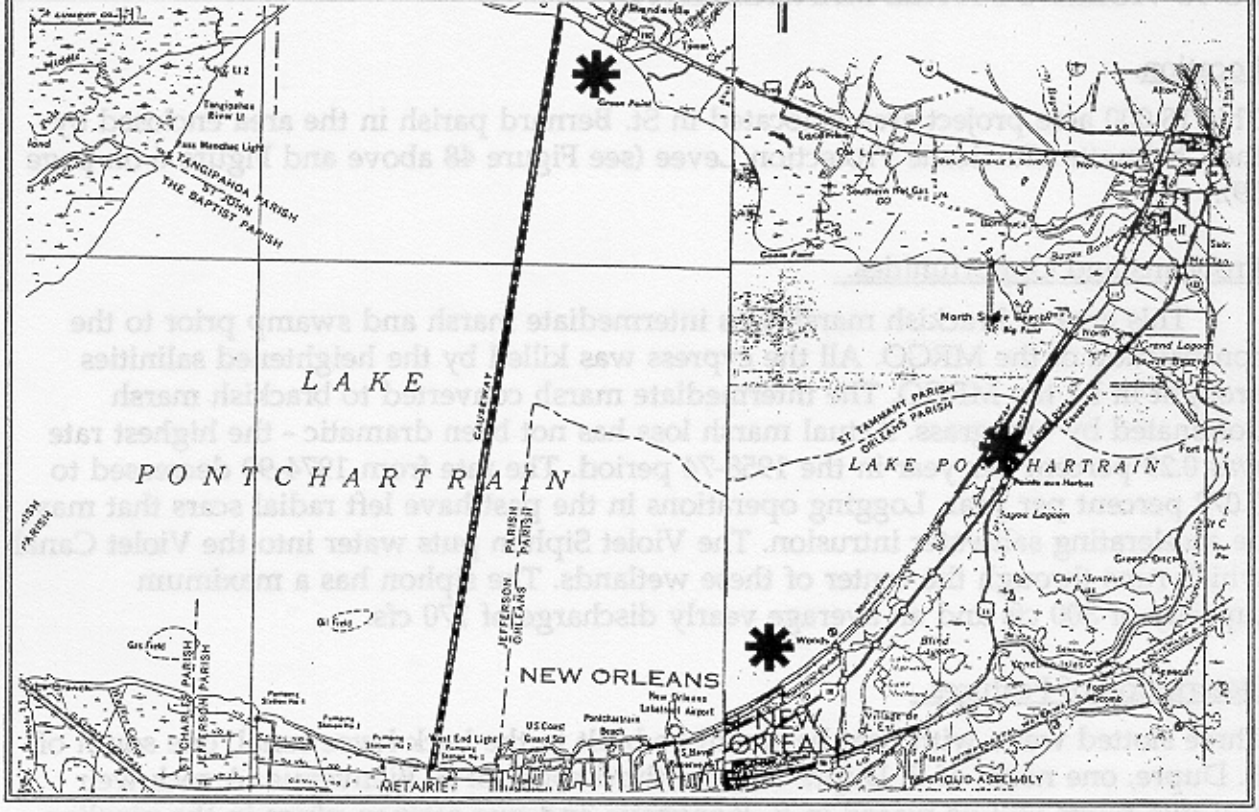


Figure 47. XPO-94 Lake Pontchartrain Grassbeds

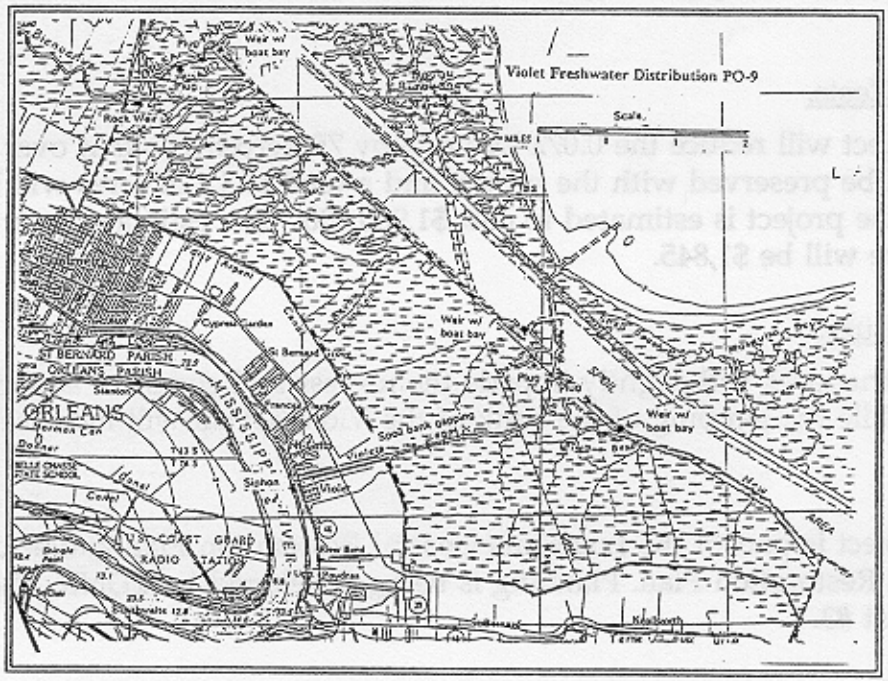


Figure 48.. PO-9a Violet Outfall Management

PO-9a VIOLET OUTFALL MANAGEMENT

Location.

This 18,000 acre project area is located in St. Bernard parish in the area enclosed by the Chalmette Hurricane Protection Levee (see Figure 48 above and Figure 6 on page 39).

Problems and Opportunities.

This area of brackish marsh was intermediate marsh and swamp prior to the construction of the MRGO. All the cypress was killed by the heightened salinities brought in by the MRGO. The intermediate marsh converted to brackish marsh dominated by wiregrass. Actual marsh loss has not been dramatic - the highest rate was 0.29 percent per year in the 1958-74 period. The rate from 197490 decreased to 0.072 percent per year. Logging operations in the past have left radial scars that may be accelerating saltwater intrusion. The Violet Siphon puts water into the Violet Canal which runs through the center of these wetlands. The siphon has a maximum capacity of 300 cfs and an average yearly discharge of 170 cfs.

