MERMENTAU

COOPERATIVE RIVER BASIN STUDY REPORT
UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
ALEXANDRIA, LOUISIANA

APRIL 1997

MERMENTAU RIVER BASIN STUDY

ADDENDUM

Item 1. Maintenance of the existing system of levees and drainage structures along the lower Mermentau River is essential to reducing wetland losses in the basin. This objective applies to units CL-1, CL-5, CC-2, CC-3, CC-4, CC-5, CC-6, CC-7, and CC-9.

Item 2. Overpopulation of herbivores is responsible for wetland loss in units CC-1 and CC-2. An additional objective for these units is to harvest surplus nutria and muskrats to reduce losses of emergent vegetation.

Item 3. Ponding of rainwater is an increasing problem in Units CC-8 and CC-9 due to siltation of the old natural channel of the Mermentau River below Lower Mud Lake. This problem will be addressed by maintaining the existing channel and making beneficial use of the dredged material.

Item 4. An additional objective for Unit CC-11 (Hog Bayou) is to revegetate open water areas by planting appropriate species or by the construction of terraces.

Item 5. In addition to the measures considered in Alternative II residents of the basin have offered the following: 1) Modify the operational scheme of the existing Corps water control structures in the basin (Leland Bowman Lock, Schooner Bayou Lock, Calcasieu Lock, and Catfish Point Control Structure) to discharge water from the Lakes Subbasin whenever possible; 2) Install flapgated culverts at the Catfish Point Control Structure so that water can be discharged from the Lakes Subbasin during those times when operators are not on duty.

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EXECUTIVE SUMMARY

Louisiana's coastal wetlands are recognized as one of the nations most productive ecosystems in terms of biological productivity. These wetlands provide important habitat for hundreds of species of fish and wildlife as well as protect inland communities from the adverse effects of tidal surges and storms. Coastal wetlands in Louisiana's Mermentau River Basin are also valued for their underlying fields of petroleum and natural gas.

Over 19 percent of the historical wetlands in the Mermentau River Basin Study area have been lost since 1932. These losses are attributed to natural as well as man induced causes. Members of the Gulf Coast and Vermilion Soil and Water Conservation Districts, alarmed over this problem, requested the USDA Natural Resources Conservation Service to appraise the basins resources and develop alternative plans for their protection and restoration.

The Mermentau Cooperative River Basin Study is authorized under Section 6 of Public Law 83-566, as amended. Sponsors of the Study are the Gulf Coast and Vermilion Soil and Water Conservation Districts, the Cameron and Vermilion Parish Police Juries and the Louisiana Department of Wildlife and Fisheries. The Natural Resources Conservation Service worked with State, Federal and local agencies and private citizens in compiling information and preparing this document.

The study analyzed three alternatives: 1) No Action; 2)Large Scale Hydrologic Management; and 3) Hydrologic Unit Treatment. The study does not contain an economic evaluation of each alternative nor of each element within an alternative. The No Action alternative contains information on projected wetland losses without project conditions. The Large Scale Hydrologic Management alternative describes measures that address problems associated with sustained high water levels in the Grand and White Lakes area. The Hydrologic Unit Treatment alternative contains information on environmental conditions, current problems, and potential solutions for the 86 hydrologic units in the basin.

Solving the problem of marsh loss in the Mermentau basin will require a concerted effort by private landowners, federal and state agencies, and local governments. Implementation of proposed measures is dependent upon the willingness of private landowners and local organizations to request assistance and assume a leadership role in project development. Technical assistance for implementation can be obtained through various federal, state, and local agencies. Financial assistance may be available from public or private sources.

INTRODUCTION

BACKGROUND

The cumulative impacts of human activities and, to a lessor extent, natural processes have led to the loss of 163 square miles of vegetated wetlands in the Mermentau Basin since 1932. Historically, floods would occur in the spring and inundate wetlands with fresh water. As water levels receded salt water would slowly move into the basin through meandering bayous especially during periods of low rainfall in late summer and early fall. The basin once functioned as a nursery for a variety of marine species that favor a low salinity environment. Projects initiated by various interests have disrupted the basin's natural processes. Extended periods of high water in the upper basin and saltwater intrusion in the lower basin have imposed physiological stresses on vegetated wetlands resulting in their conversion to open water. Access for estuarine species has been severely restricted.

In March 1991 representatives from local, state and federal agencies met to discuss factors causing accelerated wetland loss in the Mermentau Basin. Additionally, each group gave a briefing on their respective future monitoring and planning efforts in the area. The group reached the following conclusions: 1) additional computer hydrology models were needed to develop alternatives that would lower water levels in Grand and White Lakes; and 2) a cooperative river basin study conducted by the Natural Resources Conservation Service (NRCS) may provide the means to develop a basin wide plan to reduce wetland loss.

The NRCS received a request from the Gulf Coast and Vermilion Soil and Water Conservation Districts to initiate a study of the Mermentau River Basin. A study start was granted in October 1992 for that portion of the basin south of the Gulf Intracoastal Waterway.

AUTHORITY

The Mermentau Cooperative River Basin Study is authorized under Section 6 of Public Law 83-566 (PL-566), as amended. Public Law 83-566 was passed by the 83rd Congress in August, 1954. It authorizes the United States Department of Agriculture (USDA) to cooperate with other federal, state, and local agencies in making surveys and investigations of the watersheds of rivers and other waterways. Such surveys form the basis for planning coordinated water and related land resource development programs. Planning procedures are based on the Principles and Guidelines that were signed by the President on February 3, 1983 and became effective on July 8, 1983.

ACKNOWLEDGMENTS

Sponsors for the study are the Gulf Coast and Vermilion Soil and Water Conservation Districts, Cameron Parish Police Jury, Vermilion Parish Police Jury, and the Louisiana Department of Wildlife and Fisheries. The Natural Resources Conservation Service has overall responsibility for the study.

Cooperation, data, and assistance for the Study were provided by the following State and Federal agencies and private entities:

- Miami Corporation
- Stream Property Management Inc.
- Vermilion Corporation
- Louisiana Cooperative Extension Service
- Louisiana Department of Natural Resources - Coastal Restoration Division
- Louisiana Department of Wildlife and Fisheries - Rockefeller Refuge
- Louisiana State University - Center for Coastal, Energy, and Environmental Resources
- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- U.S. Forest Service
- U.S. National Marine Fisheries Service

OBJECTIVES OF THE STUDY

The objectives of the study are to facilitate and coordinate the orderly conservation and restoration of wetlands in the lower Mermentau River Basin. The study will:

1. Describe the ecological, economic, cultural, and social resources of the basin.

2. Provide a broad scale analysis of the ecological problems in the basin.

3. Describe alternatives to the basin's problems that are environmentally and economically sound and socially acceptable to local residents.

4. Identify various federal, state, and local agencies and organizations that provide technical and financial assistance for implementing solutions to wetland resource problems.

USE OF THE REPORT

The Natural Resources Conservation Service will use the report as a planning aide in the development of future wetland restoration projects. The report may be useful to other agencies and groups in identifying areas that could benefit from their respective programs.

Maps

The report has a folder in the back cover to hold maps that will help the reader to achieve a better understanding of the basin. The maps can easily be removed from the folder for referral when reading about a particular section.

General Soils Map. This map depicts the soil associations found within the basin. This information is useful in planning for engineering structures, locating important grazing areas and identifying marsh types.

Hydrologic Unit Location Map. This map depicts the boundaries of the 86 hydrologic units.

1984 Filtered Wetland Loss/Gain Map. This map illustrates changes in marsh, land, and water ratios in the project area from 1956-1984.

Appendices

The report has several appendices that contain in-depth information which may be beneficial to some readers. These supplements may be useful in understanding the report or for further research on the river basin.

Appendix A - Rangeland of the Mermentau Basin. This appendix reports on the impact of range use and livestock production within the basin. It includes utilization of livestock on specific soil and wetland types, management practices, and economic and cultural impacts of ranching.

Appendix B - List of Vegetative Species Common To The Mermentau Basin. This appendix contains a taxonomic listing of the plants found in the study area. It also provides the scientific name of plants mentioned in the document by common name only.

Appendix C - List of Common Fish and Wildlife Species In The Mermentau Basin. This appendix provides a taxonomic listing of fish and wildlife species found in the basin. Common and scientific names are given for marine invertebrates, fish, amphibians, reptiles, birds and mammals.

PHYSICAL SETTING

LOCATION AND SIZE

The Mermentau Basin study area is located in southwest Louisiana in Cameron and Vermilion Parishes (Figure 1). The 663,000 acre basin is bound on the north by the Gulf Intracoastal Waterway, on the east by Freshwater Bayou Canal, on the south by the Gulf of Mexico and on the west by Louisiana State Highway 27.

The Grand Chenier and Pecan Island ridge systems are linked by Louisiana Highway 82 and divide the basin into two distinct subbasins along an east-west line. The Lakes Subbasin lies to the north of this line and includes Grand and White Lakes and adjacent wetlands. The Chenier Subbasin lies to the south of this line and includes Hog Bayou, Rockefeller Refuge, and other marsh and open water areas south of Pecan Island.

CLIMATE

The Mermentau Basin is part of the humid subtropical climatic region of the southern United States. Its climate is influenced by latitude, the large land mass to the north, and primarily the warm waters of the Gulf of Mexico. Warm moist air from the Gulf is frequently displaced during winter and spring by incursions of continental polar air but these outbreaks are usually of short duration.

Winters are usually mild with an average January temperature of 51°_Fahrenheit (F). However, minimum temperatures two years out of ten will drop to 19°_F. A temperature extreme of 10°_F has been recorded at Rockefeller Wildlife Refuge.

The average temperature in the summer is 73.5°_F, but temperatures of 90°_ or higher can be expected from May through September. In two years out of ten the temperature in August will rise above 97° F, with a maximum of 102° F recorded at Rockefeller Wildlife Refuge.

The average annual precipitation is 61.2 inches and is evenly distributed throughout the year. Precipitation in amounts of .1 inch or greater occurs on the average of 67 days each year. Snowfall is extremely rare.

The temperature of the basin's soils is classified within the thermic regime, which means the growing season is from February to October. The growing season is defined as the portion of the year that soil temperatures are above biologic zero (41º F).

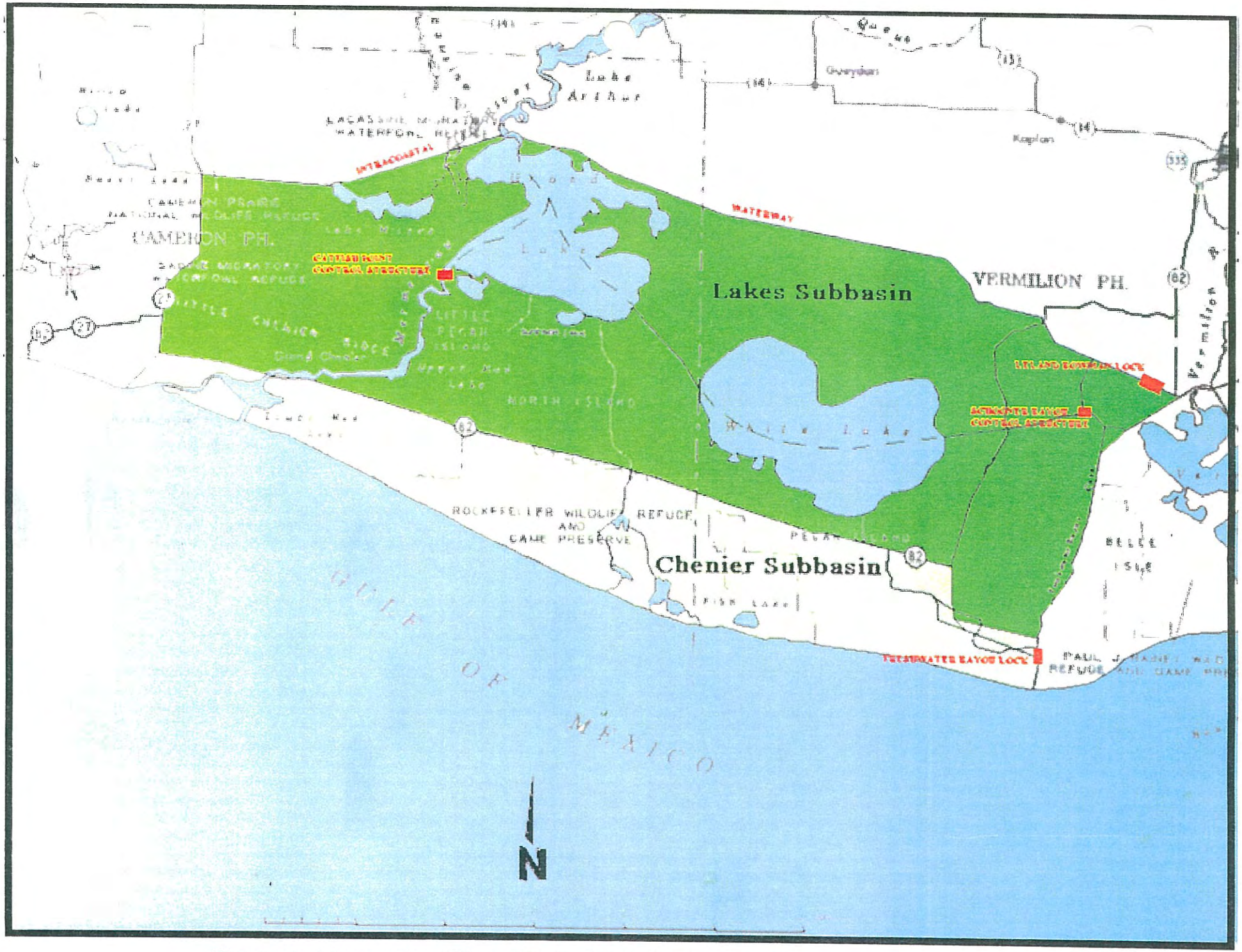

Figure 1. Mermentau River Basin Study Location Map

GEOLOGY

The Mermentau Basin is in the West Gulf Coastal Plain geomorphic province. The surface sediments dip gently toward the Gulf and are late Pleistocene to Holocene in age. Deposition of the Pleistocene formation and Holocene alluvium was regulated by changes in sea level caused by the advance and retreat of continental glaciers.

Holocene Sequence

A wedge of sediments deposited during the Holocene period records the final stage of postglacial sea level rise and its subsequent standstill at the present elevation. The basal part of the wedge consists of transgressive brackish and marine deposits laid down on the underlying Pleistocene surface. This occurred as the sea rose from -17 feet 5,600 years ago to its present level about 3,000 years ago. Coincident with reaching this present elevation an influx of sediment carried by longshore currents from the Mississippi River brought about a general progradation of the coast. During times of abundant sediment supply, the shore moved rapidly seaward; when sediment influx was slight wave attack slowed or halted shoreline advance. Cheniers or beach ridges formed during the periods of reduced sediment influx. These ridges record the progressive changes in the configuration of the shoreline and range in age from 2,800 to less than 300 years.

Mississippi River Influence

It has long been recognized that the chenier plain is constructed of sediments contributed chiefly by the Mississippi River and that pulsations in sediment from this source are responsible for alternations of coastal outbuilding. Sediment pulsations are the result of widespread shifts in the position of the river's mouth as it moved laterally across the deltaic plain. Periods of rapid progradation resulted when the river discharged into the western part of the plain. Conversely, intervals of coastal stability and local retreat occurred when the river shifted to a more easterly position.

According to dated samples, the initial outbuilding of the basin's northern most wetlands occurred when the river occupied the Teche subdelta 3,800 to 2,800 years ago. When the river shifted from the Teche subdelta to the St. Bernard subdelta on the opposite side of the deltaic plain progradation ceased and the 2,800 year shoreline was formed. Remnants of this shoreline include Little Pecan Island and Little Chenier.

The interval from 2,800 to 1,200 years ago is represented in the basin by a series of alternating wetlands and chenier complexes culminating in the 1,200 year shoreline. This shoreline can be traced with only minor interruptions for more than 50 miles from the Calcasieu River to a position about 10 miles east of White Lake along the Oak Grove-Grand Chenier-Pecan Island trend. The stability of this shoreline suggests that the main discharge of the river was located on the eastern side of the deltaic plain and that flow of sediment to the west was diminished.

Core samples indicate that about 1,200 years ago the main outlet of the Mississippi shifted to the Lafourche subdelta. From 1,200 to 600 years ago discharge from this subdelta and from the Plaquemines-Modern system, which was becoming established, brought a tremendous influx of sediment to the basin. It was during this period that the wide expanse of wetlands which form the Rockefeller Wildlife Refuge and other areas south of Louisiana Highway 82 were developed. The general stability of the present shoreline during the past 600 years attests to the abandonment of the Lafourche subdelta and a shift in the main discharge to the modern delta.

The rapid progradation taking place near the mouth of the Atchafalaya River is also having an effect on the shoreline in the Mermenatu Basin. The Atchafalaya River is the main distributary of the Mississippi River north of the Head of Passes and in recent years has diverted progressively larger quantities of sediment to the gulf. Course sediments are deposited chiefly in the Atchafalaya Basin while silt and clay particles are swept westward by longshore currents and deposited in mudflats. The increased rate of mudflat development in the basin is evident between Rollover Bayou and DeWitt Canal.

Chenier Development

The development of cheniers occurs in progressive stages. They may originate as barrier islands or as land-tied spits which project as gently curving arcs into a bay opening. As the bay fills with sediment and progradation proceeds, secondary spits with little curvature build further into the bay to develop the bifurcating pattern typical of relic shorelines in the basin. Cheniers develop as elongate beaches along straight or gently curving coasts. They often diverge at the site of beach and mudflat deposition and shift laterally along the shore. Accretionary ridges build seaward of the first ridge when the coastline remains stable for long periods. Examples of these compound cheniers are Creole Ridge and Oak Grove Ridge. Incipient cheniers are formed sporadically along exposed mudflats. These small ridges

consist of shell and sand from the gulf bottom that have been deposited over the marsh during storm events.
Cheniers usually rest on shallow gulf bottom shoreface deposits. Landward expansion of a ridge will cause it to extend over adjacent wetlands. Chenier stratigraphy indicates that initial development occurs as accretionary ridges formed along relatively stable segments of the shore. This takes place immediately seaward of previously formed mudflats through shoaling of gulf-bottom deposits. The addition of sand and shell fragments on the front slope ensures the continued seaward growth of the ridge. During periods of storm activity waves override or breach the ridge and deposit sediment and shell on the landward side of the chenier. These events cause the landward margin of the ridge to be irregular.

Beach ridges often form down-current from actively eroding marsh headlands. Active shoreline erosion on Rockefeller Wildlife Refuge is a major supplier of course sediment for the modern beach in the vicinity of the Mermentau River. Finer grained sediments are swept further down the coast to build mudflats west of the Calcasieu River. Mulberry Island, located southeast of White Lake, is another example of a chenier system that has resulted in part from upcurrent erosion of a prominent headland. This ridge was formed by the truncation of older Mississippi subdeltas to the east. Core samples indicate that the system of closely spaced cheniers north of the 1,100-year shoreline west of White Lake may be related to erosion of a marsh headland. This promontory existed south of White Lake prior to formation of the 1,100-year shoreline.

SOILS

Soils in the study area occur in an orderly pattern that is related to geology, landforms, relief, climate, hydrology, vegetation, and salinity regimes. For ease of discussion the soils in the basin are grouped into associations (General Soils Map). A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil. The individual soils in one association may occur in another but in a different pattern.

The soil associations have been grouped into six general kinds of landscapes for interpretive purposes. Table 1 provides information on these landscape groups and related soil associations. Descriptions of the associations within each group follow this table.

Table 1. - Distribution of soils in the Mermentau Basin.

SOIL GROUP	ACREAGE	PERCENT
Gulf Coast Prairie Soils		
052 Crowley-Mowata	4,427	0.7%
044 Kaplan-Midland-Judice	4,467	0.7%
Chenier and Beach Ridge Soils		
049 Mermentau-Hackberry	33,582	5.1%
Pumpout Soil		
035 Gueydan	5,613	0.8%
Fresh Marsh Soils		
018 Allemands	228,021	34.4%
037 Ged	12,387	1.8%
045 Larose	48,219	7.3%
Brackish Marsh Soils		
020 Banker	32,670	4.9%
046 Clovelly-Lafitte	40,246	6.1%
028 Creole	43,346	6.5%
Saline Marsh Soil		
055 ScatLake	94,871	14.3%
Water	115,215	17.4%
Total	663,064	100.0%

018 Allemands. This mapping unit is composed of very fluid organic and mineral soils, very poorly drained with a peat or clayey surface layer and mucky and clayey underlying material. Soils in this map unit are found in fresh marshes and are about 69% Allemands, 21% Larose and 10% soils of minor extent.