Description of Features.

Three slotted weirs with boat bays will be built in the back levee canal, one south of B. Dupre, one north of B. Dupre and the third south of B. Bienvenue. A rock weir and two plugs will be placed in B. Bienvenue and two earthen plugs in the pipeline canal paralleling the back levee canal near B. Dupre. The banks of the Violet Canal will be cut with 50 foot gaps every 500 feet as needed to let fresh water enter the marsh.

Benefits and Costs.

The project will reduce the 0.072 loss rate by 75 percent, so that over 20 years, 247 acres will be preserved with the project and a total of 1,124 acres will be benefitted. The project is estimated to cost $1,960,000. The estimated cost per benefitted acre will be $1,845.

Effects and Issues.

The control structures will slightly impede the ingress and egress of aquatic organisms, while the gapping of the bank of the Violet Canal will increase access.

Status.

This project is part of the Louisiana Coastal Restoration Plan and also part of the CWPPRA Restoration Plan. Planning is being developed by LDNR. The project is on Priority List #3.

PPO-2c LAKE BORGNE SHORE PROTECTION, PROCTOR POINT

Location.

This project is located in St. Bernard Parish and encompasses the shore of Lake Borgne around Proctor Point (see Figure 6 on page 39).

Problems and Opportunities.

Shoreline erosion is greater than 10 feet per year according to LGS data. In addition, a breakthrough will occur and increase the erosion rates of interior marsh. The rate is presently 0.46 percent per year. It will return to 1.52 percent per year if the shoreline breaks through.

Description of Features.

A total of 6,000 feet of shoreline will be built about 60 feet offshore.

Benefits and Costs.

Over 20 years approximately 28 acres of marsh will be protected from erosion. In addition, 8 acres will be created as marsh accreted at a rate of three feet per year behind the shoreline protection. In areas where shoreline breakthrough was prevented and interior marsh loss reduced about 63 acres will be saved. SAV will cover an additional 25 acres and approximately 19 acres of marsh will be enhanced. Thus, the total acres of wetlands benefitted will be 143. It is estimated that this project will cost $651,000. The estimated cost per benefitted acre is $4,552. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues

The shoreline protection will cover about 2 acres of water bottoms. The shoreline protection will not prevent ingress and egress of marine organisms.

Status

This is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be completed to determine the exact erosion rates, the length of the shoreline protection and the benefitted area.

PPO-2d LAKE BORGNE SHORE PROTECTION, EAST OF SHELL BEACH

Location.

This 1,242 acre project area is located in the brackish marshes of St. Bernard Parish and encompasses the shore of Lake Borgne from near Shell Beach to Bayou St. Malo (see Figure 6 on page 39).

Problems and Opportunities.

Shoreline erosion is 15 feet per year according to LGS data. North of Lena Lagoon, breakthroughs will occur and increase the erosion rates of interior marsh from the existing loss rate (from 1983-90) of 0.17 percent per year. If the shoreline breaks through, the rate will return to 0.74 percent per year as it was in the 1958-74 period.

Description of Features.

A total of 16,000 feet of shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

Over 20 years approximately 110 acres of marsh will be protected from erosion. In addition, 22 acres will be created as marsh accreted at a rate of three feet per year behind the shoreline protection. In areas where shoreline breakthrough was prevented and interior marsh loss reduced about 114 acres will be saved. SAV will cover an additional 63 acres and approximately 75 acres of marsh will be enhanced. Thus, the total acres of wetlands benefitted will be 384. It is estimated that this project will cost $1,664,000. The estimated cost per benefitted acre will be 4,345. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The shoreline protection will cover about 8 acres of water bottoms. The shoreline protection will not prevent ingress and egress of marine organisms.

Status.

This is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be completed to determine the exact erosion rates, the length of the shoreline protection and the benefitted area.

PPO-2e LAKE BORGNE SHORE PROTECTION, POINT AUX MARCHETTES

Location.

This 290 acre project area is located in the saline marshes of St. Bernard Parish and encompasses the shore of Lake Borgne on Point aux Marchettes (see Figure 6 on page 39).

Problems and Opportunities.

Shoreline erosion is 20 feet per year according to LGS data.

Description of Features.

A total of 10,000 feet of shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

Over 20 years approximately 92 acres of marsh will be protected from erosion. In addition, 14 acres will be created as marsh accreted at a rate of three feet per year behind the shoreline protection. Approximately 15 acres of marsh will be enhanced. Thus, the total acres of wetlands benefitted will be 121. It is estimated that this project will cost $1,056,000. The estimated cost per benefitted acre is $8,727. This project will be enhanced by the Bonnet Carre Freshwater Diversion.

Effects and Issues.

The shoreline protection will cover about 5 acres of water bottoms. The shoreline protection will not prevent ingress and egress of marine organisms.

Status.

This is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be completed to determine the exact erosion rates, the length of the shoreline protection and the benefitted area.

PPO-2f LAKE BORGNE SHORE PROTECTION, SOUTH OF MALHEUREAUX POINT

Location.

This 90 acre project area is located in the saline marshes of St. Bernard Parish and encompasses the shore of Lake Borgne just south of Malheureaux Point (see Figure 6 on page 39).

Problems and Opportunities.

Shoreline erosion is 15 feet per year according to LGS data.

Description of Features.

A total of 6,000 feet of shoreline protection will be built about 60 feet offshore.

Benefits and Costs.

Over 20 years approximately 41 acres of marsh will be protected from erosion. In addition, 8 acres will be created as marsh accreted at a rate of three feet per year behind the shoreline protection. Approximately 3 acres of marsh will be enhanced. Thus, the total acres of wetlands benefitted will be 52. It is estimated that this project will cost $651,000. The estimated cost per benefitted acre is $12,519.

Effects and Issues.

The shoreline protection will cover about 2 acres of water bottoms. The shoreline protection will not prevent ingress and egress of marine organisms.

Status.

This is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be completed to determine the exact erosion rates, the length of the shoreline protection and the benefitted area.

XPO-72 MRGO MARSH CREATION (material from Miles 9 to 23 to jetties)

Location.

The Sound reach extends 23 miles from near Breton Island to the landward end of the jetties (see Figure 6 on page 39).

Problems and Opportunities.

The Federal Standard for the Sound Reach is the 1991 Plan - partially confined marsh creation behind the south jetty with material from miles 20-23, and "island" creation with material from miles 0 to 20 with the material concentrated at two-mile intervals. The average annual cost of this Federal Standard plan is $4391,000. It will be possible to place all the material from miles 0 to 23 behind the south or north jetty at a height conducive to marsh creation. However, the cost of using the material from mile 0 to mile 9 to create marsh is very high.

Benefits and Costs.

The acreage created has not yet been estimated because of the difficulty of determining such a number. Marsh creation behind the jetties is estimated to cost $16,477,000.

Effects and Issues.

Material dredged from miles 0 to 20 is now used to make a row of "islands" across the sound. It is uncertain if these will vegetate with marsh plants. If the material is pumped behind the jetty, it will be in water shallow enough to create marsh.

Status.

This will be part of the Restoration Plan and a candidate for future Priority Lists.

XPO-74 BIENVENUE MARSHES

Location

This 2,400 acre area of brackish marshes and ponds is located in Orleans and St. Bernard parishes between the GIWW, Paris Road, the 40-Arpent Levee, and the IHNC (see Figure 6 on page 39).

Problems and Opportunities.

This marsh subsided dramatically between 1958 and 1974 and over half the area is now shallow open water. The remaining marsh, especially that in St. Bernard Parish is very low and highly stressed. The entire area needs sediment badly.

Description of Features.

All the material that is maintenance dredged from MRGO from miles 60 to 66 will be placed in the ponds in this area to create 450 acres of marsh over 20 years. It is possible that sometime in the future, additional storm water from Orleans Parish will be pumped into B. Bienvenue and then into the 300 acre marsh in Orleans Parish (or even into St. Bernard Parish) to nourish this eroding marsh and purify the water.

Benefits and Costs.

The reestablishment of 450 acres of marsh in what is now ponds will benefit the entire ecosystem system because so much of the marsh has been lost. The benefits of pumping additional stormwater into the marsh are unknown. The disposal of the MRGO material in this marsh is the Federal Standard (the least cost, environmentally acceptable plan) for this reach. Thus, the disposal will be at all Federal cost and not funded under the CWPPRA. The cost of pumping additional stormwater into the marsh is unknown.

Effects and Issues.

The ponds that were filled to create marsh will no longer be available to aquatic organisms. The possibility of using the marsh for purification must be pursued with both parishes.

Status,

This project is part of the Restoration Plan and will be a candidate for a future Priority List. The feasibility of using some of the Bienvenue marsh for stormwater purification could be pursued under Section 307 of the Water Resources Development Act of 1992.

XPO-80a LOWER PEARL SEDIMENT TRAPPING

Location.

This 11,312 acre area is a mixture of 9,715 acres of fresh, intermediate, and brackish marshes and 1,597 acres of shallow ponds (see Figure 5 at end).

Problems and Opportunities.

The lower portion of the Pearl Basin has been losing marsh at a rate of 0.18 percent per year since 1974. Subsidence seems to be playing a role in this loss.

Description of Features.

Three miles of brush fences will be placed in the open ponds in the area. Bulrush will be planted on either side of the fences.

Benefits and Costs.

The brush fence and plantings will trap the sediments carried by the Pearl River so at the end of 20 years there will be 55 acres of marsh created. SAV coverage will increase over an additional 524 acres and 2,361 acres will be enhanced. The total benefitted acres will be 2,940. The project is estimated to cost $660,000. The cost per benefitted acre will be $214.

Effects and Issues.

The brush fence will cover about an acre of water bottoms, but will not hinder the ingress or egress of marine organisms.

Status.

This project is part of the Restoration Plan and will be a candidate for a future Priority List.

SUPPORTING LONG-TERM PROTECTS

PPO-17 AMITE/PETITE AMITE SWAMP RESTORATION

Location.

The proposed project is a 49,000 acre area located in Livingston Parish. The area is bounded on the north by the Amite River drainage, on the south by the Petite Amite and Blind Rivers, and on the east by Lake Maurepas (see Figure 4 on page 38).

Problems and Opportunities.

Studies will need to be made to determine any possible hydroperiod problems. If such problems exist, a hydrologic restoration project should be developed. Herbivory control will probably also be necessary.

Description of Features.

These are unknown at this time.

Benefits and Costs.

Cypress regeneration will be improved in the 49,000 acre Amite/Petite Amite swamp. The costs of such a study and project are not known at this time.

Effects and Issues.

None

Status.

This project has not proceeded beyond the conceptual stage at this time.

PPO-36 GULF INTRACOASTAL WATERWAY BANK STABILIZATION

Location.

This 890 acre project lies in the brackish marshes and ponds in Orleans Parish along the GIWW from the MRGO to the Rigolets (see Figure 5 on page 38).

Problems and Opportunities.

Much of the south bank of the GIWW is eroding at a rate of about five feet per year. In some areas, erosion is up to 10 feet per year. There are places where the bank will break through into a complex of ponds and increase interior erosion from the existing rate to a rate which existed earlier - 0.32 percent per year.

Description of Features.

Approximately six miles of bank protection will be placed at 10 sites along the GIWW. The stabilization will consist of filter fabric, a shell or aggregate core, and three feet of armor stone. None of this work duplicates any proposed under the Alligator Point or Cutoff Bayou Marsh Restoration.

Benefits and Costs.

The shoreline protection will prevent the loss of 177 acres along the shoreline over 20 years. The shoreline protection is expected to accrete two feet per year which will create 44 acres of marsh. By stopping breakthroughs into interior marsh, about 28 acres of marsh will be saved. SAV will cover an additional 50 acres and approximately 50 acres of marsh will be enhanced. Thus, a total of 321 acres will be benefitted. This project will be enhanced by the Bonnet Carre Freshwater Diversion. The reconnaissance level cost is estimated to be $7866,000. The estimated cost per benefitted acre is $24,567.

Effects and Issues.

The bank stabilization and plugs will not inhibit ingress and egress of marine organisms nor will it prevent sediment from entering the area because numerous other pathways will still exist. Sedimentation may actually occur behind the shoreline protection.

Status.

This project is part of the Restoration Plan and will be a candidate for future Priority Lists. A feasibility study must be done to verify the erosion rates, determine the exact length of the shoreline protection and to define the benefitted area.