Allemands soils are organic and have a moderately thick upper layer composed of dark brown, very fluid mucky peat. Succeeding layers include a black very fluid muck, a dark grayish brown very fluid muck, and a buried surface layer of black, very fluid mucky clay. The underlying material is gray, very fluid clay.

Larose soils are mineral with a surface layer of dark gray, very fluid mucky clay followed by a black, very fluid mucky clay. The underlying material is a dark gray, very fluid clay.

Of minor extent are Aquents and Udifluvent soils on spoil banks along waterways and the very poorly drained Bancker, Clovelly, and Ged soils.

020 Bancker. This level, very poorly drained association has a mucky surface layer with a clayey underlying material. These soils are slightly to very fluid mineral soils found in brackish marshes. This map unit is about 75% Bancker soils, 20% Creole soils, and 5% soils of minor extent.

Bancker soils are very fluid mineral soils with a surface layer of very fluid muck that is dark grayish brown in the upper part and black in the lower part. The underlying layer is a very fluid clay that gradates in color from dark gray to dark greenish gray to greenish gray.

028 Creole. This level, very poorly drained mapping unit has a mucky surface layer and a slightly fluid to very fluid, clayey, sandy and loamy underlying material. This map unit is found in brackish marshes and is 92% Creole soils and 8% soils of minor extent.

Creole soils have a surface layer of dark gray, very fluid mucky clay and a subsurface layer of very dark gray, slightly fluid clay. The underlying subsurface material is gray, mottled, slightly fluid clay in the upper part; gray, mottled, very fluid clay in the middle part; and gray, very fluid loamy fine sand, clay loam, and clay in the lower part.

Soils of a minor extent are the Aquents and Udifluvents on spoil banks along waterways; Bancker, Larose, and Scatlake soils in adjacent wetlands and Hackberry soils on low ridges.

035 Gueydan. This map unit consists of soils that were in freshwater wetlands and are now protected from flooding by levees and pumps. These soils have subsided as a result of drainage. This map unit is about 95% Gueydan soils and 5% soils of minor extent.

Gueydan soils have a thin surface layer of black muck. The subsoil is grayish brown silty clay in the upper part, dark gray in the middle and gray clay in the lower part. The next layer is dark gray, mottled silty clay followed by gray, mottled clay.

Soils of minor extent are poorly drained Midland soils on slightly raised positions and the very poorly drained Ged soils in marshes.

037 Ged. The soils in this map unit are very poorly drained, ponded most of the time, and frequently flooded. This unit is found in freshwater marshes and is about 86% Ged soils and 14% soils of minor extent.

Ged soils have a surface layer of very dark gray, very fluid mucky clay and a subsurface layer of very dark gray, slightly fluid clay. The subsoil is gray, mottled, firm clay.

Of minor extent are the Allemands, Gentilly, and Larose soils in nearby freshwater and brackish marshes and the Judice, Midland, and Morey soils in higher positions than the Ged soils. Also included are Aquents and Udifluvents on spoil banks along waterways.

044 Kaplan-Midland-Judice. This somewhat poorly drained map unit is found on low ridges, broad slightly convex ridges, broad flats, and in swales and depressional areas on the Gulf Coast Prairie. The unit is about 38% Kaplan soils, 28% Midland soils, 21% Judice soils and 13% soils of a minor extent.

Kaplan soils are on broad ridges and have a surface layer of dark grayish brown silt loam. The subsurface layer is dark gray, mottled silt loam. The subsoil is dark gray, mottled silty clay loam in the upper part; grayish brown mottled silty clay loam in the middle; and light brownish gray silty clay loam in the lower portion.

Midland soils are on broad flats and have a surface layer of dark grayish brown silty clay loam. The subsoil is dark gray, mottled silty clay loam in the upper part; and gray mottled silty clay in the remainder.

Judice soils are in depressional areas and have a surface layer of very dark gray, mottled silty clay loam. The subsurface layer is very dark gray, mottled silty clay. The subsoil is dark gray, mottled silty clay in the upper section; grey, mottled silty clay in the middle; and gray, mottled silty clay loam in the lower section.

Soils of minor extent are Crowley soils on ridges and side slopes, Ged soils in marshy areas, Gueydan soils in drained marshes and Mowata and Morey soils on broad flats.

045 Larose. The soils in this map unit are mineral and found in freshwater marshes which are ponded most of the time and frequently flooded. Larose soils comprise 93% of this unit with the remainder being soils of minor extent.

Larose soils have a surface layer of very dark grayish brown, very fluid muck. The next layer is very dark gray, very fluid mucky clay. The underlying material is very dark gray and grey, very fluid mucky clay and clay.

Soils of minor extent are Aquents and Udifluvents on spoil banks along waterways and the Allemands, Bancker, Clovelly,

Ged, and Scatlake soils in nearby freshwater, brackish, and saline marshes.

046 Clovelly-Lafitte. This map unit is composed of very fluid organic soils found in brackish marshes. It is about 60% Clovelly soils, 32% Lafitte soils, and 8% soils of a minor extent.

Clovelly soils have a moderately thick organic layer of very fluid muck. They are dark grayish brown in the upper part, very dark grayish brown in the middle part, and black in the lower part. The next layer is black, very fluid mucky clay. The underlying material is dark gray, very fluid clay.

Lafitte soils have a thick organic layer of very dark grayish brown and black, very fluid muck. The underlying material is very dark gray, very fluid mucky clay.

Of minor extent are the Aquents and Udifluvents on spoil banks along waterways and the very poorly drained Andry, Banker, Delcomb, and Scatlake soils in marshes.

049 Mermentau-Hackberry. Soils in this map unit are found on low ridges, on the toe slopes of ridges and in swales between ridges. This unit is found in areas parallel to the coastline of the Gulf of Mexico. Mermentau soils makeup 72% of the total unit while Hackberry soils account for 15% and soils of a minor extent 13%.

Mermentau soils have a surface layer of black or very dark gray clay and a subsoil of gray, mottled clay. The substratum is grayish brown, mottled fine sandy loam in the upper part; gray, mottled sandy loam in the middle; and gray, mottled clay loam in the lower portion.

Hackberry soils have a surface layer of very dark gray sandy clay loam or fine sandy loam. The subsurface layer is dark grayish brown fine sandy loam. The subsoil is brown, mottled loamy fine sand in the upper part; mottled grayish brown fine sandy loam in the middle; and brown, mottled fine sand in the lower part. The substratum is brown and grayish brown fine sand in the upper and middle parts and dark greenish gray and olive sand in the lower part.

Soils that occur in minor amounts include Bancker, Creole, Larose, and Scatlake soils in marshes and the somewhat excessively drained Chenier soils on ridges.

052 Crowley-Mowata. The soils in this map unit are found on broad, slightly convex ridges, on broad flats, and along drainageways on the Gulf Coast Prairies. The unit is about

55% Crowley soils, 34% Mowata soils, and 11% soils of minor extent.

Crowley soils occur on broad, slightly convex ridges; on side slopes of low ridges; and on broad flats between ridges. These soils are level, nearly level, and very gently sloping and somewhat poorly drained. They have a surface layer of dark grayish brown silt loam. The subsurface layer is grayish brown, mottled silt loam. The subsoil is gray, mottled silty clay in the upper part; and gray, mottled silty clay loam in the remainder.

Mowata soils are on broad flats and along drainageways. These soils have a surface layer of dark grayish brown, mottled silt loam. The subsurface layer is dark gray silt loam. The subsoil is dark gray, mottled silty clay loam and silt loam in the upper part; gray, mottled silty clay in the middle; and mottled gray and yellowish brown silty clay loam in the lower part.

Of minor extent in this map unit are the Kaplan soils on broad ridges, and the poorly drained Judice, Midland, and Morey soils on broad flats.

055 Scatlake. This map unit is composed of very fluid mineral soils in saline marshes. Scatlake soils make up 93% of the mapping unit with 7% soils of minor extent.

Scatlake soils have a surface layer of dark gray, very fluid mucky clay. The underlying material is gray, very fluid clay.

Soils of minor extent include Aquents and Udifluvents on spoil banks along waterways; beaches along the Gulf of Mexico; and the Bancker, Clovelly, and Creole soils in nearby brackish marshes. The Bancker soils make up the largest acreage of minor soils.

EXISTING RESOURCES

AGRICULTURAL RESOURCES

The Mermentau Basin has the natural resources to support a viable agricultural economy. Gross farm revenue for Cameron and Vermilion parishes totaled over $53,000,000 in 1992 (figures not available by river basin). Approximately 110,000 acres are used as rangeland for beef cattle and 11,000 acres are in a rice/cattle rotation.

Since 1945, the average size farm in the basin has steadily increased while the number of farmers has decreased. Information from the 1992 Census of Agriculture indicates that farm production expenses for beef cattle producers has increased 10% while net returns have decreased 49%.

The production of cattle and rice in the basin are closely tied to the landforms on which they are found. Cattle are ranged primarily on cheniers and in the marsh where soil conditions are suitable. See Appendix A for detailed information on rangeland in the basin. Rice production is limited to the prairie age soils located between Schooner Bayou and the Gulf Intracoastal Waterway.

Other agricultural products produced in the basin include crawfish, honey, alligator eggs and hatchlings and miscellaneous livestock.

BIOLOGICAL RESOURCES

Botanical

Gulf Coast Marsh is the dominant major land resource within the Mermentau Basin. Emergent and submerged vegetation provide the detrital material that forms the basis of the food chain in a marsh ecosystem. Dr. Robert Chabreck has divided marsh into four types based on vegetation (see Appendix B for plant species that could occur within the study area). These vegetative types are dependent upon the amount of salt in the soil and the water which periodically inundates them. Plants found in each particular type of marsh have varing degrees of tolerance to salt. Some plant species occur in all four types of marsh while others occur only within a very narrow range of salinities. The following is a brief discussion of the four vegetative types of marsh:

<u>Fresh Marsh</u> - Fresh marsh usually occurs adjacent to uplands and is generally located in the northernmost extent of the coastal zone. There are approximately 210,000 acres of fresh

marsh in the basin. Salinities in a fresh marsh range from 0.1 - 6.7 parts per thousand (ppt) with a mean of <3.0 ppt.

Fresh marshes are dominated by such plant species as maidencane, bulltongue, spikesedge, alligatorweed, and cattails. Other major components of fresh marsh are coastal waterhyssop, coontail, fragrant flatsedge, waterhyacinth, pennywort, duckweed, Eurasian milfoil, naiad, waterlilies, common reed, and giant cutgrass (see Appendix B for scientific names).

Deer, alligator, crawfish, rabbit, nutria and duck concentrations are generally highest in a fresh marsh. The early successional stages of these marshes are excellent for waterfowl, nutria and other wildlife. However, as they progress in their plant succession, their wildlife value decreases. Dense stands of alligatorweed, cattails, bulltongue or maidencane crowd out the better wildlife foods and make feeding difficult.

Jamaica sawgrass was once a dominant plant species in fresh marshes but because of it's sensitivity to salt water it has declined significantly. Most stands began to disappear in the late 1950's and early 1960's as a result of climatic and man induced changes in hydrology.

Intermediate Marsh - Intermediate marshes generally occur south of fresh marshes and are always found between fresh and brackish marshes. There are approximately 90,000 acres of intermediate marshes in the basin. Salinities in an intermediate marsh range between 0.4 to 9.8 ppt with a mean of 3.3 ppt.

The major plant species of an intermediate marsh are marshhay cordgrass, common reed, and bulltongue. Also present in varing amounts are alligatorweed, coastal waterhyssop, coast cockspur, spikesedge, sprangletop, naiad, switchgrass, seashore paspalum, purple pluchea, saltmarsh, American and Olney bulrushes, big and Gulf cordgrass, and deerpea.

The intermediate marsh is a productive habitat for most coastal wildlife species. In its earlier successional stages, it produces many of the choice wildlife foods.

Brackish Marsh - Brackish marshes are found between saline marshes or the gulf shoreline and intermediate marshes. There are approximately 120,000 acres of brackish marsh in the study area. Salinities range between 0.4 to 28.1 ppt with a mean of 8 ppt.

The major plant species of this type of marsh are marshhay cordgrass and seashore saltgrass. Other abundant plants of this association are dwarf spikesedge, needlegrass rush,

seashore paspalum, widgeongrass, Olney and saltmarsh bulrush, smooth cordgrass and deerpea.

Brackish marsh in its early successional stages provides high quality habitat for muskrat, geese, and occasionally ducks. Alligator, crawfish and nutria use this type marsh but prefer fresher habitats. Brackish marsh provides excellent habitat for estuarine species such as shrimp, crab, menhaden, and red drum.

Saline Marsh - Saline marshes are found adjacent to the gulf and are usually tidally influenced. There are about 98,000 acres of saline marsh in the basin. The salinity range of this marsh type is from 0.6 to 51.9 ppt with a mean of 16 ppt.

The dominant plants of this marsh type are smooth and marshhay cordgrass, seashore saltgrass, and needlegrass rush. Other plants that are common in saline marshes are saltmarsh bulrush, sea seepweed, saltwort, and glasswort. This marsh type has the least plant diversity of any marshes in the coastal zone.

Saline marshes provide the least amount of habitat diversity for wildlife species. Many of the species found in the other types of marsh rarely utilize saline marshes. However, estuarine species readily use these marsh habitats.

Fisheries

Marshes in the study area support a wide variety of fish and shellfish species (Appendix C). Each species has its own salinity tolerance and food preference. Esturine dependent species found in the basin are the backbone of Louisiana's fisheries industry. Freshwater species provide recreational as well as commercial opportunities for the basin's residents.

Tidally influenced marshes in the Mermentau Basin serve as nursery habitat for esturine dependent species such as white and brown shrimp, blue crab, red drum, spotted seatrout, Atlantic croaker, sheepshead, menhaden, and others. These species typically spawn in the Gulf of Mexico and migrate into the marsh as post-larvae or juveniles. They return to the gulf as sub-adults to complete their life cycles.

Fresh to intermediate marshes in the basin provide habitat for largemouth bass, bluegill, redear sunfish, crappie, freshwater drum, gar, and catfish. Large populations of crawfish also inhabit these marshes.

Wildlife

First-time visitors to the basin are often amazed at the number and variety of wildlife species present (Appendix C). Most privately owned wetland acreage in the area is managed to some degree for the benefit of wildlife. There are two publically owned wildlife refuges located in the basin; Rockefeller Refuge operated by the Louisiana Department of Wildlife and Fisheries and Lacassine Refuge operated by the U.S. Fish and Wildlife Service.

Marshes in the basin have national and state-wide significance because they provide habitat for large concentrations of wintering waterfowl and rest areas for neotropical migratory passerine birds. Additionally, other migratory birds such as shorebirds, wading birds, rails, and gallinules are supported by these habitats.

Game species such as whitetail deer and rabbit occur in significant numbers within the basin. These mammals prefer habitats that include natural levees, roads, or spoil banks that provide a haven from high water.

Furbearers common to the study area include mink, otter, raccoon, nutria, and muskrat. Mink and nutria prefer fresh marsh while otter, muskrat, and raccoon prefer brackish marsh habitats.

The American alligator is abundant throughout the basin especially in the fresh and intermediate marshes. Alligators have responded well to management and harvesting of surplus animals and eggs contributes to the local economy.

Threatened and Endangered Species

Federally listed threatened and endangered species that may occur within the study are identified in Table 2. The large turtles listed are found in tropical seas and may be seen on beaches and in bays. Habitat in the basin meets the needs of the Southern Bald eagle and the Peregrine falcon, however, neither species is known to nest in the area. Nesting colonies of the American Brown Pelican have been reestablished in the Terrebonne Basin, consequently sightings are possible on inland lakes and the gulf shoreline. The Eskimo Curlew's spring migration path is in close proximity to western Louisiana, therefore it may be observed in the basin. The number of Piping Plovers has been declining since the 1950's because of loss of nesting habitat. The Least Tern is fairly common in coastal areas, however the interior population is endangered. The Red Wolf has not been sighted in Cameron Parish since 1979. The whale species listed may be sighted offshore or by accident in deeper bays.

Table 2. Threatened and endangered species that may occur in the Mermentau Basin.[1]

Common Name	Scientific Name	Class
Kemps's Ridley's Turtle	*Lepidochelys kempii*	E
Green turtle	*Chelonia mydas*	T
Hawksbill sea Turtle	*Eretomochelys imbricata*	E
Leatherback Turtle	*Dermochelys coriacea*	E
Loggerhead sea Turtle	*Caretta caretta*	T
American Brown Pelican	*Pelecanus occidentialis*	E
Arctic Peregrine Falcon	*Falco peregrinus tundrius*	E
Eskimo Curlew	*Numenius borealis*	E
Least Tern	*Sterna antillarum*	E
Piping Plover	*Charadrius melodus*	T
Southern Bald Eagle	*Haliaeetus leucocephalus*	T
Red Wolf	*Canis rufus*	E
Finback Whale	*Balaenoptera physalus*	E
Humpback Whale	*Megaptera novaeangliae*	E
Right Whale	*Eubalaena glacialis*	E
Sei Whale	*Balaenoptera borealis*	E
Sperm Whale	Physeter catodon	E

CULTURAL AND HISTORICAL RESOURCES

Information presented in this section was obtained from the archives of the Louisiana Department of Culture, Recreation and Tourism, Office of Cultural Development. Because cultural information on the Mermentau Basin is voluminous, only a summary is presented in this report.

Initial occupation of the basin occurred in the Paleo-Indian period between 10,000 and 6,000 BC. Paleo-Indians were nomadic and survived by hunting and gathering. Evidence of coastal occupation during this period was first noted at Avery Island which lies due east of the basin. At this site stone tools were found with the remains of eleven extinct Pleistocene age animals.

Archaic era inhabitants of the basin gradually settled into migration patterns that allowed them to take advantage of the seasonal abundance of wildlife and plants. An important food source during this period was the brackish-water clam, *Rangia cuneata*. Middens consisting of rangia shells may be found throughout the basin. During this era pottery was introduced and specialized tools were developed. Trade routes were

[1] Endangered and Threatened Species of the Southeastern United States (The Red Book). 1992. "T" stands for threatened species classification and "E" stands for endangered species classification.

established with tribes hundreds of miles from the coast as evidenced by artifacts such as copper, mica and galena. By the end of the Archaic era agriculture had become the dominant means of subsistence.

The Atakapa Indian group occupied the basin at the time of contact with Europeans. An exploration party sent westward by Bienville first described this group as a tribe of cannibals. The Atakapa remained in the basin until the middle 1800's.

Acadians first settled the study area in the 1770's followed by Anglo-Saxon immigrants in the early 1800's. Records indicate that organized schools were in existence as early as 1838.

Over 70 archaeological sites in the basin have been listed by the Office of Cultural Development. Each site has been identified by name and number. They range from shell middens which are a prominent part of the landscape to obscure locations. There are no sites in the basin listed in the National Register of Historic Places.

MINERAL RESOURCES

Crude oil and natural gas are important mineral resources in the basin. There are over 40 production fields, many of which are partially or wholly depleted, evenly distributed throughout the basin. In addition to production fields there are nine gasoline plants, one refinery, and one secondary recovery plant. Table 3 displays the production of mineral fuels for selected years in Cameron and Vermilion Parishes.

Table 3. - Production of mineral fuels.

Parish/Year		Crude Oil (Bbl)	Condensate (Bbl)	Natural Gas (Mcf)
Cameron	1968	14,927,082	7,354,865	622,403,930
Cameron	1985	7,642,550	3,316,395	132,198,794
Vemillion	1968	12,259,614	13,249,907	765,907,983
Vermilion	1985	3,909,997	4,673,162	200,628,309

RECREATIONAL RESOURCES

The Mermentau Basin offers many outdoor recreational opportunities including hunting, fishing, bird watching, and other activities. The study area is well known for its abundant wildlife, marsh habitats and numerous lakes and bayous. Public areas include Rockefeller State Wildlife Refuge, Lacassine National Wildlife Refuge, parks and beaches. Recreation in the basin is a direct product of it's abundant coastal wetlands.