XPO-59 NORTH SHORE MARSH RESTORATION WITH DREDGED MATERIAL

Location.

This project will be located somewhere on the north shore of the lake, probably in St Tammany Parish.

Problems and Opportunities.

Marsh creation be considered if and when any of the Corps maintained channels on the north shore of the lake are maintained. At the present there is no scheduled maintenance for Bayous Bonfuca and Lacombe and the Tchefuncte and Tangipahoa River.

Description of Features.

Dredged material will be placed in shallow ponds in the marsh at a height conducive to marsh creation. Marsh creation with dredged material is being considered at both Eden Isles East and Port Louis. s.

Benefits and Costs.

These are unknown at the present.

Effects and Issues.

Many of the existing ponds on the north shore support SAV. In addition, there are extensive seagrass beds in the lake which will be harmed by the dredging and disposal.

Status.

This is part of the Restoration Plan. It is a project to be considered in the future after we monitor the shoreline protection which is proposed for most north shore marshes.

XPO-60 ASCENSION PARISH SWAMP RESTORATION

Location.

The 56,800 acre area covered by this project consists of all the swamps in Ascension Parish (see Figure 4 on page 37).

Problems and Opportunities.

Studies will need to be made to determine any possible hydroperiod problems. If such problems exist, a hydrologic restoration project should be developed. Herbivory. control will probably also be necessary.

Description of Features.

These are unknown at this time.

Benefits and Costs.

The benefits and costs of such a study and project are not known at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-61 ST. JAMES AND ST. JOHN PARISHES SWAMP RESTORATION

Location.

The 53,200 acre area covered by this project consists of swamps in St. James and St. John Parishes west of the Reserve Relief Canal (see Figure 4 on page 37).

Problems and Opportunities.

Studies will need to be made to determine any possible hydroperiod problems. If such problems exist, a hydrologic restoration project should be developed. Herbivory control will probably also be necessary.

Description of Features.

These are unknown at this time.

Benefits and Costs.

The benefits and costs of such a study and project are not known at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-64 B. NEW ORLEANS EAST HYDROLOGIC RESTORATION, I-10 TO LAKE

Location.

The project area consists of 3,700 acres of fresh and intermediate marsh and ponds in eastern Orleans Parish between I-10 and Lake Pontchartrain and between Paris Road and the South Point to GIWW levee (see Figure 5 on page 38).

Problems and Opportunities.

This area is impounded by hurricane protection levees. However, it has not suffered the severe subsidence that has occurred in the B. Sauvage NUWR to the south. It has a very low erosion rate - no erosion was measured from 1983-90 and only 0.175 percent per year occurred from 1974-83. At the present time, there is no obvious problem that needs a solution.

Description of Features.

These are unknown at this time.

Benefits and Costs.

These are unknown at this time.

Effects and Issues.

The adjacent lakeshore has been proposed as a possible site for a new international airport. This development will severely impact the marsh.

Status.

This project is purely conceptual at this time.

XPO-73 MRGO BAR WETLAND CREATION

Location.

The MRGO bar channel lies off St. Bernard Parish, from near Breton Island nine miles out into the Gulf of Mexico (see Figure 6 on page 39).

Problems and Opportunities.

Approximately 4,500,000 cubic yards of material are dredged from this area annually. At the present time, it is being placed in an ocean disposal site, but concentrated as near Breton Island as possible to form a berm. It will be used for marsh creation.

Description of Features.

The material will be pumped into Breton Sound, perhaps near the jetties, to create marsh.

Benefits and Costs.

The amount of acreage that will be created is unknown at this time. This will be an extremely expensive project because of the pumping distance and the depth of the receiving waters.

Effects and Issues.

The excessive cost of this project is an issue. The 4.5 million cy of dredged material are a valuable resource, but it is uncertain if the cost of moving them to where marsh could be created will become cost effective. As technology is developed in this or other basins, the feasibility of this project will be re-assessed.

Status.

This will be left in the Restoration Plan as a possibly important project in the long term phase. In the future, a less expensive method may be found to move dredged material.

XPO-75 ST BERNARD PARISH BRACKISH MARSHES

Location.

This area of over 60,000 acres of brackish marsh lies in the center portion of the peninsula east of Lake Borgne (see Figure 6 on page 39).

Problems and Opportunities.

Since the loss rate in the St. Bernard Parish interior brackish marshes is expected to remain low, no projects are planned for this area at the present time.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

Most of the area lies within the Biloxi Wildlife Management Area and coordination will be maintained with Louisiana Department of Wildlife and Fisheries to determine what projects may be considered in the future. This project is part of the long-term phase of the Restoration Plan for the Pontchartrain Basin.

XPO-76 PONCHATOULA MARSHES

Location.

These four areas, totalling 2,800 acres, of maidencane marsh are located in Tangipahoa Parish just south of the Prairie Terrace (see Figure 5 on page 38).

Problems and Opportunities.

These fresh marshes are among the most healthy in the basin. There has been no land loss since 1932. This is the largest area of maidencane in the basin. area. These areas are listed as a separate project because they are marsh and may require separate solutions than does the surrounding swamp.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-77 GIWW NORTHERN MARSHES

Location.

This 17,000 acre area of brackish marsh lies in Orleans Parish on the north side of the GIWW from Chef Menteur Pass to the Rigolets (see Figure 5 on page 38).

Problems and Opportunities.

None at the present time. There has been essentially no natural interior loss in these wiregrass marshes. borrow pits for transportation corridors and erosion along the GIWW constitute the only loss. There are numerous circular ponds near the Rigolets that have been stable since 1932.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-78 TANGIPAHOA/BEDICO MARSHES

Location.

These fresh and intermediate marshes and wetland scrub shrub lie in Tangipahoa Parish from Bedico Creek to Middle Bayou (see Figure 5 on page 38).

Problems and Opportunities.

Essentially no land loss has occurred since 1932. But between 1978 and 1988, a strip north of North Pass and along the lake shore converted from fresh to intermediate marsh. These marshes appear to be expanding as cypress dies. In 1978, much of the area north of what is now intermediate marsh was swamp. By 1988, it was classified as wetland scrub shrub and actually consists of wiregrass, bulltongue and wild millet interspersed with palmetto, baccharis, and other shrubs. The area will receive benefits from the proposed Bonnet Carre Diversion which will reduce salinities in the area and should help reduce stress on cypress.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-79 - JONES ISLAND MARSH

Location.

This 4,500 acre fresh/intermediate marsh is located on Jones Island between North Pass and Pass Manchac (see figure 5 on page 37).

Problems and Opportunities.

There has been essentially no interior loss of marsh on this island since 1932. The shoreline erosion problem on the west end will be addressed under XPO-50b. In 3978, the entire edge of the island was classified as fresh marsh and the center was swamp. In the 1988 USFWS mapping, all of the island east of I-55 is intermediate marsh and the center of the island is bottomland scrub shrub. This indicates that the cypress is being replaced with marsh. The Bonnet Carre Freshwater Diversion should freshen these marshes.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

This project is conceptual at the present time.

XPO-80 PEARL RIVER MARSHES

Location.

This area of over 21,000 acres of fresh through brackish marshes and ponds lies at the mouth of the Pearl River in St. Tammany Parish (see Figure 5 on page 38).

Problems and Opportunities.

Since the loss rate in the Pearl River marshes is expected to remain low, no projects are planned for this area at the present time.

Description of Features, Benefits and Costs.

These are unknown at this time.

Effects, Issues, and Status.

Some of the area lies within the Pearl River Wildlife Management Area and coordination will be maintained with Louisiana Department of Wildlife and Fisheries to determine what projects may be considered in the future.

DEMONSTRATION PROTECTS

PPO-21 NEW ORLEANS EAST MARSH CREATION FOR STORMWATER

Location.

The project area is located on the Orleans Parish lakefront, immediately east of South Shore Harbor (see Figure 49 below and 5 on page 37).

Problems and Opportunities.

The Orleans Levee Board is studying the feasibility of creating wetlands in Lake Pontchartrain to treat stormwater discharge from the St. Charles Canal and construction of a barrier island in the lake to protect the wetlands and allow the public access to the lake.

Description of Features.

A series of eight wetland vegetation cells (43 acres) interspersed with eight ponding areas would be built near the shore of Lake Pontchartrain. There would also be five acres of fringing wetlands on the south side of the barrier island. Material to build these wetlands would be dredged from the lake or barged or piped from the Mississippi River. Once the land is stabilized, marsh vegetation would be planted.

Benefits and Costs.

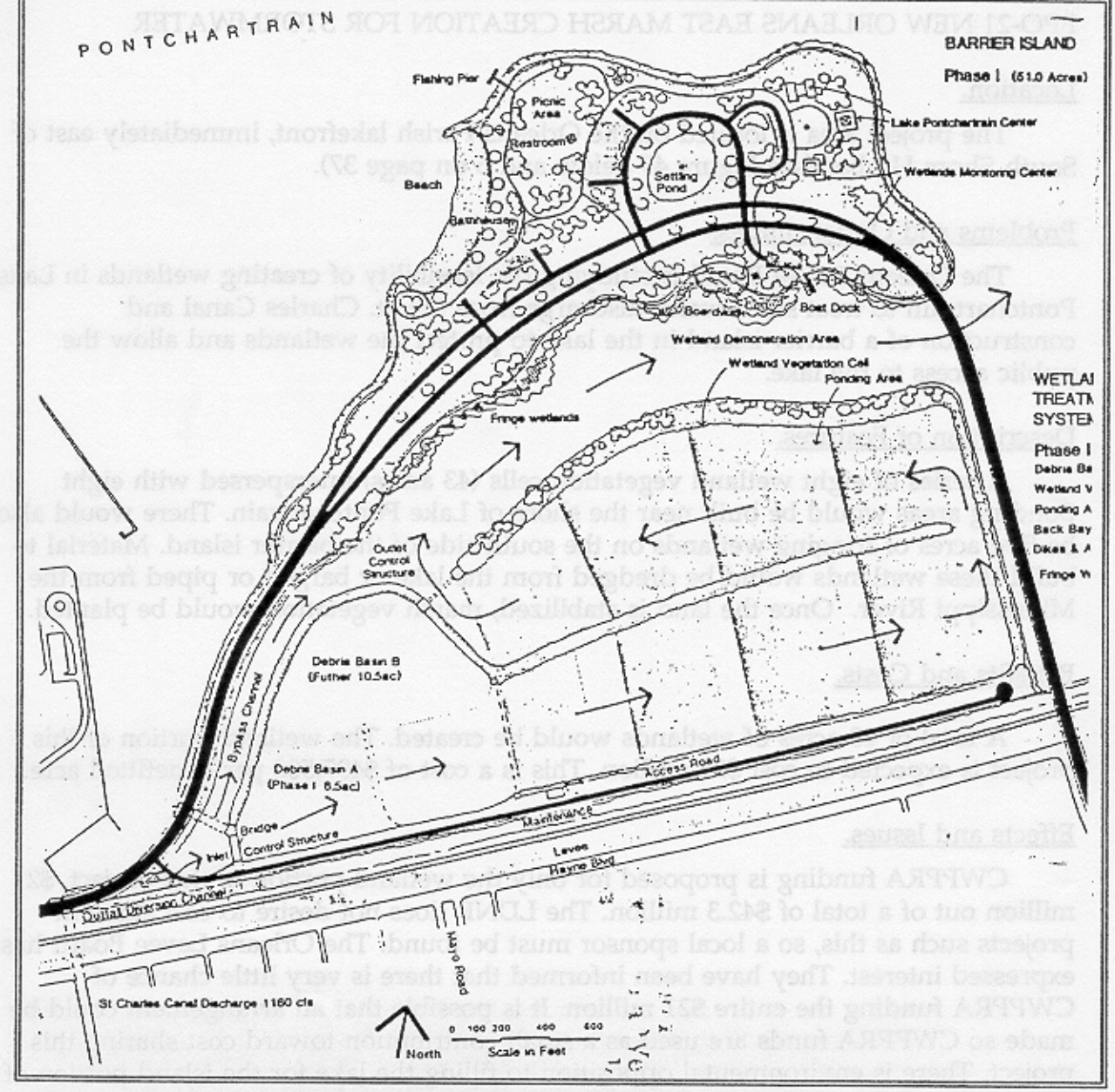
A total of 48 acres of wetlands would be created. The wetland portion of this project is expected to cost $21 million. This is a cost of $437,500 per benefitted acre.