Hunting

Southwest Louisiana is nationally known for it migratory waterfowl hunting. Millions of ducks and geese make their winter home in the basin's marshes and adjacent agricultural lands. Other important game species include deer, rabbit, and dove. Public hunting opportunities are limited but yearly leases or guided hunts are available.

Fishing

The basin's diverse wetland ecosystems provide habitat for a variety of fresh and saltwater finfish and shellfish. The most popular saltwater species are shrimp, blue crabs, spotted seatrout, red drum, and red snapper. These species are taken off-shore or in the basins, lakes and marshes. Freshwater sport fishes include largemouth bass, crappie, bluegill, catfish, and crawfish. Numerous boat-launching facilities located throughout the basin allow visitors and residents to take advantage of fishing opportunities. Guide services are available for both fresh and saltwater fishing trips.

Bird Watching

Bird watching is another popular recreational activity in the area that brings in visitors from many states. Louisiana is considered one of the top three states for birding. Because of its unique location at the mouth of the Mississippi River visitors have the opportunity to see more migratory species than possible in any other state.

Over 300 of the state's 430 species can be observed in the basin making it Louisiana's premier birding area. The area's system of public roads and wildlife refuges make viewing of vast expanses of marsh possible for visitors and residents alike.

Other

Other recreational attractions in the study area include: marsh boat tours, boating, swimming, sea shell collecting, beaches, and scuba diving. Festivals and annual events are also popular pursuits.

SOCIOECONOMIC RESOURCES

The demographic information contained in this section was obtained from the 1980 and 1990 U.S. Census publications and the 1990 and 1994 Statistical Abstract of Louisiana. These

publications give general population characteristics and a summary of social, economic, and housing characteristics. From this information comparisons and inferences will be made among the parishes in the basin and state averages in many categories. Agriculture information is based on 1982, 1987, and 1992 Agricultural Census. The information contained in this section will look at the two parishes in their entirety, however, only portions of each parish are in the study area.

Population Demographics

The Mermentau Basin is situated in rural Cameron and Vermilion Parishes. The more urban portions of these parishes are outside of the study area.

The population of Cameron Parish decreased between the 1980 to 1990 time period. In 1980, 9,336 people resided in the parish, by 1990 the population fell to 9,260. Vermilion Parish's population increased from 48,458 in 1980 to 50,055 in 1990.

The population distribution of the parishes shows similar age distribution, in 1990, except for Vermilion Parish which has a larger portion of its population in the over 45 group than Cameron Parish. The 45 and over group accounts for 31 percent of the population in Vermilion parish while it accounts for 29 percent of the population in Cameron Parish. On average the parishes had about 26 percent of the population under 15 years of age, 22 percent of the population in the 15 to 29 years of age group, 22 percent of the population in the 30 to 44 years of age group, and 30 percent in the 45 or older age group.

Economic Characteristics

During the 1980 to 1990 period unemployment in the state rose from six percent to over nine percent. The loss of jobs resulted in an increase of unemployment rates from 5.8 percent in 1980 to 7.6 percent unemployment in 1990 for Cameron Parish. This trend was evident in the increased percentage of population below poverty level. In 1980, Cameron Parish had 11.0 percent of the population below poverty level while in 1990 the percent of the population below the poverty level was 16.2 percent. The actual number of residents under the poverty level went up 463 from 1,027 to 1,490.

Vermilion Parish's unemployment rate showed an increase from 4.6 percent in 1980 to 9.2 percent unemployment in 1990. These changes also showed up in the percentage of population below poverty level. In 1980, Vermilion Parish had 14.1 percent of the population below poverty level while in 1990 the percent of the people below the poverty level was 26.5

percent. The actual number of residents under the poverty level went up 6,257 from 6,833 to 13,090.

A further indication of the increasing poverty level and poor job market is the amount of per capita (per person) income for parish residents. In 1980 the per capita income was $9,945 in Cameron Parish. By 1990 the per capita income increased by $344. During the same period inflation drove the average cost of living up 58%[2]. This means that 1990 dollars are worth $6,512 in 1980 terms and that residents actually lost $3,433 (34.5 percent) of buying power per person.

Vermilion Parish had a per capita income of $6,106 in 1980 and $8,752 in 1990 an increase of $2,646. During the same period inflation drove the average cost of living up 58%. This means that 1990 dollars were worth $5,539 in 1980 terms and that residents actually lost $567 (9.3 percent) of buying power per person.

Education

Comparison of the 1980 and 1990 data on education shows that basin residents are, on average, less educated than the state on average. The education level information is on based the percent of residents, age 25 or older, that graduated from high-school or college. In 1980, Cameron parish had 44.4 percent of residents with at least a high school education and 6.9 percent with a college degree.

Vermilion Parish, in 1980, also lagged behind the state average with 43.6 percent of the 25 and older population with high school degrees and 8.0 percent with college degrees. The state average was 57.7 percent with a high school degree and 13.9 percent with a college degree.

In 1990, 61.1 percent of Cameron Parish residents had at least a high school education while 7.9 percent had a college degree. Vermilion Parish had 58.3 percent with a high school degree and 8.8 percent with a college degree. The state average was 68.3 percent with a high school degree and 16.1 percent with a college degree.

Each parish has a lower rate than the state but both parishes had a 33 percent increase in the high school degree rate of the studied population. This was greater than the state average increase of 18 percent.

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[2]The inflation information is based on the consumer price index for all items for urban consumers between the 1980 and 1990. The basin population is predominantly rural, but inferences can be made when using this inflation estimate.

Agriculture

The section on agriculture is based on comparisons and inferences from the 1982, 1987, 1992 Census of Agriculture from U.S. Department of Commerce Bureau of the Census (Table 4).

Agricultural statistics show that farm income in the basin is crop based. The average farm size for the basin parishes is slightly greater than the state average during the census periods. However, the percent of land in agriculture production is only greater than the state average in Vermilion Parish.

Vermilion parish followed the trend of increasing farm size and decreasing numbers of farmers. Cameron parish had a smaller farm size trend with a variable farm base.

Table 4. - Agricultural demographics for 1982, 1987, and 1992.

1982	Farms	Av. size	Tenents	Av. Age	Farmers w/other jobs
Louisiana	31,628	282 ac	3,878	50.5	16,999
Cameron	466	583 ac	48	51.8	293
Vermilion	1,283	267 ac	210	50.8	545
1987					
Louisiana	27,350	293 ac	3,686	52.0	13,854
Cameron	442	578	66	54.2	254
Vermilion	1,189	284	166	53.2	426
1992					
Louisiana	25,652	306	3,883	53.5	12,721
Cameron	453	570	68	55.7	256
Vermilion	1,117	284	176	54.4	449

One indicator of the profitability of a business is its net income. A farm's profitability is measured in net income on a per acre basis. Table five compares farm net income per acre in Cameron and Vermilion Parishes with that of the state for selected years.

Table 5. - Farm per acre net income for 1982, 1987, and 1992.

	1982	1987	1992	(inflation adjusted) 1992
Louisiana	$54.89	$39.59	$38.04	$36.25
Cameron	$ 5.01	$ 5.92	$ 3.02	$ 2.87
Vermilion	$68.26	$30.21	$29.33	$27.95

In 1987 the average net income per acre was $39.59 for the state, which was about $15 less than the 1982 figure. Vermilion Parish farmers were less profitable on a per acre basis than the state average with $30.21 profitability. Cameron parish profitability was considerably less than the state average with $5.92.

In 1992 the average net income per acre was $38.04 for the state, which was about $1.50 less than the 1987 figure. Vermilion and Cameron parishes are less profitable than the state average and each parish had a larger percentage decline in profitability than the state average over the period. The state had a 31 percent loss in per acre profitability. Cameron and Vermilion suffered a 40 percent and 57 percent loss in per acre profitability, respectively.

Farming has been under a cost-price squeeze on production due to inflation. The Economic Research Service reports that the average price received for farm products between 1982 and 1992 increased by 5.0 percent. During the same period the prices paid for farm production inputs increase by 12.7 percent. This represents a 7.3 percent rate of increase in per unit costs over per unit income while the consumer price index on all consumer goods increase 1.45 times between 1982 and 1992. This means that the buying power of the 1992 net income per acre was less than of 1982 income. In fact the average for the state, Cameron, and Vermilion Parishes were $26.23, $2.08, and $20.23 per acre, respectively.

The cost-price squeeze shows up in the 1976 statistics when the prices of production inputs began rising at a faster rate than farm outputs. The affects of the cost-price squeeze on agriculture, inflation, and farm consolidation has had a major impact on the local communities. Inflation adjusted (from 1982 to 1992 dollars) farm net income went down in each parish.

Fisheries

Louisiana's wetlands are a nationally important economic resource. In 1992 Louisiana's total commercial fish landings amounted to over one billion pounds with a value of $295 million. This accounted for 11% of the total pounds harvested in the United States. Shrimp are the state's most valuable food fish; in 1993 87.6 million pounds of all species were harvested. The dock-side value was $114 million. Fisheries processors and wholesalers employed over 5,600 people at 577 plants in 1991.

The Mermentau Basin's tidal wetlands are a vital part of Louisiana's estuarine habitats and lie between two major commercial fishery ports. The ports of Cameron and Intercoastal City have a 1992 ranking of 4th and 6th,

respectively, in the United States in tonnage and dollar value.

Table six depicts the leading species landed in Cameron and Vermilion Parishes ranked by pounds.

Table 6. - Fisheries Landings 1993.

Three Leading Species
(in thousands)

Parish	Species	Pounds	Species	Pounds	Species	Pounds
Cameron	Shrimp	8,067	Crab	2,111	Snapper	338
Vermilion	Shrimp	7,329	Crab	530	Snapper	215

Minerals

Oil and Gas Industry

Despite declining production and employment the oil and gas industry remains the leading source of revenue in the basin. The 1992 combined earnings for the oil and gas industry in Cameron and Vermilion Parishes was $73.3 million. Figures for the same year show that the industry employed over 1,800 people in the two parishes.

WATER RESOURCES

Ground Water

The Chicot aquifer system is the principal source of freshwater in the basin. The aquifer is composed of course sand and gravel and ranges in thickness from 50 to 1,050 feet. Water occurs in the aquifer from 20 to 1,100 feet below the land surface with an average depth of 290 feet. The aquifer is recharged by downward seepage of rainfall through overlying silts and clays, subsurface inflow from the north, and seepage from streams and bayous during high stages. Underlying the Chicot aquifer system is an aquifer of tertiary age that contains no freshwater.

The basin's ground water supply is relatively free of man-made chemicals, but naturally occurring chemicals such as calcium, sodium, silica, chlorides, and magnesium affect the quality. The percentage of dissolved chemicals varies within the aquifer consequently the water is softer in recharge areas and is harder in central and southeastern areas, except soft in deeper units to the south. Saltwater occurs in the basal portion of the aquifer near the coast. The U.S. Geological Survey maintains two water quality monitoring wells within the study area.

Approximately 609 million gallons per day (Mgal/d) are withdrawn from the Chicot aquifer. Water is withdrawn primarily for irrigation (321 Mgal/d). Other uses include industry, public supply, rural domestic use, livestock, and aquaculture. Water levels within the upper sand unit of the aquifer have remained nearly constant from 1985-1991.

Surface Water

According to Geographical Information System (GIS) data there are over 115,000 acres of open surface water in the basin. The two major water bodies Grand and White Lakes comprise about 94,000 acres of this total. The Mermentau River is the basin's largest stream with an average annual peak discharge of 31,600 cubic feet per second (cfs) at the GIWW. The 50 year peak flow is estimated to be 72,200 cfs.

Surface water located within the impounded portion of the basin is used for irrigation, fisheries (primarily freshwater species), navigation and wildlife habitat. This source provides approximately 150 million gallons per day of water for rice culture and aquaculture. Surface water not protected from tidal influence is used by esturine species, navigation interests, and a variety of wildlife species.

According to the Louisiana Department of Environmental Quality the quality of water in the basin south of the GIWW fully supports its designated uses which are primary contact, secondary contact, and fish and wildlife propagation.

PROBLEM IDENTIFICATION

WETLAND LOSS RATES

Over 104,000 acres of the basin's emergent wetlands have been converted to open water since 1932. This total represents 19 percent of the study area's historical wetlands (Table 7). Almost half of the wetland loss occurred between 1955 and 1974.

Table 7. - Historic wetland losses in the Mermentau Basin.

	Lakes Subbasin		Chenier Subbasin	
Period	Acres/Yr	Percent/Yr	Acres/Yr	Percent/Yr
1932-1955	222	0.06	708	0.43
1955-1974	1,457	0.37	1,243	0.83
1974-1983	1,439	0.40	622	0.49
1983-1990	1,024	0.29	851	0.71

Source: USACE GIS Data Base (2/93)

Areas in the basin that have experienced the most significant wetland loss rates include: the shorelines of Grand and White Lakes; the Big Burn; Little Pecan Bayou; Hog Bayou; the Gulf shoreline; Deep Lake/Grassy Lake; south Pecan Island; Freshwater Bayou wetlands; and south Florence Canal wetlands. See the enclosed 1984 Filtered Wetland Loss/Gain Map for additional information on marsh loss in the basin.

Factors that contribute to wetland loss can be categorized as either naturally occurring or man induced. Naturally occurring factors include relative sea level rise, hurricanes, shoreline erosion and herbivory. Man induced factors include hydrologic alterations and direct loss.

NATURAL OCCURRENCES

Relative Sea Level Rise

Relative sea level by definition refers to the long-term correlation between water and land elevations. The major components of relative sea level are eustacy (worldwide change in volume in the oceans) and subsidence (compaction, consolidation and downwarping of sediments). Relative sea level rise is one of the primary factors causing land loss in the Louisiana coastal zone. Because of the basin's gently sloping coast a small change in water level causes the coastline to shift dramatically inland.

In 1989 the Louisiana Geological Survey published a report titled Relative Sea Level Rise and Subsidence in Louisiana and the Gulf of Mexico. The report included an analysis of data

from six tide gage stations in the Mermentau Basin (Table 8). Also, the report states that the rate of sea level rise in Louisiana and other Gulf Coast states is increasing and predicts that coastal Louisiana will experience a 1.5 to 2 meter rise in sea level over the next century.

Table 8. - Relative sea level rise rates for selected tide gage stations.

Station	1942-1962	1962-1983
Catfish Point Structure (South Auto)	-0.42 ± 0.51 cm/yr	1.22 ± 0.26 cm/yr
Schooner Bayou Structure (East Auto)	0.46 ± 0.21 cm/yr	0.88 ± 0.21 cm/yr
Schooner Bayou Structure (East Staff)	0.47 ± 0.21 cm/yr	0.93 ± 0.21 cm/yr
Vermilion Lock (East Auto)	0.11 ± 0.17 cm/yr	0.88 ± 0.21 cm/yr
Vermilion Lock (East Staff)	0.22 ± 0.21 cm/yr	0.78 ± 0.20 cm/yr
Vermilion Lock (West)	0.71 ± 0.32 cm/yr	0.75 ± 0.22 cm/yr

Hurricanes

The Louisiana Gulf Coast is struck by a hurricane an average of three times per decade. From 1900 to 1980 approximately 20 hurricanes have had a negative impact on the wetlands within the study area. The most damaging storm ever recorded in the basin is Hurricane Audry which made landfall on June 25, 1957.

The three components of a hurricane that cause wetland loss are:

Wind - Damaging winds may extend as much as 200 miles in all directions from the eye of a hurricane. Strong winds cause marsh plants such as bull whip, cattails, and maidencane to be uprooted and transported inland.

Tidal surge - The most significant damage to wetlands associated with a hurricane passage is caused by the accompanying tidal surge. Emergent vegetation may be scoured from the marsh surface by the velocity of the tidal surge, this in turn accelerates the erosion of fragile organic soils. A surge also transports large volumes of saltwater into fresh and intermediate marshes which can stress or kill salt intolerant vegetation.

Flooding - In addition to the damaging effects of wind and tidal surge large amounts of rainfall can cause long duration flooding which creates additional stress on emergent vegetation.

Shoreline Erosion

The Mermentau Basin is experiencing some of the highest shoreline erosion rates in Louisiana. Chronic shoreline erosion results from a limited sediment supply, relative sea level rise, and seasonal impacts from cold fronts and tropical storms.

Shoreline erosion rates in the Lakes region vary according to the size of the water body, location with regards to prevailing winds, and composition of the bank material. Comparisons of aerial photographs indicate that shoreline retreat in Grand and White Lakes ranges from 1 to 15 feet per year. Erosion is higher, 25 to 100 feet per year, where the shoreline protrudes into the lakes and wave energy is focused. Smaller lakes in the region are experiencing loss rates of from 1 to 6 feet per year.

The entire Gulf shoreline of the basin is in retreat with the exception of that portion between Freshwater Bayou Canal and Flat Lake. The rate of erosion has been calculated to be from 25 to over 50 feet per year. However, if Atchafalaya River sediment discharge continues to increase, mudflat growth may reverse the process of shoreline retreat west of Flat Lake.

Herbivory

Due to a decline in the fur market the number of nutria and muskrat harvested statewide have dropped from an average of 1.5 million pelts to less than 300,000 pelts annually. As a result of this market decline the number of reports from land managers concerning the problem of nutria and muskrat herbivory in some parts of the basin has increased. Research has shown that grazing by herbivores can result in decreased plant biomass and changes in dominant plant species.

MAN INDUCED PROBLEMS

The cumulative impacts of human activities have altered the hydrology of the entire Mermentau Basin. Hydrologic modifications in the form of navigation channels and canals, water control structures and locks, changes in land use and upstream drainage projects, highway embankments, and forced drainage areas have directly or indirectly contributed to wetland loss in the basin. Figure 2 depicts the major hydrologic features of the basin.

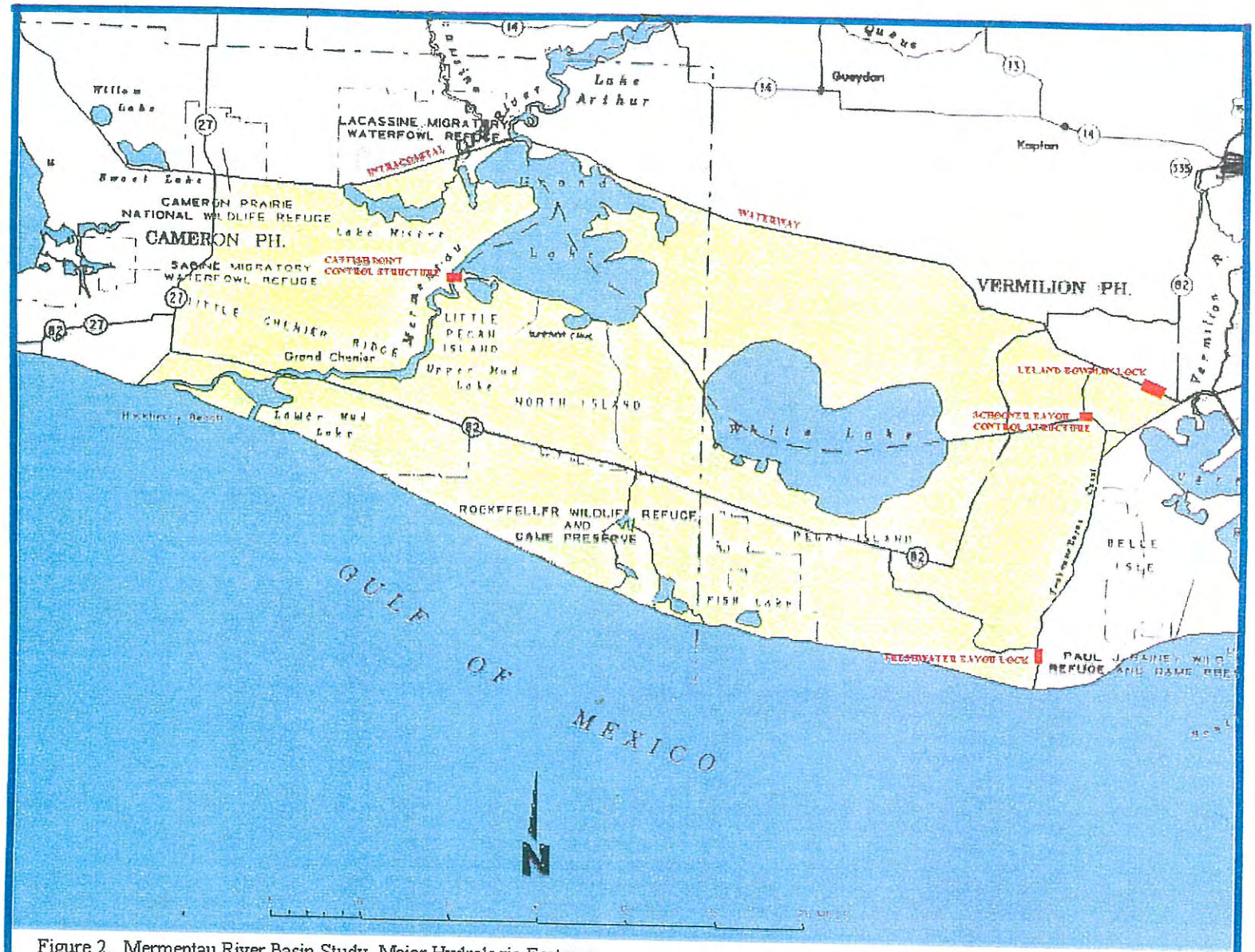

Figure 2. Mermentau River Basin Study Major Hydrologic Features

Navigation Channels and Canals

Major navigation channels that influence hydrology in the study area include: 1) The Gulf Intracoastal Waterway (GIWW) which runs east-west through the basin with a channel dimension of 12'x 125'; 2) The inland waterway which connects the Mermentau River to Freshwater Bayou Canal via way of Grand and White Lakes and Schooner Bayou; 3) The Mermentau River Navigation Channel (9' x 100') runs from the Gulf through Grand Lake and the Mermentau River to Mermentau, La. At this point the channel branches and extends up Bayou Nezpique to Panchoville, Louisiana and up Bayou Des Cannes to Evangeline, La. A channel of the same dimensions extends from the Mermentau River up Bayou Que de Torture to Riceville, Louisiana. An 8'x 60' channel runs up Bayou Plaquemine Brule' to Crowley, Louisiana; and 4) The Freshwater Bayou Canal is a 12'x 125' channel that extends from the GIWW at mile 161.2 south to the Gulf.

Numerous privately constructed canals crisscross the basin. Some canals such as Superior Canal, Humble Canal, and Joseph's Harbor Canal were excavated to allow petroleum interest access to the basin's oil and gas fields. Others were excavated to facilitate highway and pipeline construction and trapping. The Warren Canal is an example of a canal constructed to move irrigation water.

Some channels and canals act as conduits for saltwater which has caused wetland loss in the areas of Freshwater Bayou Canal, Little Pecan Bayou, South Pecan Island, Rockefeller Refuge, and Hog Bayou. Wetlands adjacent to channels and canals are often subjected to high energy boat waves that scour the marsh surface. Additionally, channels and canals increase the incidence of flooding by rapidly moving rain water into and across the basin.

The dredging of channels and canals also causes a direct loss of wetlands. For example, a typical access canal 100' wide with spoil deposited 30' on either side dredged for a distance of one mile destroys 20 acres of wetlands. There are over 265 miles of channels and canals dredged through the basin's wetlands.

Water Control Structures and Locks

The Corps of Engineers operates and maintains five major structures that influence water levels and salinity regimes in the basin. A number of state or privately owned structures are operated to manipulate the study area's hydrology on a lesser scale.

The Calcasieu Lock is located on the GIWW near the intersection of La. Highway 384. This lock was constructed to

prevent saltwater from entering the basin through Calcasieu Lake. Under extreme conditions it may be operated to release flood waters. Leland Bowman Lock is situated on the GIWW near Intracoastal City. It also serves as a saltwater barrier but it has the capability to be operated for flood control as needed. Freshwater Bayou Lock is located on Freshwater Bayou approximately one mile from the Gulf of Mexico. This structure restricts saltwater intrusion in the southeast portion of the basin.

The Catfish Point and Schooner Bayou Control Structures were authorized to release flood water from the Lakes Subbasin and reduce tidal inflow. The target water level is 2.0' mean low gulf, however, levels are almost always higher. Drainage from the Lakes Subbasin is difficult because outside stages are higher than inside stages 75% of the time.

Operation of the Catfish Point Control Structure has recently been modified to allow for the ingress of marine fisheries into Grand Lake under special low salinity conditions. Prior to this modification marine fisheries were excluded from this once low salinity estuary.

The large navigation structures have had a positive effect on the basin's wetlands by creating barriers to saltwater intrusion. However, they have contributed to the problem of excessive high water levels in the Lakes Subbasin by restricting the passage of flood water and maintaining a minimum water level to facilitate navigation and agricultural interests. Prolonged high water levels can have a detrimental effect on many desirable emergent plant species. Physiological stresses associated with prolonged high water levels have led to direct wetland loss and shifts in plant species composition to communities having reduced primary productivity and reduced fish and wildlife habitat value.

Numerous smaller water control structures have been installed throughout the basin by private landowners or units of goverment. Some examples are the East End Lock, and the structures on Big and Little Constance Bayous located on Rockefeller Refuge which impacts drainage in the Superior Canal system. These structures act as barriers to saltwater intrusion, serve as drainage outlets through protection levees, allow for increased water managment capabilities in managed areas, or allow freshwater to be introduced into areas of high salinity. Many of these structures were installed in response to problems created by previous hydrologic modifications to the basin.

Land Use Changes and Upstream Drainage Projects

Changes in land use and the subsequent demand for improved drainage in the upper Mermentau Basin has had an impact on the

study area. The clearing of land for agriculture has affected the rate of run-off and percolation of storm water and has led to a reduction in land available for flood storage. The construction of upstream drainage channels and the dredging of bayous has modified natural hydroperiods and flooding regimes. As a consequence of these actions, peak storm flows now move into the lower basin at a faster rate. The resulting prolonged high water levels in the study area have led to direct wetland loss and a shift in plant species composition.

Highways

Highways in the study area traverse cheniers wherever practical. However, this is not always possible and direct loss of wetlands has occurred from the construction of highways, parish roads, and oil field access roads. Additionally, Louisiana Highways 27 and 82 form a hydrologic barrier within the basin by altering natural drainage patterns and disrupting sheet flow.

Forced Drainage Areas

Numerous tracts of wetlands adjacent to Pecan Island and Grand Chenier were converted to pastureland by means of levee systems and pumps. Many of these forced drainage pastures have been abandoned due to the high maintenance costs required to keep them productive. Marsh soils are high in organic matter which readily oxidides and shrinks in volume when drained. Consequently, abandoned pastures revert to open water areas with little or no emergent vegetation because of extreme water depths.

ALTERNATIVES AND ANALYSIS

The abundant supply of sediment that contributed to building wetlands in the Chenier Plains has been interrupted by flood control and navigation projects on the Mississippi and Atchafalaya Rivers. In light of this fact, it was determined that planning efforts would focus on measures that would restore or preserve rather than create wetlands. Three alternatives were developed by a team composed of participating agencies, groups, and individuals. A description of these alternatives and their effects are described as follows:

ALTERNATIVE I

Alternative one is the future without project conditions. Under this alternative the basin's wetlands will continue to deteriorate. Table nine depicts projected wetland loss for 20 and 50 year periods. Wetlands loss projections are based on an analysis of historical losses as presented by Dunbar, Britsch, and Kemp.

Table 9. - Projected wetland loss.

	Projected Loss (20 yrs.)		Projected loss (50 yrs.)	
Subbasin	Acres	Percent	Acres	Percent
Lakes	25,160	7.3	62,900	18.3
Chenier	14,440	12.6	36,100	31.5
total	39,600	8.6	99,000	21.4

Land loss in the Lakes Subbasin is expected to occur in wetlands adjacent to the shorelines of White and Grand Lakes and along the banks of the GIWW and Freshwater Bayou Canal. Interior wetland losses will continue in the areas of Deep Lake, Freshwater Bayou Wetlands, and Little Pecan Bayou. In the Chenier Subbasin interior wetland losses will continue to occur south of Pecan Island and Grand Chenier. Shoreline erosion along the gulf will continue at the present rate of 25 to 50 feet per year.

ALTERNATIVE II

The second alternative is the large scale hydrologic management alternative. This alternative addresses the problem of sustained high water levels in the Grand and White Lakes system. A reconnaissance level study of the basin's

high water problem conducted by the New Orleans District Corps of Engineers considered the following measures:

a) Catfish Point
The discharge capacity of the Catfish Point Control Structure can be improved by constructing additional outlets. Increasing the discharge at Catfish Point would require a corresponding increase in size of the channel of the lower Mermentau River. Channel modifications are required if the discharge of the lower Mermentau River is to be compatible with the increased capacity of the structure.

b) Superior Canal
The discharge capacity of the Superior Canal can be increased by enlarging the existing channel. In addition to channel improvements this measure would require installation of a structure to prevent salt water intrusion.

c) Pecan Island
This measure consists of constructing a new channel from the Pecan Island ridge south to the Gulf of Mexico. This measure would also require the installation of a structure to prevent salt water intrusion. An alternative measure for this location would be the construction of a pumping station to facilitate lowering of water levels during periods of high tides.

d) Black Bayou
This measure consists of a drainage structure that would divert water from the GIWW into Calcasieu Lake via Black Bayou. A pumping station is also being evaluated for this location.

e) Calcasieu Lock
The Corps of Engineer's 1992 Intracoastal Waterway Locks Reconnaissance Report identified the need for additional lockage capacity at this location. A second lock would provide additional opportunities to drain water from the basin.

The above measures are conceptual and future engineering, environmental and economic evaluations by the Corps will be necessary to determine which measure or combination of measures will best produce the desired results.

ALTERNATIVE III

Alternative three consists of conservation measures installed on a hydrologic unit basis. A set of treatment practices that could remediate the effects of natural and man-induced problems was formulated for each unit. The planned practices were designed to meet the landowner's goals and objectives and evaluated for their impact on adjacent hydrologic units.

The study area is divided into 86 hydrologic units. Twenty-seven units are located in Vermilion Parish, 23 are located on Rockefeller Refuge, and 36 units are located in Cameron Parish (Hydrologic Unit Location Map).

Description of Hydrologic Units

Vermilion Lake Unit 1 (VL-1)

The 17,425 acre hydrologic unit is located north of White Lake near the Cameron Parish line. Soils in the unit are mapped as Allemands muck (94%) with the exception of Deer Island which is mapped as Ged clay (6%). The 1949 O'Neil vegetative type map, which is considered to represent baseline conditions, indicates the unit was once a sawgrass marsh. In 1978 and 1988 Chabreck and Linscombe mapped the unit as fresh marsh. Typical fresh marsh vegetation is maidencane, alligator weed, bulltongue, water hyacinth, pennywort, and pickerelweed.

The south spoilbank of the GIWW which forms the northern boundary of the unit is experiencing a high rate of erosion. Once this spoilbank is breached it will expose fragile wetlands to high energy boat wakes resulting in marsh loss.

The landowner's objectives for this unit are to reduce shoreline erosion along the GIWW and to manage the unit to improve habitat for fish and wildlife. These objectives will be accomplished by placing rip-rap bank protection along the GIWW and by managing water levels within the unit separate from that of the Lakes Subbasin. The unit's water lveels will be managed utilizing the present system of structures and levees which will be maintained or upgraded as needed to sustain the current management scheme.

Vermilion Lake Unit 2 (VL-2)

This unit is located on the north shore of White Lake and is 5,507 acres in size. The entire unit is mapped as Allemands muck. In 1949 the unit's vegetation was mapped as sawgrass marsh. The 1978 and 1988 vegetative maps show the unit to be fresh marsh.

This unit is managed by the landowners as a refuge for migratory waterfowl. The existing system of levees and pumps will be maintained to preserve this area in its present use.

Vermilion Lake Unit 3 (VL-3)

The 44,026 acre unit is located between the GIWW and the north shore of White Lake. The unit is composed of Allemands muck (91%), Ged (5%), Crowley-Mowata-Vidrinee (3%), and water (1%). Historically, the vegetation in this unit was mapped as a

sawgrass marsh along the unit's western boundary, fresh marsh along the GIWW, the eastern boundary, and along White Lake. The central portion was mapped as floating fresh marsh. The dominant vegetation in a floating fresh marsh is maidencane. The entire unit was mapped as fresh marsh in 1978 and 1988.

The White Lake shoreline which forms the southern boundary of this unit is eroding at the rate of 2 to 10 feet per year. Spoil banks along the GIWW, the units north boundary, are in danger of being breached in several locations. Breaching of this spoil bank would expose fragile marsh soils to high energy waves resulting from barge traffic.

The landowner's objectives for this unit are to reduce shoreline erosion by constructing suitable wave dampening structures along the shorelines of White Lake and the GIWW. Sediment deposited behind the structures will be vegetated to create additional wetland habitat.

Vermilion Lake Unit 4 (VL-4)

The 22,623 acre hydrologic unit includes Forked Island and surrounding agricultural areas. The soils are 23% Gueydan muck, 24% Ged, 19% Kaplan, 18% Allemands, and 14% Crowley silt loam. The 1978 and 1988 vegetative maps depict the unit as non-marsh however, historically the unit was mapped as fresh water marsh in the north and sawgrass marsh in the south. The areas considered non-marsh on the 1978 and 1988 maps were once marshes that have been leveed and pumped-off for the purpose of producing agricultural commodities.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage facilities in the area in order to continue the production of agricultural commodities. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Vermilion Lake Unit 5 (VL-5)

This 6,654 acre hydrologic unit is located between Schooner Bayou and the GIWW. Soils in this unit are mapped as 93% Allemands muck and 7% Ged muck. In 1949 the unit was mapped as sawgrass marsh in the north and excessively drained salt marsh in the south. The dominant species in an excessively drained salt marsh are black needle rush, marshhay cordgrass, smooth cordgrass, and occasional clumps of sawgrass. According to Chabreck and Linscombe the unit's vegetative type in 1978 and 1988 was fresh marsh.

The Warren Canal is located in this unit and lies in close proximity to the Schooner Bayou Control Structure. This canal serves as a conduit for irrigation water which is used by rice farmers south of Gueydan. Operation of the Schooner Bayou structure for the purpose of lowering water levels in White Lake increases the incidence of saltwater intrusion via the Warren Canal. Salinity levels in irrigation water above 1.3 ppt have a harmful effect on rice production. In order to minimize the incidence of saltwater intrusion resulting from a change in the operational scheme of the Schooner Bayou structure basin residents have requested that an armored plug be constructed in the Warren Canal immediately north of its intersection with Schooner Bayou. In addition to lowering water levels opening the Schooner Bayou Structure whenever outside conditions are favorable will have an added benefit of improving ingress and egress of marine organisms into the basin.

Vermilion Lake Unit 6 (VL-6)

The 7,998 acre unit is located in the northeast corner of the basin at the intersection of Freshwater Bayou Canal and the GIWW. In 1949 the vegetation was mapped as sawgrass marsh in the north and excessively drained salt marsh in the south. In 1978 the unit was mapped as intermediate except for a small area in the northwest corner which was mapped as fresh marsh. Typical intermediate plant species include: marshhay cordgrass, deerpea, bulltongue, California bullwhip and sawgrass. In 1988 the western half of the unit was mapped as intermediate with a small area of fresh marsh along the GIWW and the eastern half was mapped as brackish marsh. Typical brackish marsh species include: marshhay cordgrass, three-cornered grass, and leafy three square. Soils in the unit are mapped as Allemands muck (61%) in the west and Clovelly muck (39%) in the east.

The existing spoil banks along the GIWW and Freshwater Bayou Canal are eroding at a rapid rate. In some parts of the unit the spoil bank along Freshwater Bayou Canal is non-existent and adjacent wetlands are subjected to tidal scouring and high energy boat wakes. Additionally, a system of canals and natural bayous link North Prong with Freshwater Bayou Canal. This linkage allows saltwater to intrude farther into the unit and may account for the increasing amount of brackish vegetation present.

The landowner objectives for this unit are to reduce shoreline erosion and the infiltration of saltwater into the units interior. This will be accomplished by installing bank stabilization measures along the shorelines of the GIWW and Freshwater Bayou Canal. Sediment deposited behind the wave stilling structures will be vegetated to create additional wetland habitat. Additionally, construction of a weir with a

boat bay on Bayou Chene near its intersection with Freshwater Bayou Canal will reduce saltwater intrusion into the unit's interior.

Vermilion Lake Unit 7 (VL-7)

This 604 acre hydrologic unit is located at the intersection of Schooner Bayou and Freshwater Bayou Canal. The 1949 vegetative map shows the unit to be excessively drained salt marsh. The 1978 and 1988 vegetative maps show the unit as intermediate marsh. Soil in the entire unit is mapped as Clovelly muck.

The existing spoil bank along Freshwater Bayou Canal has eroded away, allowing tidal scouring and breakup of the adjacent wetlands to occur. Shoreline stabilization measures will reduce erosion and preserve adjacent wildlife habitat for wetland dependent species.

Vermilion Lakes Unit 8 (VL-8)

This 34,776 acre hydrologic unit is located between Louisiana Highway 82 and the Freshwater Bayou Canal. The unit was historically mapped as a sawgrass marsh in the western half and as excessively drained salt marsh in the eastern half. In 1978 the unit was 60% fresh marsh and 40% intermediate marsh. In 1988 the unit was mapped as 40% fresh marsh, 50% intermediate marsh and 10% brackish. Salinities are highest along the Freshwater Bayou Canal. Soils in the unit are mapped as Allemands muck (94%), Mermentau-Hackberry association (4%), and Clovelly muck (2%).

Wetlands within this unit are adversely affected by high water levels in the Grand/White Lakes system. High water levels have led to direct wetland loss and shifts to plant species that are less productive and have reduced fish and wildlife habitat value. Inputs of suspended sediments to the unit are very small, consequently marshes must overcome the effects of subsidence and sea level rise primarily through production and accumulation of organic matter. Reduced plant productivity will make future marsh loss more likely.

High rates of shoreline erosion are washing away the spoil banks along Humble Canal. The loss of these spoil banks is exposing interior wetlands to the detrimental effects of saltwater intrusion and tidal scouring.

The landowner's objectives are to increase emergent vegetative growth by restoring the unit's natural hydrologic regime to the extent possible and to reduce shoreline erosion along Humble Canal. This will be achieved by constructing additional outlets to outside channels to more rapidly

discharge excess water; managing water levels to mimic natural conditions; regulating the inflow of water from the White Lake system with water control structures and canal plugs; and installing bank stabilization measures on the north bank of Humble Canal.

Vermilion Lake Unit 9 (VL-9)

The hydrologic unit is a 1,318 acre area located along the east bank of the Acadiana Marina Canal. The 1978 vegetative type map shows the unit to be 100% fresh marsh. The 1988 map shows the unit is fresh to the north and intermediate in the south. Historically the unit was mapped as a sawgrass marsh. Soils in the unit are mapped as 62% Allemands and 38% Mermentau-Hackberry association.

The landowner's objectives are to maintain the unit in its present use which is grazing land for cattle. This will be accomplished by maintaining the existing system of levees and pumps.

Vermilion Lake Unit 10 (VL-10)

This 13,055 acre hydrologic unit borders the eastern shore of White Lake. In 1949 the vegetative map shows this unit to be a sawgrass marsh. This unit was mapped as fresh marsh in 1978 and 1988. The entire unit is mapped as Allemands muck (96%) with the remainder mapped as water (4%).

The shoreline of White Lake which forms the unit's western boundary is eroding at the rate of 14' per year. The landowner's objectives are to reduce this high rate of erosion using structural measures. Additional measures to be installed are two armor plated earthen plugs in the oil field canal that runs north and south between Schooner Bayou and Louisiana highway 82 borrow ditch. These plugs will eliminate channel flow from White Lake into unit VL-8.

Vermilion Lake Unit 11 (VL-11)

The hydrologic unit is a 2,560 acre area located between the south shore of White Lake and Pecan Island. The soils in this unit are mapped 89% Allemands muck, 8% Mermentau-Hackberry association, and 3% water. In 1949 this unit was mapped as a sawgrass marsh. The unit was mapped as fresh marsh in 1978 and 1988.