Effects and Issues.

CWPPRA funding is proposed for only the wetland portion of this project, $21 million out of a total of $42.3 million. The LDNR does not desire to cost share in projects such as this, so a local sponsor must be found. The Orleans Levee Board has expressed interest. They have been informed that there is very little chance of CWPPRA funding the entire $21 million. It is possible that an arrangement could be made so CWPPRA funds are used as a small contribution toward cost sharing this project. There is environmental opposition to filling the lake for the island portion of this project. Some groups also feel that the LPBF demonstration project for created wetlands at Bonnabel Canal be completed before any other created wetlands for stormwater treatment are built.

Status.

The Orleans Levee Board is in the third phase of planning for this project. This phase is scheduled for completion in September 1994. This demonstration project will be a candidate for a future Priority Project List; however, it is very costly and has environmental opposition, so it may not receive CWPPRA funding.


PONTCHARTRAIN
BARRIER ISLAND
Phase I (51.0 Acres)
Fishing Pier
Picnic Area
Restroom
Lake Pontchartrain Center
Wetlands Monitoring Center
Settling Pond
Beach
Bathhouse
Boardwalk
Boat Dock
Wetland Demonstration Area
Wetland Vegetation Cell
Ponding Area
Fringe wetlands
WETLAI
TREATM
SYSTEM
Phase I
Debris Ba
Wetland V
Ponding A
Back Bay
Dikes & A
Fringe W
Outlet Control Structure
Debris Basin B (Futher 10.5ac)
Bypass Channel
Debris Basin A (Phase I 6.5ac)
Access Road
Maintenance
Bridge
Inlet
Control Structure
Levee
Payne Blvd
Outfall Diversion Channel
Hayes Road
St Charles Canal Discharge 1160 cfs
North
0 100 200 400 600
Scale in Feet

PPO-25 BAYOU ST. JOHN GRASSBEDS

Location.

This demonstration site is located in Bayou St. John on the south shore of Lake Pontchartrain in Orleans Parish (see Figure 5 on page 38).

Problems and Opportunities.

In 1985, SAV beds existed in Bayou St. John. By 1991, these beds were gone. Their disappearance could be due to urban stormwater runoff which introduces turbidity, nutrients, herbicides and heavy metals. Another contributing factor could be the construction of the hurricane protection floodgate which could have caused wave energies to increase in the mouth of the bayou. The sediments which once covered the mouth of the bayou have been replaced with a hard shell surface.

Description of Features.

Sediment fences would be placed in Lake Pontchartrain and in the mouth of the bayou. The density of fencing, angle of wave approach, and height would be varied and the amount of sediment accumulated in the area monitored. If and when sufficient sediments are deposited, the area would be revegetated with SAV.

Effects and Issues.

This demonstration could determine if SAV can be re-established in the vicinity of urban runoff.

Status.

This demonstration will be a candidate for future priority lists.

PPO-34 BONNABEL CANAL MARSH CREATION FOR STORMWATER

Location.

This demonstration is located on the south shore of Lake Pontchartrain along the Jefferson Parish shoreline where Bonnabel Canal enters the lake.

Problems and Opportunities.

Stormwater runoff from this canal, especially the first flush, is contaminated with fecal coliforms, total suspended solids, heavy metals, and pesticides and has a high biological oxygen demand. Wetlands improve water quality by filtering out such contaminants. Jefferson Parish has evaluated this site for such a demonstration. The

Benefits and Costs.

This demonstration project will analyze and confirm the effectiveness of created wetlands to economically reduce stormwater pollution in Lake Pontchartrain. The costs have not been developed at this time.

Effects and Issues.

Created wetlands to treat stormwater runoff are a state-of-the-art concept. There may be opposition by local residents to the creation of a “smelly” marsh near their neighborhood. LDNR has stated that they would not act as a local sponsor to cost share projects using created wetlands to treat stormwater runoff. Thus, a local sponsor must be found for this demonstration.

LPBF is constructing a small-scale demonstration wetland on the land near the Bonnabel Canal. If the LPBF demonstration proves feasible, Bonnabel Canal could be the site of a larger demonstration.

Status.

This demonstration will be a candidate for future priority lists.

XPO-47 AMITE RIVER DIVERSION CANAL BANK MODIFICATION

Problems and Opportunities

There are numerous areas in the basin where banks of dredged material impound swamps. One such site is north of the Amite River Diversion Canal. This 3,400 acre area of cypress and shallow ponds is located in Livingston Parish between Petite Amite River and Blind River (see Figure 50 below and Figure 4 on page 37). The north bank of the canal has impounded the swamp to the north. Cypress there are very stressed with tops dead and many broken trees. The area is about 10 percent open water.

Description of Project Features and Estimated Cost.

Gaps with a width of 50 feet will be cut every 500 feet in the north bank of the canal - about 40 gaps will be necessary.

Benefits and Costs.