Estimated shoreline erosion rates for this unit are 3' per year. The landowner's objectives for this unit are to reduce shoreline erosion using vegetative plantings where feasible or structural measures where conditions warrant. Wetlands in

this unit have been under management for several years and would benefit from an influx of sediment and nutrients. The existing system of levees and structures will be maintained and managed to introduce sediment and nutrients from White Lake and to promote emergent plant productivity.

Vermilion Lake Unit 12 (VL-12)

This 5,229 acre unit is located between the south shore of White Lake and Louisiana Highway 82. The soils in this unit are 95% Allemands muck, 3% Mermentau-Hackberry association and 2% open water. Vegetation in this unit was mapped as a sawgrass marsh in 1949. This unit was mapped as non-marsh in 1978 and fresh marsh in 1988.

This unit is a former cattle pump-off area that has experienced high rates of subsidence due to decomposition of soil organic matter. The landowner's objectives are to restore the unit to a fresh marsh. In order to achieve this objective perimeter levees and water management infrastructure must be restored to prevent the unit from reverting to a large area of shallow open water. Additionally, White Lake shoreline erosion in the vicinity of Bear Lake is occurring at the rate of 5-18' per year. A segmented rock breakwater along the two foot contour line with vegetative planting along the shoreline is planned for this area.

Vermilion Lake Unit 13 (VL-13)

The hydrologic unit is a 2,712 acre area located between Louisiana Highway 82 and Grande de Volle Lake. Soil in this unit is mapped as Allemands muck (98%) the remainder of the unit is open water. In 1978 Chabreck and Linscombe mapped the eastern half of the unit as fresh marsh and the western half as intermediate. In 1988 the entire unit was mapped as intermediate marsh. Historically the unit was mapped as a sawgrass marsh.

Erosion is a serious problem in this unit along the shorelines of White and Grande de Volle Lakes. A segmented breakwater that extends from the unit's eastern boundary westward across the mouth of Grande de Volle Lake is proposed for this unit.

Vermilion Chenier Unit 1 (VC-1)

This 2,946 acre hydrologic unit is located on the Vermilion/Cameron Parish line between Louisiana Highway 82 and the Rockefeller Refuge. The soils in this unit are mapped as 70% Scatlake mucky clay, 18% Allemands muck, and 12% Clovelly muck. The historical vegetation in this unit according to the 1949 vegetative survey was a sawgrass marsh. The 1978

Chabreck and Linscombe map showed the unit to be fresh along its northern boundary, brackish along its southern boundary, and intermediate in the middle. The 1988 vegetative map shows the entire unit as intermediate marsh. Water levels and salinities are managed in this unit by a system of levees and water control structures. This system serves as a saltwater barrier for the lakes subregion of the basin. The landowner's objective for this unit is to manage for waterfowl, alligators and estuarine organisms. This will be accomplished by maintaining the existing water management system.

Vermilion Chenier Unit 2 (VC-2)

This 2,737 acre unit is located between Louisiana Highway 82 and the Rockefeller Refuge. Soils in the unit are mapped as 73% Clovelly muck, 16% Allemands, 7% Scatlake, and 4% Mermentau-Hackberry association. In 1978 the unit's vegetation was mapped as intermediate in the northern half and brackish in the southern half. In 1988 it was mapped entirely as intermediate. Historically the unit was mapped as a sawgrass marsh.

This unit is similar to unit VC-1 in that water levels and salinities are managed by a system of levees and water control structures. The levee system serves as a saltwater barrier for the lakes subregion of the basin. The landowner's objective for the unit is to manage for waterfowl, alligators and estuarine organisms. This will be accomplished by maintaining the existing water management system.

Vermilion Chenier Unit 3 (VC-3)

The hydrologic unit is a 956 acre area located between Louisiana Highway 82 and Rockefeller Refuge. Soils in this unit are mapped as 78% Clovelly, and 22% Mermentau-Hackberry association. Vegetation in this unit was mapped as a sawgrass marsh in 1949. The vegetation in this unit was mapped as non-marsh in 1978. In 1988 vegetation was mapped as intermediate marsh.

This unit is a former cattle pump-off area that has experienced high rates of subsidence due to decomposition of soil organic matter. The landowner's objectives are to manage the unit for wildlife as marsh habitat. This will be accomplished by maintaining the existing system of levees and water control structures.

Vermilion Chenier Unit 4 (VC-4)

The 19,800 acre unit is located between Louisiana Highway 82 and the Gulf of Mexico. Soils in the unit are mapped as 42%

Scatlake mucky clay, 40% Clovelly muck, 11% Bancker muck, and 6% Mermentau-Hackberry association. The historical vegetation in the unit was sawgrass marsh in the northern half, leafy three-cornered grass marsh in the south with a band of excessively drained salt marsh adjacent to the sea rim. The 1978 vegetative map depicts this unit as non-marsh along the northern boundary, intermediate in the north central portion, and brackish in the southern part. In 1988 the entire unit was mapped as brackish marsh except for an area adjacent to the gulf which was mapped as saline marsh.

The northern portion of this unit consists of large expanses of open turbid water that occurred as a result of a former cattle pump-off area being abandoned. Saltwater intrusion into the central portion of the unit has resulted in a decline in emergent vegetation.

Proposed measures for this unit include: maintenance of existing levees and structures and the installation of additional structures as necessary to restrict saltwater intrusion; and construction of terraces in the failed impounded area to provide a platform for emergent vegetation and reduce wave fetch.

Vermilion Chenier Unit 5 (VC-5)

This 1,056 acre unit is located on the Pecan Island Ridge. Soils in the unit are mapped as 59% Mermentau-Hackberry association and 41% Allemands muck. The 1949, 1978 and 1988 vegetative maps depict the unit as non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage facilities in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Vermilion Chenier Unit 6 (VC-6)

This 1,279 acre unit is located east of VC-4 in the Pecan Island Gas Field. Soils in this unit are 67% Bancker muck and 33% Clovelly muck. The historical vegetation in this unit is sawgrass marsh. The 1978 and 1988 vegetative maps for the unit show the marsh to be brackish.

The hydrology in this unit has been altered by oil and gas exploration and recovery activities. These activities have resulted in marsh loss due to saltwater intrusion. The landowner's objectives for the unit are to improve conditions for fish and wildlife habitat. This will be accomplished by maintaining the existing system of spoil banks and structures

and by the addition of an earthen plug in the pipeline canal located in the northeast corner. This plug will provide protection from salinity spikes.

Vermilion Chenier Unit 7 (VC-7)

This 545 acre unit is located south of Pecan Island on the Humble Canal. Soils in this unit are mapped as 27% Clovelly muck and 73% Bancker muck. The historical vegetation in this unit was sawgrass marsh. The vegetation in 1978 and 1988 was mapped as brackish marsh.

This unit is similar to unit VC-6 in that it is bounded on all sides by oil and gas canals. These canals have altered natural hydrology and serve as a conduit for saltwater.

The landowner's objective is to manage the unit for fish and wildlife habitat. This objective will be achieved by maintaining the existing system of spoil banks and replacing existing structures with adequately sized variable crest weirs. Replacement structures will be designed to allow ingress and egress of marine organisms.

Vermilion Chenier Unit 8 (VC-8)

This 265 acre hydrologic unit is located south of Pecan Island on the Humble Canal. The soils in this unit are mapped as 51% Clovelly muck and 49% Bancker muck. The historical vegetation in this unit was sawgrass marsh. The 1978 and 1988 vegetation type maps show the unit to be brackish marsh.

This unit is similar to units VC-6 and VC-7 in that it is bounded on all sides by oil and gas exploration canals. These canals have altered natural hydrology and serve as conduits for saltwater.

The landowner's objective for the unit is to manage for fish and wildlife habitat. This objective will be achieved by maintaining the existing system of spoil banks and replacing existing structures with adequately sized variable crest weirs. Replacement structures will be designed to allow ingress and egress of marine organisms.

Vermilion Chenier Unit 9 (VC-9)

This hydrologic unit is a 1,031 acre area located near the eastern end of the Pecan Island Ridge. Soil in this unit is mapped as Clovelly muck. In 1949 this unit was mapped as a sawgrass marsh. The unit was mapped as intermediate marsh in 1978 and brackish in 1988.

This unit is similar to surrounding units in that it is bounded on all sides by oil and gas exploration canals. These canals have altered natural hydrology and serve as a conduit for saltwater.

The landowner's objective for the unit is to improve the area's habitat for fish and wildlife. This objective will be achieved by maintaining the existing system of spoil banks and replacing existing structures with adequately sized variable crest weirs. Replacement structures will be designed to allow ingress and egress of marine organisms.

Vermilion Chenier Unit 10 (VC-10)

This 9,379 acre unit is located on the eastern end of the Pecan Island Ridge. Soils in this unit are mapped as 65% Mermentau-Hackberry association, 28% Allemands muck, and 6% Clovelly muck. This unit is considered non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage facilities in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Vermilion Chenier Unit 11 (VC-11)

This hydrologic unit is a 3,015 acre area adjacent to the Pecan Island Ridge and bisected by Louisiana Highway 3147. The soils in this unit are mapped as Clovelly muck (64%), Bancker muck (27%), and Mermentau-Hackberry association (9%) in remainder. In 1949 the vegetative map indicates the unit was a sawgrass marsh. The 1978 vegetative map shows the area to be intermediate in the north half and brackish in the southern half of the unit. In 1988 the unit is mapped as brackish in the west half and intermediate in the east half.

The landowner's objectives are to manage the unit to improve wildlife habitat with emphasis on increasing waterfowl and furbearer populations. Trapping and hunting success has declined in recent years due to increased open water areas that are the result of saltwater intrusion.

Proposed measures for this unit include: maintenance of existing spoil banks to reduce the incidence of saltwater intrusion; and increase the size of weir openings on existing structures and install additional structures to facilitate water management. The additional structures will incorporate design features that allow ingress and egress of marine organisms.

Vermilion Chenier Unit 12 (VC-12)

This 741 acre unit is located between Louisiana Highway 3147 and the Acadiana Marina Canal. The soils in this unit are 36% Clovelly muck, 26% Bancker muck, 24% Mermentau-Hackberry association, and 14% Allemands muck. Vegetation in 1949 was mapped as a sawgrass marsh. In 1978 and 1988 the vegetation was mapped as intermediate.

The hydrology in this unit has been extensively altered by exploration canals, pipeline, and highway construction. These activities have resulted in large expanses of turbid open water due to ponding and saltwater intrusion.

The landowner's objectives are to manage the area as an intermediate marsh to improve habitat for waterfowl, furbearers, alligators, and as a nursery for marine organisms. This will be accomplished by closing breaches in existing spoil banks and installing structures to improve water management capabilities.

Vermilion Chenier Unit 13 (VC-13)

This hydrologic unit is 14,283 acres in size and is located between the Humble Canal and the Gulf of Mexico. Soils in this unit are Clovelly muck (2%) along the north boundary, Bancker muck (93%) in the central area, Scatlake muck (2%) in the southern portion and Mermentau-Hackberry association (3%) along the gulf rim. Marsh types in 1949 were sawgrass in the north, leafy three-cornered grass in the west and excessively drained salt marsh in the east. The 1978 and 1988 vegetative maps show the unit as brackish marsh.

The landowner's objective for this unit is to maintain primary productivity of emergent vegetation to provide habitat for wildlife and grazing for cattle. Most of the marsh loss in this unit is direct loss attributed to the construction of petroleum pipelines and exploration and recovery canals. No specific measures are recommended for this unit.

Vermilion Chenier Unit 14 (VC-14)

This 4,801 acre unit is bounded on the north by the Humble Canal and on the east by Freshwater Bayou Canal. Soils in this unit are mapped Mermentau-Hackberry association (13%), Bancker muck (86%), and 1% Allemands along the north boundary. The unit's vegetation was mapped as excessively drained salt marsh in 1949. In 1978 it was mapped as brackish marsh and in 1988 as intermediate in the north half and brackish to the south.

Direct marsh loss in this unit can be attributed to shoreline erosion along Freshwater Bayou Canal and construction of Louisiana Highway 3147, cattle walkways, navigation and port facilities, and petroleum pipelines and access canals. There is also evidence of marsh loss due to saltwater intrusion in this unit.

The landowner's objectives are to manage the marsh to provide habitat for wildlife and grazing for cattle and reduce shoreline erosion. These objectives will be accomplished by maintaining the existing system of structures and through the installation of bank stabilization measures on Humble and Freshwater Bayou Canals.

Cameron Lake Unit 1 (CL-1)

This 56,125 acre hydrologic unit is located in the northwest corner of the basin adjacent to the GIWW and Louisiana Highway 27. Soils in the unit are predominately mapped as Allemands muck (61%), Ged muck (28%), Creole mucky clay (7%), and others. Vegetation in this unit was mapped as a sawgrass marsh in 1949. In 1978 the unit was mapped as predominately fresh marsh with a small portion of brackish marsh in the southeast and a zone of intermediate marsh in the southwest corner and adjacent to the brackish area in the southeast. In 1988 the unit's vegetation was mapped as fresh marsh except for a small area of intermediate adjacent to the Mermentau River and Louisiana Highway 82.

Overall the unit is experiencing a problem with prolonged periods of high water. Shoreline erosion along Grand Lake, the GIWW, and Lake Misere is also a serious problem. Large expanses of open water occur in the central and western portion of the unit. The open water areas along the western boundary were caused by the intrusion of saltwater through what is now known as the Cameron-Creole Watershed. In the central portion of the unit a large open water area resulted from an extensive marsh fire that destroyed much of the organic substrate.

The landowner's objectives are to manage the unit to maintain and improve habitat for waterfowl, alligators, freshwater fisheries, and furbearers. Water levels in this unit are passively managed by structures located at the outlet of Humble Canal, Superior Canal, under state highway 27 via the welfare bridge structure, plugged canals and various unstructured canals. Landowner's objectives will be achieved by implementing the following measures: replacement of the Humble Canal Structure; reduction of the cross-sectional area of Superior Canal; installation of bank stabilization measures on the GIWW; and construction of terraces in the large open water areas.

Cameron Lake Unit 2 (CL-2)

This 5,405 acre unit is part of the Lacassine NWR and is located between Lake Misere and the GIWW. Soils in this unit are mapped as Allemands muck (98%) with a band of Larose muck (2%) along Bayou Misere. Vegetation in this unit was mapped as freshwater marsh in 1949, 1978, and 1988.

The landowner's objectives for this unit are to reduce shoreline erosion by constructing suitable wave dampening structures along the shorelines of Lake Misere and the GIWW. Sediment deposited behind the structures will be vegetated to create additional wetland habitat.

Cameron Lake Unit 3 (CL-3)

This unit is 1,002 acres in size and part of the Lacassine NWR. The unit is located between the GIWW and Grand Lake. The unit's soils are mapped as Larose muck (29%) along Bayou Misere with the remainder mapped as Allemands muck (71%). In 1949, 1978 and 1988 the vegetation in this unit was mapped as freshwater marsh.

The landowner objectives for this unit are to reduce shoreline erosion by constructing suitable wave dampening structures along the shorelines of Grand Lake and the GIWW. Sediment deposited behind the structures will be vegetated to create additional wetland habitat.

Cameron Lake Unit 4 (CL-4)

The unit is comprised of 20,238 acres located between Grand and White Lakes. Soils in this unit are mapped as predominately Allemands muck (63%), Larose muck (20%) around lake rims, Ged muck (15%) along the GIWW, and 2% water. In 1949 the unit was mapped as fresh water marsh in the north and sawgrass marsh in the south. In 1978 and 1988 the entire unit was mapped as fresh marsh.

This unit contains more miles of shoreline than any unit in the basin. Consequently, shoreline erosion is a very serious problem. Another problem common to this unit and other units in the Lakes subbasin is prolonged periods of high water levels which are adversely affecting emergent vegetation.

The landowner's objective for this unit is to manage for waterfowl, alligators, furbearers, and grazing along the GIWW. Recommended measures for this unit are shoreline stabilization structures at critical areas of the GIWW and vegetative planting with wave stilling devices along lake rims.

Cameron Lake Unit 5 (CL-5)

This 5,329 acre unit is located on the east bank of the Mermentau River and north of Little Pecan Bayou. Soils in this unit are mapped as Larose (55%), Clovelly (22%), Bancker (13%), and Creole (10%). In 1949 vegetation in the unit was mapped as sawgrass marsh. In 1978 vegetation was mapped as brackish along the Mermentau River and Little Pecan Bayou grading to intermediate in the center and fresh marsh in the northeast corner. The 1988 vegetative map shows the unit to be intermediate marsh in the north and brackish in the south.

Marsh in this unit is being lost as a result of saltwater intruding via the Mermentau River Little Pecan Bayou system. Erosion is also a problem along the shoreline of Catfish Lake.

The landowner's objectives are to improve habitat conditions for waterfowl, alligators, and furbearers. This will be accomplished by restoring the natural levees along the north shore of Little Pecan Bayou and by installing structures that allow marine organism access while providing drainage and excluding saltwater. Shoreline protection of suitable design will be installed along the banks of Catfish Lake.

Cameron Lake Unit 6 (CL-6)

This unit is located on the southwest shore of Grand Lake and is 3,561 acres in size. Soils in the unit are mapped as Larose muck (48%) along the shorelines of Catfish and Grand Lakes, Allemands muck (46%), and 6% water. The unit's vegetation was mapped as a sawgrass marsh in 1949 and as a fresh marsh in 1978 and 1988.

Erosion of the Grand Lakes shoreline is the major cause of wetland loss in the unit and is estimated at 11 feet per year. Shoreline protection measures of suitable design will be installed at critical areas along the project's north boundary.

Cameron Lake Unit 7 (CL-7)

This 3,210 acre unit is located on the north bank of Little Pecan Bayou. Soils are mapped as 27% Clovelly muck along Little Pecan Bayou, 66% Allemands muck, and the remaining 7% as Larose muck. In 1949 vegetation in this unit was mapped as sawgrass marsh. Vegetation was mapped as fresh marsh with bands of intermediate and brackish marsh parallel to Little Pecan Bayou in 1978. In 1988 the unit's vegetation was mapped as fresh marsh to the north, intermediate in the center and brackish along Little Pecan Bayou.

This unit contains some unique and diverse wetlands that are salt sensitive. These wetlands are protected from saltwater intrusion via the Mermentau River/Little Pecan Bayou system by water control structures. However, these structures are in need of repair.

Proposed measures for this unit include replacement of existing water control structures with a single structure in Sawmill Canal and repairs to the levee on the north bank of Little Pecan Bayou. The structure for water control will be design to accommodate ingress and egress of marine organisms.

Cameron Lake Unit 7A (CL-7A)

This 2,129 acre unit is located adjacent to the north and east shore of Little Pecan Lake. The soil in this unit is mapped as Allemands muck. In 1949 vegetation in this unit was mapped as a sawgrass marsh. In 1978 and 1988 the unit was mapped as fresh marsh. Marsh loss is not a serious problem in this unit consequently no restoration measures are proposed.

Cameron Lake Unit 8 (CL-8)

This unit is located north of the Rockefeller Refuge Headquarters and is 5,991 acres in size. The unit's soils consist of 6% Clovelly muck, 7% Allemands muck, 20% Creole mucky clay and 67% Bancker muck. The historical vegetation in the unit was a sawgrass marsh. In 1978 the unit was mapped as intermediate to fresh marsh. The 1988 vegetative maps shows the unit to be intermediate marsh in the south and brackish marsh in the north.

Salinities in this unit have gradually increased since modifications were made to the Mermentau River channel. Marsh loss due to salt water intrusion can be found throughout the unit but is more evident in the southern part.

The landowner's objectives for CL-8 are to improve habitat conditions for waterfowl, alligators, and furbearers and improve grazing for cattle. These objectives will be accomplished by refurbishing the existing levee that forms the northern boundary, maintaining existing water control structures, and adding additional structures as necessary to provide drainage.

Cameron Lake Unit 9 (CL-9)

CL-9 is a 17,047 acre unit located on the south shore of Grand Lake and west of the Superior Canal. Soils in this unit are mapped as 82% Allemands muck, 7% Clovelly muck, 6% Bancker muck, 4% Larose and 2% Creole mucky clay. Historical vegetation was mapped as sawgrass marsh. Vegetation in 1978

was mapped as fresh marsh. In 1988 the unit's vegetation was mapped predominately as intermediate marsh with a small area of brackish in the west central area and a band of fresh marsh in the upper third.

The unit's hydrology has been extensively altered by petroleum exploration and extraction canals. This system of canals has created an avenue for saltwater intrusion via Little Pecan Bayou. An additional problem is shoreline erosion along Grand Lake where rates are estimated to be 30 to 50 feet per year.

The landowner's management objective for this unit is to improve conditions for waterfowl, furbearers, alligators, and freshwater fisheries. Proposed measures include maintenance of the existing saltwater barrier and installing rip-rap shoreline protection at critical locations on the Grand Lake rim.

Cameron Lake Unit 10 (CL-10)

This 9,931 acre unit is located between the Superior Canal and the Old GIWW. Soils in this unit consist of Larose muck (25%) along lake rims, Allemands muck (74%) in the interior and 1% water. The 1949 vegetation map show the unit's vegetation to be a sawgrass marsh. The unit was classified as a fresh marsh in 1978. In 1988 the unit was mapped as fresh marsh with a zone of intermediate marsh along its southern boundary.

Hydrology in this unit has been altered by navigation and oil exploration channels and pipelines. The shoreline of Grand and Collicon Lakes are also eroding at a high rate. For example, in the vicinity of Chenier du Fond the rate of erosion on Grand Lake is 14 feet per year. The shoreline of the Old GIWW is rapidly eroding increasing the size of the hydrologic link between Grand and White Lakes.

Proposed project measures consist of suitable shoreline protection along the Old GIWW and in the Chenier du Fond area of Grand Lake.

Cameron Lake Unit 11 (CL-11)

This unit is located north of North Island and is 1,562 acres in size. Soils are mapped as 4% Allemands muck, 14% Creole muck, 38% Larose muck, and 44% Clovelly muck. Vegetation in 1949 was mapped as a sawgrass marsh. In 1978 the unit was mapped as a fresh marsh with a small amount of intermediate marsh in the southwest corner. In 1988 the entire unit was mapped as intermediate marsh.

This unit is experiencing loss of emergent wetlands due to prolonged periods of high water levels; a problem common to

many units in the Lakes Subbasin. No site specific measures are proposed for this unit.

Cameron Lakes Unit 12 (CL-12)

This unit is located in the vicinity of North Island on the west bank of Superior Canal and is 1,817 acres in size. Soils are mapped as 9% Allemands muck, 3% Creole mucky clay, and 88% Larose muck. In 1949 the unit's vegetation was mapped as a sawgrass marsh. The 1978 vegetative map indicated the unit was mapped as a fresh marsh except for a small area in the southwest mapped as intermediate marsh. In 1988 the entire unit was mapped as intermediate marsh.

Hydrology in this unit has been altered by navigation canals, petroleum exploration canals, and trapper's ditches. As a result of these actions the unit has experienced a loss of vegetative wetlands attributed to ponding and saltwater intrusion.

The landowner's objectives are to manage the unit for waterfowl and freshwater fisheries habitat improvement and to provide forage for livestock. This will be accomplished by maintaining structures installed in adjacent units to control salinity spikes. The effects of ponding may be addressed by measures implemented on a basin scale.

Cameron Lake Unit 13 (CL-13)

This unit is located between Superior Canal and White Lake and is 15,541 acres in size. Soils in this unit are mapped as 49% Larose, 42% Allemands muck, and 9% Creole mucky clay. Vegetation in this unit was mapped in 1949 as a sawgrass marsh and in 1978 it was mapped as fresh marsh with a band of intermediate on the southern boundary. In 1988 the entire unit was mapped as intermediate marsh.

Problem areas in this unit are located along the shoreline of White Lake and in the vicinity of Deep Lake. Shoreline erosion rates along White Lake are estimated to be 10 feet per year. This high rate of shoreline loss is due in part to elevated water levels in the Lakes Subbasin. Loss of wetlands in the vicinity of Deep Lake is due in large part to salinity spikes that moved into the area via petroleum access canals.

Alternatives for this unit are: 1) appropriate bank stabilization measures along the shoreline of White Lake; 2) construction of terraces in the Deep Lake area to reduce fetch, enhance aquatic growth by reducing turbidity, create a platform for the growth of emergent vegetation, and increase the land to water ratio; 3) maintain the existing earthen plug

on the access canal that enters Deep Lake. This plug was installed to prevent saltwater intrusion into the lake.

Cameron Lake Unit 14 (CL-14)

This 1,960 acre unit is comprised of North Island and adjacent lands. Soils are mapped as 48% Clovelly, 48% Creole, 4% Mermentau-Hackberry association. Historical vegetation was mapped as a sawgrass marsh. In 1978 the area was mapped as predominately fresh marsh with some intermediate marsh in the southern portion of the unit. Acreage in the North Island chenier is mapped as non-marsh. In 1988 wetlands in the unit were mapped as intermediate marsh.

Cattle grazing was once and to a lesser extent still is a major land use in this unit. Consequently, portions of the unit were leveed and pumped to create additional grazing land. Some cattle pump-off areas have been abandoned and allowed to reverted to open water.

The landowner's objectives are to improve grazing and increase the wildlife and fisheries potential of the unit. This will be accomplished by repairing and maintaining existing levees and structures and managing water levels to improve conditions for wildlife while providing forage for livestock.

Cameron Chenier Unit 1 (CC-1)

The unit is located north of Creole and adjacent to Louisiana Highway 27. Soils in the 7,006 acre unit are mapped as 67% Creole mucky clay and 33% Larose muck. Historically the vegetation in the unit was mapped as a sawgrass marsh. In 1978 the vegetation was mapped as intermediate in the western half and fresh in the eastern half. In 1988 the entire unit was mapped as intermediate marsh.

Marsh loss in the unit can be attributed to saltwater intrusion and ponding. Saline water may enter the unit via Calcasieu Lake and the Cameron-Creole watershed causing a vegetative die-back. The unit has numerous oil field access roads, levees, and cattle walkways that as a general rule run north and south. These changes to the landscape have blocked drainage that generally occurs in a east to west direction. The result is wetland loss due to the effects of ponding and localized flooding of pastures.

The landowner's objectives for the unit are to maintain the existing fresh and intermediate marsh for wildlife habitat and rangeland. This can be accomplished by maintaining the existing system of structures that control saltwater intrusion. Ponding and local flooding problems can be addressed by reestablishing natural flow patterns and

replacing undersized culverts and bridges. Additional structures may be needed at outlet points on the Oak Grove Canal.

Cameron Chenier Unit 2 (CC-2)

This 4,570 acre unit is located in the vicinity of Little Chenier Bayou. Soils are mapped as 37% Larose muck, 35% Creole mucky clay, and 28% Bancker muck. Vegetation in 1949 was mapped as sawgrass marsh. Vegetation in 1978 was mapped as brackish adjacent to the Mermentau River, intermediate in the center, and fresh in the western portion of the unit. The unit was mapped as intermediate marsh in 1988.

This unit is managed primarily to provide grazing for livestock. Consequently, it's hydrology has been altered by cattle walkways, levees, and roads. There is an active oil field in the unit and recovery activities have also contributed to changes in hydrology. Loss of wetland vegetation due to ponding is directly related to changes in the unit's hydrology. Some marsh loss has occurred in the past due to saltwater intrusion via the Mermentau River/Little Chenier Bayou.

Ponding in the unit can be alleviated by reestablishing drainage through Little Chenier Bayou. This will require installing an adequately sized structure at it's intersection with the Mermentau River to prevent saltwater intrusion. Also, the outlet for the east-west levee that bisects the unit should be upgraded to reduce the effects of ponding.

Cameron Chenier Unit 3 (CC-3)

The 10,309 acre unit is located between the communities of Creole and Oak Grove. Soils in the unit are predominately Creole mucky clay (68%) with a small area of Mermentau-Hackberry association (32%) in the eastern portion. Historical vegetation was mapped as fresh marsh with a small area of leafy three corner grass marsh in the northwest portion of the unit. Vegetation in 1978 was mapped as intermediate in the central portion of the unit and brackish in the east and west ends of the unit. In 1988 the unit was mapped as intermediate marsh.

This unit is similar to Cameron Chenier Unit 2 in terms of land use and changes in natural hydrology. Problems in the unit are localized flooding, saltwater intrusion, and shoreline erosion along the Mermentau River.

Alternative solutions for the unit include: reevaluation of all drainage ways, culverts under roads and walkways, and structures for the purpose of determining adequate size and

location; and the redirection of flow of surface water into the Creole Canal. Adding additional water to Creole Canal may require improvements in the present condition and operation scheme of this system. Appropriate vegetation will be planted on the shoreline of the Mermentau River to control erosion. The problem of saltwater intrusion can be addressed by replacing the existing water control structure at Pumpkin Ridge.

Cameron Creole Unit 4 (CC-4)

This unit is located between Pumpkin Ridge and Chenier Perdue Ridge. Soils in this 8,298 acre unit are mapped as Creole mucky clay (73%), Mermentau-Hackberry association (11%), Bancker muck (9%), and Larose muck (7%). In 1949 vegetation in the unit was mapped as fresh water marsh. Vegetation in 1978 was mapped as fresh marsh in the west, brackish in the south central area and near Big Mouth Bayou with the remainder of the unit classified as intermediate marsh. Vegetation was mapped as intermediate marsh in 1988.

This unit is also similar to Cameron Chenier Unit 2 with respect to land use and the incidence and nature of hydrologic modifications. Problems associated with this unit are localized flooding and shoreline erosion.

Alternatives that address the identified problems are: 1) the installation of adequately sized culverts and structures, 2) locate culverts and structures in a manner that will improve their hydraulic efficiency, and 3) shoreline vegetative plantings.

Cameron Chenier Unit 5 (CC-5)

This 3,607 acre unit is located between Little Pecan Bayou and the Dr. Miller Canal. Soils in the unit are mapped as Creole mucky clay (15%) in the west, Bancker muck (40%) in the central area and Clovelly (45%) muck in the east. Historical vegetation was mapped as predominately sawgrass marsh with a small area of fresh water marsh in the west. Vegetation in 1978 was mapped as brackish along the Mermentau River and Little Pecan Bayou and intermediate in the southeast part of the unit. In 1988 the entire unit was mapped as brackish marsh.

This unit is experiencing marsh loss due to intrusion of saltwater via Little Pecan Bayou. Shoreline erosion is also a problem on the Mermentau River and Little Pecan Bayou.

The landowner's objectives for the unit are to improve habitat conditions for fish and wildlife and to provide forage for livestock in the area along the Mermentau River. These

objectives will be accomplished by: 1) maintaining the existing levees and structures on the south side of Little Pecan Bayou, 2) maintaining the plug in the Dr. Miller Canal to prevent circulation of saltwater, and 3) vegetating critical areas on the shoreline of the Mermentau River and Little Pecan Bayou.

Cameron Chenier Unit 6 (CC-6)

This 1,801 acre unit is located between the Grand Chenier Ridge and Upper Mud Lake. Soils are mapped predominately as Creole mucky clay (83%) with Mermentau-Hackberry association (17%) along the Mermentau River. In 1949 vegetation in the unit was mapped as fresh water marsh. Vegetation in 1978 was mapped as brackish marsh. Vegetation in 1988 was mapped as intermediate marsh.

Marsh loss is not a serious problem in this unit. The landowner's objective of managing the unit to provide grazing for livestock and habitat for wildlife can be met by maintaining the existing system of levees and water control structures.

Cameron Chenier Unit 7 (CC-7)

The unit is located between the Grand Chenier Ridge and the Dr. Miller Canal. Soils in the 4,205 acre unit are mapped as Banker muck (30%)in the northeast, Mermentau-Hackberry association (8%) on the ridge and the remainder as Creole mucky clay (62%). The unit's historical vegetation was mapped as fresh water marsh along the Mermentau River and the balance in sawgrass marsh. The 1978 vegetative map depicts the unit as non-marsh because it is leveed and under forced drainage. In 1988 vegetation was mapped as intermediate marsh in the west, non-marsh in the center and brackish marsh in the east.

Hydrology in the unit has been manipulated since the 1950's by a complex system of levees and pumps which provide forced drainage. As a result of this action the unit has subsided due to decomposition of the organic substrate. Failure to adequately maintain the levee system in the eastern most subunit has resulted in large expanses of open water.

The landowner's objectives are to manage the unit for recreational hunting and cattle grazing. This will be accomplished by maintaining and repairing the existing system of levees, structures and pumps.

Cameron Chenier Unit 8 (CC-8)

This 3,697 acre unit is located in the extreme southwest corner of the basin. Soils are mapped as 32% Mermentau-Hackberry association and 68% Scatlake muck. The unit's vegetation was mapped as excessively drained salt marsh adjacent to the beach rim and brackish three-cornered grass marsh to the north. The 1978 and 1988 vegetative maps depict the area as brackish marsh in the north and a band of saline marsh along the gulf.

Prior to construction of the Mermentau Ship Channel saltwater intrusion was a problem in this unit. High salinity water would move up the Creole Canal into the marsh between Rutherford Beach and Front Ridge. The mouth of the Mermentau River has silted in and this is no longer a problem.

Habitat conditions in this unit would be improved if shallow open water areas affected by saltwater intrusion were reestablished to vegetation. Terracing may be necessary to provide a platform for the growth of emergent plants.

Cameron Chenier Unit 9 (CC-9)

The 4,116 acre unit is located between the lower Mermentau River and La. Highway 82. Soils in the unit are mapped as Mermentau-Hackberry association (18%) in the east and Scatlake muck (82%) in the west. Historical vegetation was mapped as brackish three-cornered grass marsh. Vegetation in 1978 was mapped as predominately brackish with a band of saline marsh along the Mermentau River. In 1988 the unit's vegetation was mapped as brackish marsh.

The major landuses in this unit are livestock and mineral production. Access roads and cattle walkways have altered the units hydrology and caused minor losses of emergent vegetation due to ponding. Additionally, shoreline erosion on the east end of the unit is resulting in loss of emergent species.

Alternatives that address the loss of the unit's emergent vegetation are: 1) the installation of adequately sized culverts and structures, 2) locate culverts and structures in a manner that will improve their hydraulic efficiency, and 3) shoreline vegetative plantings.

Cameron Chenier Unit 10 (CC-10)

This 3,563 acre unit is located between Lower Mud Lake and the Gulf of Mexico. Soils are mapped as 22% Mermentau-Hackberry association and 78% Scatlake muck. In 1949 the vegetation was mapped as brackish three-cornered grass marsh. In 1978 and 1988 vegetation in the entire unit was mapped as saline marsh.

Beach erosion in that portion of the unit west of the ship channel jetties is occurring at the rate of 30 feet per year. Shoreline erosion is also a problem in the Mermentau Ship Channel.

Alternatives that address the problem of shoreline erosion are: 1) dispose material dredged from the Mermentau Ship Channel to the west of the channel's jetties and 2) install appropriate shoreline protection measures at critical locations on the Mermentau Ship Channel.

Cameron Chenier Unit 11 (CC-11)

The unit is located between Hog Bayou and Grand Chenier and is 7,058 acres in size. Soils in this unit are Scatlake muck (51%), Creole mucky clay (28%), Bancker muck (14%), and Mermenatu-Hackberry association (7%). Historical vegetation was mapped as brackish three-cornered grass marsh. In 1978 the unit's vegetation was mapped as predominately brackish marsh with saline marsh along Hog Bayou. In 1988 the unit was mapped as saline marsh adjacent to Lower Mud Lake and the remainder as brackish marsh.

The unit has sustained considerable marsh loss from 1978 to 1985; converting from a brackish to a saline marsh. High rates of emergent vegetation loss are attributed to man-made changes in the unit's hydrology such as petroleum access canals and roads, cattle walkways and trenasses. Canals and trappers ditches created avenues for saltwater intrusion and increased tidal amplitude since the construction of the Mermentau Ship Channel. Additionally, large subunits are managed as cattle pump-offs with levees, water control structures and pumps in need of various repairs.

The landowner's objectives for this unit are to maintain the existing brackish marsh to provide habitat for waterfowl and estuarine organisms, and reduce saltwater intrusion. This will be accomplished by repairing the existing system of levees and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Cameron Chenier Unit 12 (CC-12)

This 372 acre unit is located south of Louisiana Highway 82 and east of Grand Chenier. Soils are mapped as 60% Mermentau-Hackberry association and 40% Creole mucky clay. In 1949 vegetation was mapped as brackish three cornered grass. In 1978 and 1988 the unit's vegetation was mapped as brackish.

The landowner's objectives are to manage the unit for forage production and wildlife habitat. This will be accomplished by maintaining the existing system of levees and pumps.

Cameron Chenier Unit 13 (CC-13)

This unit is located south of Louisiana Highway 82 and west of Club Canal. Soils in the 878 acre unit are mapped as 73% Creole mucky clay and 27% Mermentau-Hackberry association. In 1949 the unit's vegetation was mapped as brackish three cornered grass. The unit was mapped as non-marsh in 1978 and brackish marsh in 1988.

The landowner's objectives are to manage the unit for forage production and wildlife habitat. This will be accomplished by maintaining the existing system of levees and pumps.

Cameron Chenier Unit 14 (CC-14)

This 7,316 acre unit is located south of La. Highway 82 and east of Club Canal. Soils in this unit are mapped as 31% Creole mucky clay, 7% Mermentau-Hackberry association, and 62% Scatlake muck. Vegetation in 1949 was mapped as brackish three-cornered grass marsh. In 1978 vegetation was mapped as brackish marsh in the north, non-marsh (pump-off) in the central area, and saline marsh adjacent to the gulf. In 1988 the entire unit was mapped as brackish marsh except for a narrow band of saline marsh along the gulf shoreline.

Hydrology in this unit has been extensively altered by man induced and natural occurrences. Levees, associated water control structures and walkways, many of which are currently in a state of disrepair, were constructed to facilitate cattle grazing. Roads were established to facilitate petroleum exploration and recovery. Beach Prong, a distributary channel of Hog Bayou, has silted in at it's intersection with the gulf resulting in ponding in this and adjacent units. The product of these cumulative actions is loss of emergent marsh due to subsidence and ponding.

The landowner's objectives for the unit are to stabilize water levels, reduce salinities, increase the wildlife and fisheries potential, and improve conditions for desirable plant communities. Alternative solutions to the unit's problems include: 1) repair breaches in existing levees, 2) replace deteriorated and undersized water control structures, and 3) reestablish drainage outlets.

Cameron Chenier Unit 15 (CC-15)

This unit is located south of Louisiana Highway 82 and west of Rockefeller Refuge. The soil in the 2,754 acre unit is mapped as 62% Scatlake muck, 21% Clovelly muck and 17% Mermentau-Hackberry association. Historical vegetation was mapped as brackish three-cornered grass marsh. Vegetation in 1978 and 1988 was mapped as brackish marsh.

This unit consists of subunits that are well maintained cattle pump-offs and subunits that are abandoned cattle pump-offs. Loss of emergent marsh in the abandoned pump-offs is attributed to subsidence and lack of an adequate drainage outlet.

The objectives of the landowners of this unit are to maintain the present management scheme in existing cattle pump-offs. In abandoned pump-offs their objectives are to improve habitat conditions for waterfowl and estuarine organisms. These objectives will be accomplished by maintaining the existing system of levees, water control structures, and pumps and by reestablishing drainage outlets.

Cameron Chenier Unit 16 (CC-16)

The 3,817 acre unit is located between Hog Bayou and the Gulf of Mexico. The soil is mapped as 100% Scatlake muck. Historical vegetation was mapped as brackish three cornered grass in the north, sea rim along the Gulf of Mexico in the south, and excessively drained salt marsh in the middle. Vegetation in 1978 and 1988 was mapped as saline marsh except for a small area of brackish marsh in the northeast part of the unit.

Marsh losses in the unit are attributed to changes in hydrology and salinity regimes and beach erosion. The unit's interior is experiencing increased salinity levels and high rates of water exchange. Beach erosion along the eastern part of the unit is occurring at the rate of 30 feet per year.

The current landuse for this unit is pasture for cattle and habitat for fish and wildlife species. Installation of shoreline protection measures would assure the continued present usage of the unit.