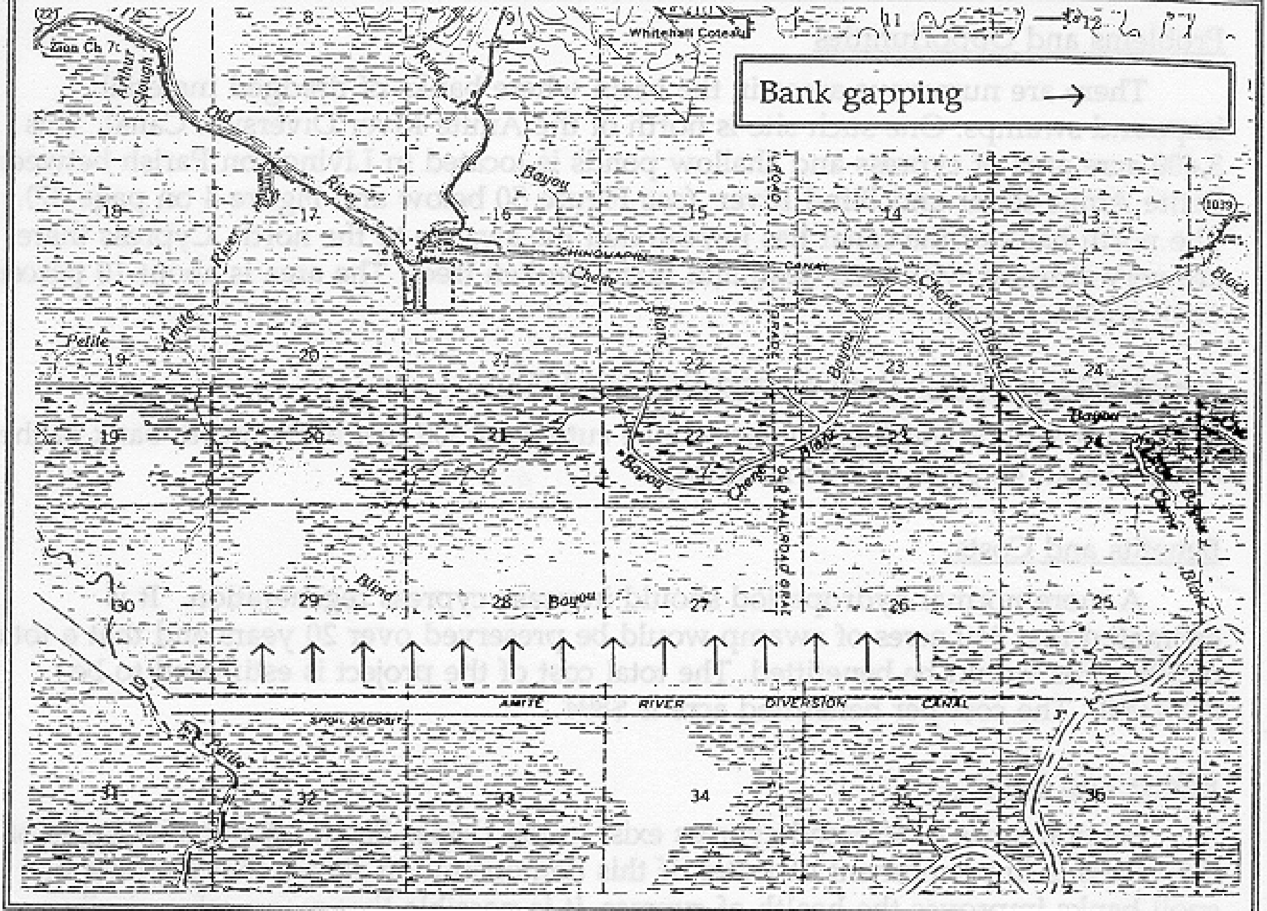
A more normal hydroperiod should increase cypress regeneration. It is estimated that 340 acres of swamp would be preserved over 20 years and that a total of 596 acres would be benefitted. The total cost of the project is estimated to be $533,000. The cost per benefitted acre is $894.

Effects and Issues.

Several areas of stressed cypress exist in the Upper Basin. A possible cause of this stress is impoundment of water. If this demonstration shows that gapping of spoil banks improves the health of cypress, it is possible that many other similar projects could be implemented.

Status.

This demonstration project will be a candidate for Priority List # 4. This is a significant demonstration because the principle it demonstrates can be used in many other areas throughout the state.



Bank gapping
Whitehall Coteau
Arthur Slough
Old River
Amite River
Bayou
CHINQUAPIN CANAL
Chene Blanc
Bayou Chene Blanc
Petite
Blind Bayou
AMITE RIVER DIVERSION CANAL
SPOIL DEPOSIT
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XPO-92 SHORELINE PROTECTION DEMONSTRATION

Location.

Anywhere in the basin where shoreline erosion is high and the substrate is soft.

Problems and Opportunities.

There are numerous areas in the basin where the shoreline of lakes is eroding at rates greater than five feet per year. The soft substrate of the lake adjacent to the eroding shoreline cannot always support one of the traditional solutions to erosion problems, rock breakwaters. In addition, there are some local groups which oppose placing rocks in these lakes. The Pontchartrain Basin provides an opportunity to compare traditional and innovative methods of shoreline protection.

Description of Features.

The following methods of shoreline protection will be tested at an appropriate site in the basin:

1) Addition of a thin layer of dredged material to the bank,
2) rock structures below the water,
3) rock structures protruding above the water,
4) bank shaving with the addition of a concrete mat placed on geotextile fabric,
5) heavy duty sediment fences,
6) gabions.

Benefits and Costs.

Neither the benefits nor costs are developed at this time.

Effects and Issues.

Since several groups objected to the reliance on hard structures in the Pontchartrain Basin, this demonstration will allow the most cost efficient method of stabilizing shorelines to be selected. This is an important demonstration because shoreline erosion is a significant cause of marsh loss in this basin.

Status.

This demonstration will be recommended as a candidate for Priority List # 4.

XPO-93 NEW ORLEANS EAST MARSH CREATION WITH BIO-SOLIDS

Location.

The location for this demonstration project is uncertain at this time. The most logical place would be in New Orleans East, near the sewerage disposal plant.

Problems and Opportunities.

All major urban areas, including New Orleans, must find methods of treating the bio-solids that remain after sewerage is treated. At the present time, Orleans Parish incinerates this material and the ashes are placed in a land fill. These bio-solids should be regarded as a resource in an area that is losing wetlands ar a rapid rate. The possibility exists that wetlands could be created with a mixture of bio-solids an dredged material.

Description of Features.

Artificial wetland soil would be created with a mixture of bio-solids and dredged material and this soil would be used to create wetlands in New Orleans East.

Benefits and Costs.

The results of this demonstration, if successful, could be applied throughout the state. The cost is unknown at this time.

Effects and Issues.

CWPPRA funding is only proposed for the portion of this demonstration involving moving of dredged material and placement of the new wetland soil. The remainder of the cost would be shared by the New Orleans Sewerage and Water Board, Tulane University, and an engineering consulting firm.

Status.

This demonstration will be a candidate for future priority lists.

DEFERRED PROTECTS

PO-1 VIOLET SIPHON ENLARGEMENT

Operation of the Violet siphon has been transferred to the Lake Borgne Levee District and the siphon is currently operating. Enlargement of the siphon is an inactive project in the State's Coastal Restoration Plan. Enlarging the structure will be considered after PO-9a, the outfall management plan, is implemented.