Cameron Chenier Unit 17 (CC-17)

This 2,241 acre unit is located south of Hog Bayou in the vicinity of First Lake. Soils in the unit are predominately mapped as Scatlake muck (72%), Clovelly muck (17%) and Creole mucky clay (11%). Vegetation in 1949 was mapped as leafy three corner grass marsh. In 1978 and 1988 the entire unit

was mapped as brackish except for a small area in the southwest portion which was mapped as saline marsh.

Marsh loss in this unit is attributed to natural and man-made changes in hydrology occurring within the unit and in adjacent units. Petroleum exploration and recovery roads, cattle pump-off levees and walkways, and silting up of the mouth of Beach Prong have resulted in blocking natural drainage in the unit. The outcome of these actions is marsh loss due to ponding.

The landowner's objectives for the unit are to stabilize water levels, improve drainage of excessive water, and improve conditions for emergent plant growth. Solutions to the unit's problems include: 1) replacement of deteriorated and undersized water control structures and culverts and 2) re-establishment of drainage outlets.

Cameron Chenier Unit 18 (CC-18)

This 1,160 acre unit is located on the Little Chenier Ridge. Soils in the unit are mapped as 84% Creole mucky clay and 16% Larose muck. The 1949, 1978, and 1988 vegetative maps depict the unit as non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage facilities in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Cameron Chenier Unit 19 (CC-19)

This 5,984 acre unit is located on the Creole and Pumpkin Ridges. The soils in the unit are mapped as Mermentau-Hackberry association (62%), Creole mucky clay 34%, and Larose muck (4%). The 1949, 1978, and 1988 vegetative maps depict the unit as non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage facilities in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Cameron Chenier Unit 20 (CC-20)

This 2,395 acre unit is located on the Oak Grove Ridge. The soils in this unit are mapped 85% Mermentau-Hackberry

association and 15% Creole mucky clay. The 1949, 1978, and 1988 vegetative maps depict the unit as non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage infrastructure in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Cameron Chenier Unit 21 (CC-21)

This 9,636 acre unit is located on the Grand Chenier Ridge. The soils in this unit are mapped 65% Mermentau-Hackberry association, 28% Creole mucky clay, and 7% Scatlake muck. The 1949, 1978, and 1988 vegetative maps depict the unit as non-marsh.

The major objectives of local landusers for this unit are to maintain adequate flood control and drainage infrastructure in the area. All wetland conservation measures installed in adjacent hydrologic units will be compatible with these objectives. There are no specific marsh conservation practices proposed for this unit.

Rockefeller Refuge Unit 1 (R-1)

This hydrologic unit is a 1,081 acre area located adjacent to the east end of the Rockefeller Headquarters complex. Soils in the unit are mapped as Scatlake muck (55%), Mermentau-Hackberry association (32%) and Creole mucky clay (13%). The area's vegetation was mapped as a sawgrass marsh in 1949. In 1978 and 1988 the unit's vegetation was mapped as intermediate marsh.

The objectives for this unit are to manage for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing system of levees, pumps, and structures.

Rockefeller Refuge Unit 1a (R-1a)

This 180 acre unit consists of the Rockefeller Refuge Headquarters complex and research ponds. The soil in this unit is mapped as Mermentau-Hackberry association. Historic marsh vegetation was mapped as sawgrass marsh. In 1978 vegetation was mapped as intermediate marsh. In 1988 the unit was mapped as non-marsh. No specific measures are planned for this unit.

Rockefeller Refuge Unit 1b (R-1b)

The unit is located in the northwest corner of Rockefeller Refuge and is 252 acres in size. The soil in this unit is mapped Mermentau-Hackberry association. Vegetation was mapped in 1949 as a sawgrass marsh and as intermediate marsh in 1978. In 1988 the unit was mapped as non-marsh.

The objectives for this unit are to manage for waterfowl and deer. This will be accomplished by maintaining the existing system of levees, pumps, and structures.

Rockefeller Refuge Unit 2 (R-2)

The 1,185 acre unit is located south of the refuge headquarters complex. Soils in this unit are mapped as 94% Scatlake muck and 6% Mermentau-Hackberry association. Historical vegetation in the unit was mapped as sawgrass marsh. Vegetation was mapped as intermediate in 1978 and 1988.

The unit's hydrology is controlled by a forced drainage system comprised of levees, a water control structure, and a pump. The objectives of this unit are to manage the existing intermediate marsh as habitat for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 3 (R-3)

This unit is bounded on the north by the Headquarters Canal and on the west by the Bertrand Canal and is 4,190 acres in size. Soil is this unit is mapped as Scatlake muck. Vegetation was mapped as a sawgrass marsh in 1949 and as intermediate to brackish marsh in 1978. The 1988 vegetative map depicts the unit as intermediate marsh.

The unit's hydrology is controlled by a gravity drainage system comprised of levees and water control structures. The objectives of this unit are to manage the existing intermediate marsh as habitat for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 4 (R-4)

The 5,135 acre unit is located immediately south of North Island. Soils in this unit are mapped as 72% Scatlake muck, and 28% Clovelly muck. Vegetation in 1949 was mapped as sawgrass marsh in the north and leafy three-cornered grass in the south. In 1978 vegetation was mapped as intermediate

marsh with brackish marsh in the southwest. The unit's vegetation was mapped in 1988 as brackish marsh in the west half and intermediate marsh in the east half.

The unit's hydrology is controlled by an actively managed gravity drainage system comprised of levees and three water control structures. This system will be maintained to achieve the objective of managing the unit as an intermediate/brackish marsh habitat for waterfowl, shorebirds, and estuarine organisms.

Rockefeller Refuge Unit 5 (R-5)

Unit R-5 is bounded on the north by Union Canal and on the west by Joseph Harbor Bayou. It is 5,356 acres in size. The unit is almost entirely Scatlake muck soil except the beach rim along the gulf. Historical vegetation was mapped as leafy three-cornered grass with a band of excessively drained salt marsh along the gulf. Vegetation in 1978 and 1988 was mapped as brackish marsh with a band of saline marsh parallel to the beach rim.

Water management in this unit is accomplished by gravity drainage utilizing a levee system and two water control structures. The objectives of this unit are to manage the existing brackish/saline marsh as habitat for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 6 (R-6)

This 14,252 acre unit is located in the central portion of Rockefeller Refuge. It is bounded on the north by the Property Line Canal and on the west by North Island Canal and Deep Lake. Soils in this unit are predominately Clovelly muck (54%) with Scatlake muck (46%) along the southern boundary. Historical vegetation in the unit was mapped as sawgrass marsh in the northern third and leafy three-cornered grass in the remainder. In 1978 and 1988 vegetation in this unit was mapped as intermediate in the northern half and brackish in the remainder.

Water exchange between this unit and adjacent waterbodies is managed by a system of levees, five existing water control structures, one sheet pile dam, and eight earthen plugs with weir sections. These structures reduce tidal amplitude and stabilize water levels and salinities not only on the refuge but in the Lakes Subbasin as well.

The objectives for this unit are to maintain the existing intermediate/brackish marsh habitats for waterfowl,

shorebirds, alligators, and estuarine organisms. This will be accomplished by maintenance of the existing system of levees and structures.

Rockefeller Refuge Unit 7 (R-7)

This 499 acre unit is situated on the gulf shore south of Deep Lake. The soil in the unit is mapped as Scatlake muck. In 1949 vegetation in the unit was mapped as leafy three-cornered grass with excessively drained salt marshes to the south. In 1978 and 1988 the unit's vegetation was mapped as saline marsh.

The major problem in this unmanaged tidal marsh is gulf shoreline erosion. Refuge personnel estimate erosion is occurring at the rate of 30' to 50' per year. The management objective of the unit is to maintain the existing saline marsh as habitat for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by installing suitable shoreline protection measures.

Rockefeller Refuge Unit 8 (R-8)

This unit is located in the central portion of Rockefeller Refuge along it's northern boundary and is 1,142 acres in size. Soils in the unit are predominately Scatlake muck (96%) with a band of Creole muck (2%) and Clovelly muck (1%) along the north and south respective boundaries. Historical vegetation was mapped as a sawgrass marsh. Vegetation in 1978 and 1988 was mapped as an intermediate marsh.

The unit's hydrology is controlled by a forced drainage system comprised of levees, a water control structure, and a pump. The objectives of this unit are to manage the existing intermediate marsh as habitat for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 9 (R-9)

The 124 acre unit is located on the refuge's northern boundary east of the Superior Canal. Soil in the unit is mapped as 97% Scatlake muck and 3% Creole muck. Vegetation in the unit was historically mapped as a sawgrass marsh. In 1978 the unit was mapped as an intermediate marsh. Vegetation was mapped as fresh marsh in 1988.

The objective for this unit is to manage the area as an impoundment. This will be accomplished by maintaining the existing system of levees and water control structures.

Rockefeller Refuge Unit 10 (R-10)

This 530 acre unit is located in the north central portion of the refuge; it's western boundary is the Superior Canal. Soils in this unit are mostly Scatlake muck (93%) with some Creole muck (7%) along the northern boundary. In 1949 vegetation in the unit was mapped as a sawgrass marsh. Vegetation was mapped as intermediate marsh in 1978 and as fresh marsh in 1988.

The unit's hydrology is controlled by a forced drainage system comprised of levees, a water control structure, and a pump. The objectives of this unit are to manage the existing fresh/intermediate marsh as habitat for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 11 (R-11)

This 196 acre unit is bounded on the west by Humble Canal and on the north by Property Line Canal. The soil in this unit is mapped 92% Scatlake muck and 8% Creole muck. Vegetation was mapped as a sawgrass marsh in 1949, intermediate marsh in 1978, and brackish marsh in 1988.

This unit was once managed as an impoundment but unstable soil conditions and wave erosion caused the levee to fail along Humble Canal. Proposed measures to restore this open water area to a productive marsh include sediment trapping devices or terraces and vegetative plantings.

Rockefeller Refuge Unit 12 (R-12)

This 863 acre unit is know as Deep Lake. No specific measures are planned for this open water unit.

Rockefeller Refuge Unit 13 (R-13)

This 2,006 acre unit is located in the north central portion of the refuge; it's eastern boundary is the Cameron/Vermilion Parish line. The soil in this unit is mapped Scatlake muck. Vegetation was mapped as a sawgrass marsh in 1949, intermediate marsh in 1978, and fresh marsh in 1988.

The unit's hydrology is controlled by a forced drainage system comprised of levees, a water control structure, and a pump. The objectives of this unit are to manage the existing fresh/intermediate marsh as habitat for waterfowl, shorebirds, alligators, and deer. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 14 (R-14)

This 2,294 acre unit is located in the northeast portion of the refuge in Vermilion Parish. Soils mapped in this unit are Scatlake muck (58%) and Clovelly muck (42%). The historical vegetation in this unit was mapped as sawgrass marsh. Vegetation in 1978 and 1988 was mapped as intermediate marsh.

Water management in this unit is accomplished by gravity drainage utilizing a system of levees and water control structures. The objectives of this unit are to manage the existing intermediate marsh as habitat for waterfowl, shorebirds, and alligators. This will be accomplished by maintaining the existing water management system.

Rockefeller Refuge Unit 15 (R-15)

The hydrologic unit is a 761 acre area located in the northeast corner of the refuge. The unit contains mostly Scatlake muck (63%) except for a band of Clovelly muck (37%) along the western boundary. Vegetation was mapped as a sawgrass marsh in 1949, brackish marsh in 1978 and intermediate marsh in 1988.

Water is managed in this unit by a gravity drainage system consisting of levees and a water control structure. The objective of this unit is to maintain the existing intermediate marsh as habitat for waterfowl, alligators, shorebirds, and estuarine organisms. This will be accomplished by maintaining the existing levees and structure.

Rockefeller Refuge Unit 16 (R-16)

The 2,037 acre unit is located on the easternmost end of the refuge and is bounded on the south side by the Gulf of Mexico. Scatlake muck is the only soil found in this unit. In 1949 vegetation was mapped as leafy three-cornered grass with a band of excessively drained salt marsh along the gulf. Vegetation in 1978 and 1988 was mapped as brackish in the north and saline in the south.

Currently the unit is experiencing an impediment of tidal water exchange and drainage because outlet channels are being filled by sediment from the gulf. Also, the gulf shoreline is eroding at a rate of 30' to 50' per year.

The objective of this unit is to maintain the existing brackish/saline marsh as habitat for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by maintaining channel openings during periods of high water events. Shoreline erosion will be treated with segmented break water structures.

Rockefeller Refuge Unit 17 (R-17)

This hydrologic unit is a 8,264 acre area located in the southwest portion of the refuge. Price Lake and Alligator Lake are included in this unit. Scatlake muck is the dominant soil mapped in the unit (78%) however, Clovelly muck occurs in the west central area (22%). Vegetation in 1949 was mapped as a sawgrass marsh in the extreme northeast section of the unit with the remainder mapped as leafy three-cornered grass. Vegetation in 1978 and 1988 was mapped as brackish marsh.

The unit has a gravity drainage system composed of levees and two water control structures. Currently there is a ponding problem in the western portion of the unit and on private property adjacent to the refuge's western boundary.

The objectives for the unit are to maintain the existing brackish marsh as habitat for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by maintenance of the existing levee system and water control structures. Also, two additional water control structures will be installed in the unit to provide additional drainage in ponded areas on and off the refuge.

Rockefeller Refuge Unit 18a (R-18a)

The 2,538 acre unit is located along the gulf from Miller Lake west to the Beach Prong. Scatlake muck is the only soil found in this unit. Historical vegetation in this unit was mapped as leafy three-cornered grass with a band of excessively drained salt marsh in a narrow band along the coast. In 1978 vegetation was mapped as brackish with a band of saline marsh parallel to the coast. In 1988 the entire unit was mapped as saline marsh.

Beach erosion is a serious problem in this unit. Refuge personnel estimate current rates are from 30' to 50' per year.

The management objective for this unit is to maintain the existing brackish/saline marsh habitats for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by constructing segmented breakwaters along the gulf shoreline.

Rockefeller Refuge Unit 18b (R-18b)

This 2,068 acre unit is located on the gulf shoreline in the vicinity of Little Constance Bayou. The entire unit is mapped as Scatlake muck. In 1949 vegetation in the unit was mapped as a leafy three-cornered grass marsh with a narrow band of excessively drained salt marsh along the coast. In 1978 the vegetation was mapped as brackish in the northern two-thirds

and saline marsh in the lower third. The unit was mapped in 1988 as predominately saline marsh with a narrow band of brackish marsh along the north boundary.

This unit is experiencing an impediment of tidal water exchange and drainage because outlet channels are being filled by sediment from the gulf. Also, the gulf shoreline is eroding at a rate of 30' to 50' per year.

The management objective for this unit it to maintain the existing brackish/saline marsh habitat for waterfowl, shorebirds, and estuarine organisms. Shoreline erosion will be treated with segmented breakwater structures at critical locations. Outlet channels will be maintained to allow drainage during periods of high water.

Rockefeller Refuge Unit 18c (R-18c)

The 2,660 acre unit is located on the gulf shore in the vicinity of Big Constance Lake. The entire unit is mapped as Scatlake muck. In 1949 vegetation in the unit was mapped as a leafy three-cornered grass marsh with a narrow band of excessively drained salt marsh along the coast. In 1978 the vegetation was mapped as brackish in the northern half and saline marsh in the remainder. The unit was mapped in 1988 as predominately saline marsh with a small area of brackish marsh in the northwest corner.

Erosion of the gulf shoreline is a critical problem in this unit. Shoreline loss rates are greater than 50' per year at some locations. Additionally, the unit is experiencing an impediment of tidal water exchange and freshwater removal because outlet channels are being filled by sediment from the gulf.

The management objective for this unit is to maintain the existing brackish/saline marsh habitat for waterfowl, shorebirds, and estuarine organisms. Shoreline erosion will be treated with segmented breakwater structures at critical locations. Outlet channels will be maintained to allow drainage during periods of high water.

Rockefeller Refuge Unit 18d (R-18d)

This unit is located along the gulf coast in Vermilion Parish and is 17,162 acres in size. Scatlake muck is the only soil type mapped in this unit. The unit was historically leafy three-cornered grass with a narrow band of excessively drained salt marsh along the gulf shoreline. The 1978 Chaubreck and Linscomb map shows the vegetation in the unit to be brackish marsh with the exception of a band of saline marsh along the coast. In 1988 vegetation was mapped as brackish marsh in the

northeast and north central portion of the unit and saline in the remainder.

The unit is relatively unmanaged, but there are four structures at various locations that influence hydrology to some degree. Weirs are located on Rollover Bayou and Pigeon Bayou. A fresh water diversion structure and sheet pile dam are located at Cop-cop Bayou.

This unit is experiencing an impediment of tidal water exchange and freshwater removal because outlet channels are being filled by sediment from the gulf. Also, the gulf shoreline is eroding at a rate of 30' to 50' per year.

The management objective for this unit is to maintain the existing brackish/saline marsh habitat for waterfowl, shorebirds, and estuarine organisms. This will be accomplished by maintaining all structures particularly the fresh water introduction structure at Cop-cop Bayou. Shoreline erosion will be treated with segmented breakwater structures at critical locations. Outlet channels will be maintained to allow drainage during periods of high water.

IMPLEMENTATION

Solving the problem of marsh loss in the Mermentau basin will require a concerted effort by private landowners, federal and state agencies, and local governments. Implementation of proposed measures is dependent upon the willingness of private landowners and local organizations to request assistance and assume a leadership role in project development. Technical assistance for implementation can be obtained through various federal, state, and local agencies. Financial assistance may be available from public and private sources.

STATE AND LOCAL GOVERNMENT

Louisiana Department of Natural Resources/Coastal Restoration Division (LDNR/CRD)

The primary function of LDNR/CRD is to conserve and restore vegetated wetlands in coastal Louisiana. A dedicated trust fund was created by Act 6 of the Second Extraordinary Session of the 1989 Louisiana Legislature to provide a long-term funding source for coastal wetlands projects. The agency prepares a Coastal Wetlands Conservation and Restoration Plan for each fiscal year and evaluates all submitted projects for funding and implementation. A LDNR/CRD project office is located in Abbeville, Louisiana.

Louisiana Department of Agriculture and Forestry Office of Soil and Water Conservation

The primary function of the Office of Soil and Water Conservation is to provide program, administrative, and financial support to Louisiana's 43 soil and water conservation districts. This agency is responsible for planning and implementing all soil and water conservation programs in the state. Recognizing the need to provide direction for future soil and water conservation programs, as well as guidance for funding activities, the agency developed, in concert with others, the Louisiana Statewide Resource Conservation Program. This plan represents proposals for program needs, priorities, operational funding levels, and a schedule for implementation. The Office of Soil and Water Conservation maintains an office in Baton Rouge, Louisiana.

State Soil and Water Conservation Districts

In Louisiana, SWCD's have been charged with the responsibility of conserving Louisiana's soil and water resources since 1938 when the Louisiana Legislature passed the Soil Conservation District Law, Act no. 370. The objectives, as stated in the law, are to provide for conservation of the State's soil and water resources, control and prevent soil erosion, preserve wildlife, protect public lands, and promote the health,

safety, and general welfare of the people of the state. The framers of the Act recognized Louisiana's farm, grazing, and forestlands as assets basic to survival of mankind. The Gulf Coast and Vermilion SWCD's serve landowners in the study area. Offices are located in Lake Charles and Abbeville, Louisiana respectively.

FEDERAL GOVERNMENT

United States Department of Agriculture
Natural Resources Conservation Service (NRCS)

The Soil Conservation and Domestic Allotment Act, Public Law 74-46, approved April 27, 1935, is the authorizing legislation that created the NRCS. The objectives of the legislation were to plan and carry out a national soil and water conservation program, and to provide leadership in conservation, development, and productive use of the nations soil, water, and related resources.

The NRCS provides technical assistance to individuals and groups in planning and applying soil and water conservation practices, and furnishing technical soil and water conservation information to units of government.

The NRCS in Louisiana has 10 field offices that provide technical assistance to marsh landowners. This is not a new concept, because assistance has been provided since the 1940's. Over the years, NRCS personnel have provided essential interdisciplinary input into preparing complex coastal wetland restoration plans. NRCS offices in Abbeville and Lake Charles, Louisiana serve landowners in the Mermentau Basin.