PO-5 SOUTHEAST LAKE MAUREPAS WETLAND

Continuous high water levels were reported in the area west of Lake Pontchartrain and north of La Place. However, field studies showed that the marsh and swamp are very healthy and show no sign of hydrologic stress. This is a project that is part of the State's Coastal Restoration Plan, but is inactive at this time.

PPO-12 LA BRANCHE WETLAND MANAGEMENT, WEST

A weir is proposed in Bayou La Branche north of Bayou Trepagnier to prevent future saltwater intrusion. Since this project overlaps with the Bonnet Carre Outfall Management Plan, it will be deferred until the results of the Bonnet Carre Outfall Management Plan are known.

PPO-20 PORT LOUIS HYDROLOGIC RESTORATION

Most of the area in St. Tammany Parish just east of the Tangipahoa Parish line was leveed and pumped in the 1958-74 period in order to grow rice and much of the marsh was lost. More areas were leveed and pumped between 1983 and 1990. The owner has applied for a permit to raise crawfish in the area. The owner is not interested in wetland restoration on his land at this time.

PPO-35 DUNCAN CANAL MARSH CREATION FOR STORMWATER

This project is deferred until the results of the demonstrations at Bonnabel Canal and in New Orleans East are known.

XPO-48 TANGIPAHOA SWAMP HYDROLOGIC RESTORATION

Water with salinities of greater than 3 ppt enters the swamps between the Tangipahoa River and Pontchatoula Creek in the late summer and early fall. This is stressing cypress and causing swamp to convert to fresh marsh or open water. The Bonnet Carre Freshwater Diversion should improve salinities in the area. It will be wise to wait until after the freshwater diversion project has had a chance to improve the salinities in the these swamps before planning a project.

XI'O-56b SEABROOK SILL

This project was proposed to reduce salinities in Lake Pontchartrain. The Bonnet Carre Diversion will not only reduce salinities in Lake Pontchartrain, but also in St. Bernard Parish. If the diversion does not prevent the formation of the dead zones in

Lake Pontchartrain as it is expected to do, consideration will be given to studying the a sill at the north end of the IHNC to achieve this.

XPO-65 ARTIFICIAL OYSTER REEFS

There is one such reef at a demonstration site on the shore of Lake Borgne. Larger demonstrations are proposed in other basins. If these demonstrations perform as expected, it is likely that these reefs will be used in other sites. They are cost competitive with other shoreline stabilization materials.

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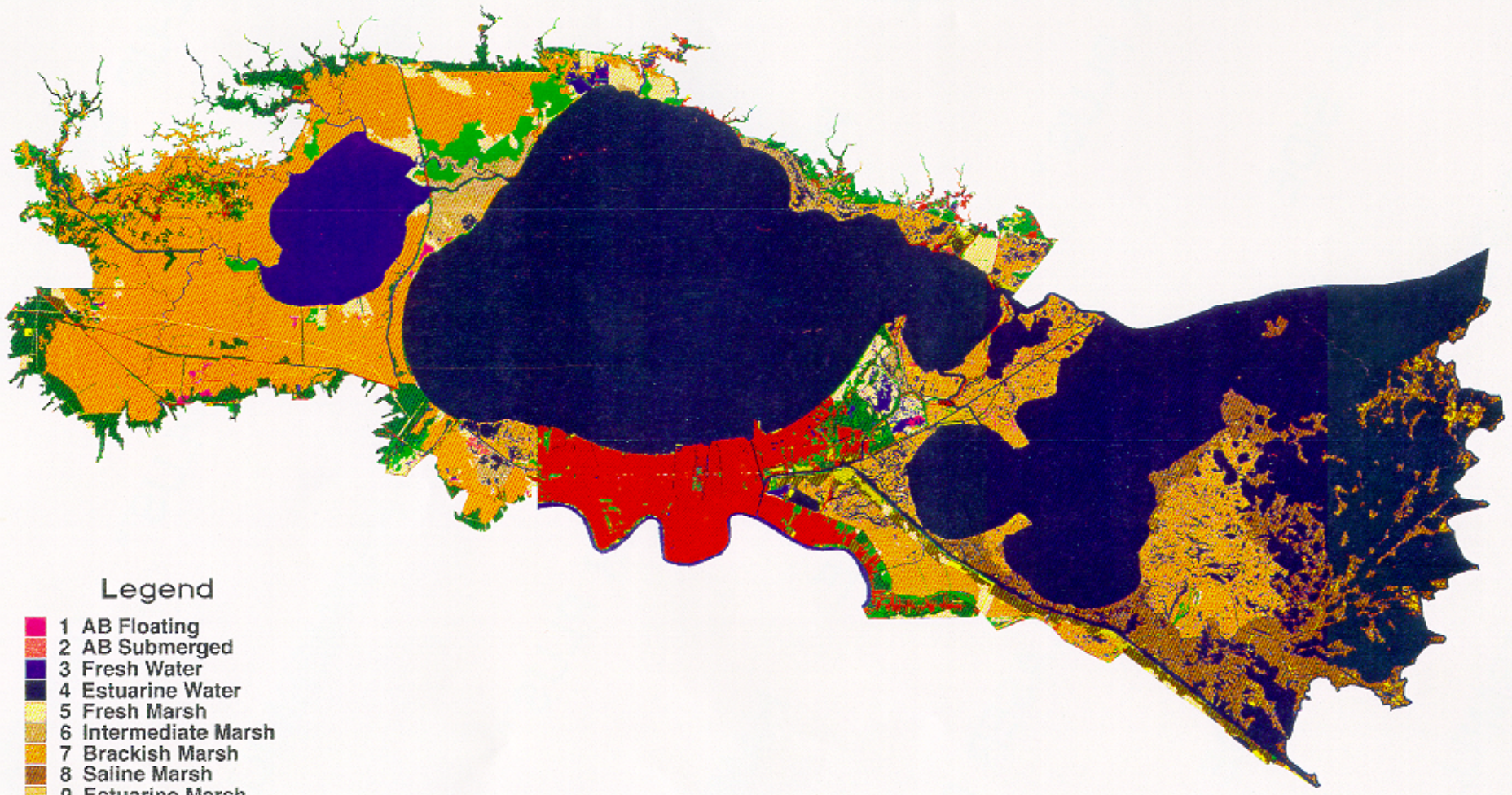

Legend

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
Pontchartrain Basin

1988 HABITAT DATA

date: April 1993

PLATE