NRCS Programs

Watershed Protection and Flood Prevention

This program was authorized under the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended. The objectives are to provide financial and technical assistance in planning and carrying out works of improvement to protect, develop and utilize the land water resources in small watersheds (under 250,000 acres).

Assistance is provided in planning, designing, and installing watershed works of improvement; in sharing costs of flood prevention, irrigation, watershed protection, sedimentation control, and public water based fish and wildlife habitat, and recreation; and in extending long-term credit to help local interests with their share of the costs.

Public Law 566 funds have been used in Louisiana to protect wetlands in the coastal zone. About 26 miles of levees and

five major structures for water control have been installed under this authority. Several coastal zone projects are currently in the the planning stage of development.

River Basin Surveys and Investigations

The program was authorized under the Watershed Protection and Flood Prevention Act, Public Law 83-566, as amended, Section 6. The objectives are to assist Federal, State, and local agencies in collecting decision making information regarding water and related land resources with specific objectives of improving national economic development and environmental quality. Studies are carried out in cooperation with State, Federal and local agencies. Special priority is given to solving non-point pollution problems including erosion and salinity; protecting and improving important farmlands, wetlands, flood plains, and other special resources; improving irrigation efficiencies; and identifying flood hazards and other flood plains resources to assist local governments in developing a flood plain management program.

Inventory and Monitoring

The objectives of this program are to provide for field collection, interpretation, and publication of natural and related resource data. These data and interpretations serve many agency and department needs as well as those of individuals, groups, and units of government. They permit users to examine the relations and interaction of natural and related resources to determine how they are used, how they are managed, to define resource problems, and to identify resource potential.

The "Coastal Marsh Inventory," a three-year inventory of Louisiana's Coastal Marsh, was completed in 1986. The inventory was designed to consider all program and agency resource data needs. The data collected permits an in-depth evaluation of the coastal marshland and its degradation. Although the 1982 National Resources Inventory (NRI) did not inventory marshland erosion, data was collected on the 1982 Primary Sample Units (PSU's) so that erosion trends can be established from future monitoring of the PSU's.

Plant Materials for Conservation

The program was authorized under the Soil Conservation and Domestic Allotment Act, Public Law 74-76, approved April 27, 1935. Program objectives are to assemble, evaluate, select, release, and introduce into commerce new and improved plant materials for soil, water, wildlife conservation, and environmental improvement.

Plant materials are used in all phases of the soil and water conservation program. Plant material centers produce only enough of any variety for field testing; to prove value in conservation

on cooperator's properties; and to provide commercial producers with breeder and foundation quality seed or propagules. Large-scale production is conducted by cooperating commercial producers in conjunction with Soil Conservation Districts, State Agricultural Experiment Stations, State Crop Improvement Associations, and other Federal and State agencies.

The Natural Resources Conservation Service operates a plant materials center near Galiano, Louisiana. This center develops improved wetland plant materials for use in marsh restoration.

United States Department of Defense
U.S. Army Corps of Engineers (USACE)

The USACE has been authorized by Congress under various resolutions and acts to initiate projects that create and restore wetlands and wetland processes in coastal Louisiana. Typical project types that benefit wetlands include the following: sediment and freshwater diversions, dedicated dredging, and shoreline protection. The USACE project office in Lafayette, Louisiana serves residents of the Mermentau Basin.

Other Federal Programs

Coastal Wetlands Planning, Protection, and Restoration Act (PL 101-646)

The act was signed into law by President Bush in 1990. The Act directed that a Task Force composed of representatives of five federal agencies (EPA, NMFS, NRCS, USF&WS, and USACE) and the State of Louisiana develop a comprehensive approach for the long-term protection, restoration, and enhancement of Louisiana coastal wetlands. The Task Force is charged with preparing an annual list of wetland restoration projects. Approved projects are funded at the rate of 75% federal and 25% state. The projects that go into the annual plan are evaluated as to need and cost-effectiveness for implementation purposes. The Act calls for a monitoring plan for each project in order to evaluate the effectiveness of the project in protecting and restoring vegetated coastal wetlands.

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APPENDICES

APPENDIX A

RANGE SECTION

Range is land on which the native vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs suitable for grazing or browsing use. Rangelands include natural grasslands, savannahs, most deserts, tundra, alpine communities, coastal marshes, wet meadows, and introduced plant communities managed like rangeland.

RANGE SITES / SOILS

The Mermentau River Basin Study area consists of 11 different soil types and 9 different range sites. Each soil type has properties and characteristics that determine which dominant plant community will be present and which type of herbivore will be able to utilize the existing plant cover. Range sites are developed based on the plant cover capable of being produced on the soils present. Factors such as soil-plant-water interactions are considered in determining range sites. In coastal marshes, salinity is a major determinant in what plant cover a soil is capable of producing. The climax plant community is used as the benchmark, and any deviation from the climax indicates the ecological position of the vegetation present at a given time. Therefore, range sites are established in conjunction with soil types.

Soil salinity and (N-value) the relative softness or firmness of soil layers are the two major soil properties that determine type of plant cover, plant utilization, and consequently range site.

The nine range sites found within this river basin are: 1) Fresh firm mineral marsh; 2) Fresh organic marsh; 3) Fresh fluid mineral marsh; 4) Brackish organic marsh; 5) Brackish fluid mineral marsh; 6) Brackish firm mineral marsh; 7) Clayey chenier brackish marsh; 8) Saline mineral marsh; and 9) Sandy chenier.

Fresh Firm Mineral Marsh Site

The Fresh Firm Mineral Marsh range sites are found where areas of Ged and Gueydan soils occur. There are approximately 3,500 acres of Ged clay and 47,400 acres of Gueydan muck. Ged and Gueydan soils are generally adjacent to the Coastal Prairie. These soils consist of areas where Coastal Prairie soils have subsided below present marsh level. Ged soils occur in the northwestern portion of the basin and Gueydan soils occur in the northeastern portion of the basin. Ged soils have a fluid clay surface layer a few inches thick over firm clayey subsoil layers. Gueydan soils are forced drained, with pumps and

levee systems. These soils have muck surface layers about 6 inches thick, overlying firm clayey layers. These sites are dominated by cattail, maidencane, giant cutgrass, bull tongue and common reed. The surface layers of this soil will not support the weight of domestic livestock, but the subsoil layers will. These areas have fair trafficability. Grazing distribution is limited by the thickness of the surface layers. There is considerable forage utilization by whitetail deer, nutria, and other wetland wildlife on these sites.

Fresh Organic Marsh

The Fresh Organic Marsh range sites are found where areas of Allemands muck occurs. There are 232,400 acres of Allemands muck in the basin. Allemands soils occur throughout the broad central portion of the basin. These soils have muck surface layers 16-40 inches thick overlying fluid mineral layers. This soil occurs in areas where the Prairie Terrace has subsided to depths ranging from about 16 inches to 20 feet. These areas are dominated by bulltongue, maidencane, giant cutgrass, and cattail. These areas have poor trafficability, and cannot support the weight of domestic livestock. Most forage utilization is in the form of feeding nutria, muskrat, and other wetland wildlife.

Fresh Fluid Mineral Marsh

This range site consists of 85,900 acres of Larose muck. Larose soils occur adjacent to the northernmost cheniers and around the perimeter of fresh lakes. These soils have muck surface layers about 6 inches thick, overlying very fluid mucky clay layers. These areas cannot support the weight of domestic livestock. Vegetation on this site is dominated by giant cutgrass, and maidencane.

Brackish Organic Marsh

This marsh type is made up of Clovelly and Lafitte soils. There are about 39,000 acres of Clovelly muck and 9,500 acres of Lafitte muck in the basin. Clovelly soils have a muck surface layer 16-40 inches thick overlying a fluid mineral layer. Lafitte soils have a muck surface layer about 55 inches thick underlain by very fluid mucky clay layers. These soils are dominantly vegetated with marshhay cordgrass, black needle rush, and leafy three square. These soils have poor trafficability and cannot support the weight of domestic livestock. most forage utilization is in the form of feeding nutria, muskrat, and other wetland wildlife.

Brackish Fluid Mineral Marsh

This range site is made up of Bancker soils. There are approximately 31,400 acres of this soil in the basin. Bancker soils have a muck surface layer about six inches thick and

underlying fluid mineral layers. This soil is dominantly vegetated with marshhay cordgrass, and Olney bulrush. This soil has poor trafficability and cannot support the weight of domestic livestock. Most forage utilization is in the form of feeding nutria, muskrat, and other wetland wildlife.

Brackish Firm Mineral Marsh

This range site contains approximately 56,300 acres of Creole clay. This soil is adjacent to Mermentau clay soils and is positioned slightly lower in the landscape. These soils have slightly fluid clay surface layers and very fluid clay underlying layers. These soils are dominantly vegetated with marshhay cordgrass, seashore paspalum, and seashore saltgrass. These soils have good trafficability and can support the weight of domestic livestock throughout the year. The surface layer of this soil may become boggy during the wet season if cattle utilization is concentrated.

Clayey Chenier Brackish Marsh

This range site consists of 18,200 acres of Mermentau clay. This soil is found adjacent to beach ridges. It occurs where clay deposits have buried low beach ridges and the lower edges of higher ridges. This soil has firm clay surface layers ranging in thickness from 10 inches to 30 inches. The underlying soil layers are firm/consolidated very fine sandy loam. These soils are dominantly vegetated with gulf cordgrass, marshhay cordgrass, seashore paspalum, and seashore saltgrass. These soils have excellent trafficability and can support the weight of domestic livestock throughout the year.

Saline Mineral Marsh

This range site consists of approximately 98,500 acres of Scatlake mucky clay soil. This soil has a mucky clay surface layer about 10 inches thick overlying fluid clayey layers. This soil has high concentrations of available salts. The range site is dominated by smooth cordgrass and seashore saltgrass. Scatlake soils have poor trafficability and cannot support the weight of domestic livestock. Most forage is utilized by wetland wildlife.

Sandy Chenier

This range site is made up of Peveto and Hackberry soils. They account for about 1% or approximately 9,000 acres of the basin area. These soils have firm and consolidated sand and shell layers and low concentrations of available salts. This range site is predominantly vegetated with gulf cordgrass, common bermuda grass, and hackberry trees. These soils have excellent trafficability throughout the year.

Spoil Bank

This range site consist of about 3,300 acres of Udifluvents and Aquents. Udifluvents are the higher areas of spoil that support numerous types of trees, shrubs and grasses. They are firm and consolidated soils unless recently dredged material has been disposed on them. This soil type has good to excellent trafficablity and domestic livestock utilize these areas for bedding, resting, and refuge from storm tides and other flood events.

Aquents are lower areas of spoil that are vegetated with the dominant grasses and forbs in the area. These soils consist of slightly fluid and very fluid soil layers.

VEGETATION

In the first half of the twentieth century, marsh ecotypes were more stratified than they are today. According to the 1978 Vegetative Type Map of the Coastal Marshes by Dr. Robert H. Chabreck, the basin was characterized by fresh marshes along the Intracoastal Waterway and Grand and White Lakes; intermediate marshes along Creole, Little Chenier and the northern section of Rockefeller Refuge; progressing to brackish marshes along Little Pecan Bayou, Oak Grove, Grand Chenier, Rockefeller Refuge and south of Pecan Island.

Intermediate marshes serve as a buffer zone between the brackish and fresh marshes. Hydrologic modifications such as oilfield and navigation canals negatively impact intermediate marsh by creating avenues for saltwater intrusion and subjecting fragile marsh soils to increased tidal action. Prior to hydrologic modifications the less salt tolerant plant species were gradually influenced by the movement of higher salinity water. As dredging activities increased, the affects of tidal currents and increased levels of salinity transformed intermediate marsh plant communities to a more brackish plant community. In areas where changes in salinity levels and tidal influences occurred slowly marsh losses were minimal and there was a gradual transformation from intermediate to brackish marsh. In many areas changes occurred so fast that marshes reverted to open water before brackish species could become established.

Historically, the dominant vegetation in the intermediate marshes consisted of Jamaica sawgrass interspersed with marshhay cordgrass. The vegetation was altered due to saltwater intrusion during droughts and saltwater pushed inland by hurricanes. Conditions of higher salinity in the upper soil strata permitted more salt tolerant plants such as marshhay cordgrass the opportunity to encroach on these areas. The result is a brackish vegetative community growing in an intermediate setting.

The basin was formed upon marine sediments which have salinity concentrations ranging from saline to brackish. The plant community which ultimately inhabits the different marsh types is contingent upon the salinity of the water in the root zone. If salinity levels in the root zone support intermediate vegetation and the substrate salinities are in the brackish range the marsh will for the purpose of this report be considered brackish.

Plant communities in a "true" brackish marsh are also contingent upon the saltwater concentrations and water levels in which they evolved. The highest percentage of emergent vegetation in the brackish marsh is marshhay cordgrass. These areas produce the highest amount of biomass and grazeable forage per acre. Long growing seasons in the basin coupled with the enormous growth potential of marsh vegetation necessitates the removal of annual growth. In the absence of plant removal either by grazing animals or prescribed burning a thatch of old growth can quickly develop. Under these conditions, new growth is restricted due to competition for sunlight with the canopy of the previous years growth. Total annual vegetative production on a dry matter basis can range from 6,000 lbs./acre on an under-utilized site with no burning program to upwards of 24,000 lbs./acre on a properly managed site.

Gently undulating complexes associated with Hackberry and Mermentau soils exhibit the highest diversity of vegetation in the brackish marsh. These areas support a large amount of marshhay cordgrass and seashore saltgrass in lower positions on the landscape and gulf cordgrass on the low ridges. Individual communities of jointgrass, sedges, and annuals occupy natural drains. Backslopes grading towards the gulf are dominated by gulf cordgrass and seashore saltgrass with smooth cordgrass in the intertidal zone.

RESOURCE CONCERNS

One of the chief concerns of the basin's livestock producers is prolonged high water levels. Over grazing occurs on higher ground when prolonged high water levels make large areas unavailable for grazing. Under this condition livestock lose weight and become more susceptible to communicable diseases. Additionally, when forage production is reduced supplemental feeding or reducing the size of herds becomes necessary. This results in a reduced profit margin for the producer.

The optimal water regime for the majority of emergent wetland plants ranges from a few inches above to a few inches below marsh level. This condition allows gas exchange essential for plant growth in the root zone when the water levels are low while maintaining the wetland character of the marsh.

NUTRITIONAL VALUE OF MARSH PLANTS

Forage plants in the Southeast are noted for having low nutritional value as they reach maturity or enter dormancy. However, many marsh plants are an exception to this rule. Marsh forages typically supply brood cows with needed calcium and phosphorus for fetal development and lactation. Research has shown that cattle will select those plants that most nearly meet their nutritional needs. Supplemental feeding is necessary only during periods of cold, wet weather.

GRAZING MANAGEMENT PRACTICES

Prescribed Burning

Prescribed burning benefits wildlife and cattle in several ways. The most important benefit is the reduction of foliar cover and excessive roughage. This allows ecologically lower plants to compete with higher order plants. When the dense cover of mature marsh vegetation is burnt new succulent growth is stimulated. Under controlled water conditions a burn will also encourage desirable waterfowl plants such as millets, sprangletop, coastal waterhyssop, and saltmarsh bulrush. Other benefits of prescribed burns are the release of nutrients tied up in organic matter and faster green-up in the spring.

Cattle Walkways

Walkways are earthen levees that lead from cheniers to interior marshes. They improve accessibility and encourage uniform use of marsh vegetation. Walkways benefit cattle by serving as trails, bedgrounds, calving locations, and resting places for calves. They also provide resting, nesting, and den sites for several species of birds and mammals as well as add to plant diversity.

Range Proper Use

Range proper use is grazing at an intensity that will maintain or improve the quality and quantity of the desirable vegetation. This is normally 50 percent by weight of the current growth of the key plant or plants.

Range Deferred Grazing

Deferred grazing involves resting range from cattle grazing during the major growth period of key plants. This practice will improve plant vigor, encourage vegetative increase through rhizomes and stolons, and promote seed production.

Fencing

The establishment of fences will aid in the distribution of grazing and facilitate forage and livestock management.

Brush Management

Control of competitive shrubs such as Cherokee rose, Eastern Baccharis, rattlebox and Chinese tallow trees are needed to provide favorable conditions for more desirable plant species. Consideration should be given to leaving some native trees and shrubs which can provide shade for livestock and food and cover for wildlife. Brush management methods include mowing, burning and chemical control.

SOCIAL AND CULTURAL ASPECTS

The livestock industry in the Mermentau River Basin Study area is the dominant agricultural enterprise. About 200 operating units are headquartered in the basin. Other producers are headquartered outside the basin but utilize grazing within the basin on a part time basis.

The family unit is evident in the livestock operations. Family members share responsibility for the day to day management of the livestock enterprise. Actual ownership may be distributed between various family members. Youth activities are highly influenced by the industry. Participation in 4-H, FFA and High School Rodeo activities are major activities many of the basin's youth.

ECONOMICS

In 1992 Vermilion and Cameron Parishes led the state in the production of beef cattle with a total of 41,500 head. Beef cattle sales in the basin totaled over $8 million 1992. Almost all of the cattle in the basin are in the cow-calf phase of the industry.

APPENDIX B

LIST OF VEGETATION IN THE MERMENTAU RIVER BASIN

The vegetation that could occur within the Mermentau River Basin was taken from Allen (1975), Dutton (1985), Montz (1979) and Thieret (1980), and follows the format of USDA-NRCS National List of Scientific Plant Names (1984). This taxonomic listing provides the family (using family number according to USDA-NRCS National List of Scientific Plant Names), common name, scientific name, and abundance.

References:

Allen, Charles M. 1975. Grasses of Louisiana, Univ. Southwest. Louisiana, 358 pp.

Dutton, Bryan Eugene. 1985. A Preliminary Survey of the Vascular Flora of Cameron Parish, Louisiana. Northeast Louisiana Univ., MS Thesis, 141 pp.

Montz, Glen N. 1979. Distribution of Selected Aquatic Species in Louisiana, US-CE, 33 pp.

Thieret, John W. 1980. Louisiana Ferns and Fern Allies, Laf. Nat. Hist. Mus., Lafayette, 123 pp.

USDA-NRCS, National List of Scientific Plant Names. 1984. Wash. DC, 2 volumes.

Fam #	Common Name	Scientific Name
001	Scouringrush Horsetail	*Equisetum hyemale*
005	Blackfoot Quillwort	*Isoetes melanopoda*
008	Ebony Spleenwort	*Aspelenium platyneuron*
008	Japanese Holly-fern	*Cyrtomium falcatum*
008	Ressurrection Fern	*Polypodium polypodioides*
008	Widespread Maiden Fern	*Thelypteris kunthii*
008	Southern Marsh Fern	*Thelypteris thelypteroides*
009	American Waterfern	*Ceratopteris pteridoides*
012	Japanese Climbing Fern	*Lygodium japonicum*
013	Royal Fern	*Osmunda regalis*
014	Mosquito-fern	*Azolla caroliniana*
014	Salvinia	*Salvinia minima*
017	Bulbous Adders-tongue	*Ophioglossum crotalophoroides*
017	Limestone Adders-tongue	*Ophioglossum engelmannii*
017	Long-stemmed Adders-tongue	*Ophioglossum petiolatum*
023	Eastern Redcedar	*Juniperus virginiana*
023	Slash Pine	*Pinus elliottii*
023	Longleaf Pine	*Pinus palustris*
023	Loblolly Pine	*Pinus taeda*
023	Baldcypress	*Taxodium distichum*
023	Northern White Cedar	*Thuga orientalis*
025	Southern Cattail	*Typha domingensis*
025	Common Cattail	*Typha latifolia*
028	Curly Pondweed	*Potamogeton crispus*
028	Waterthread Pondweed	*Potamogeton diversifolius*
028	Long-leaved Pondweed	*Potamogeton nodosus*
028	Sago Pondweed	*Potamogeton pectinatus*
028	Small Pondweed	*Potamogeton pusillus*
028		*Potamogeton tenuissimus*
028	Wigeongrass	*Ruppia maritima*
029	Southern Naiad	*Najas guadalupensis*
032	Creeping Burhead	*Echinodorus cordifolius*
032	Upright Burhead	*Echinodorus rostratus*
032	Coastal Arrowhead	*Sagittaria falcata*
032	Grassy Arrowhead	*Sagittaria graminea*
032	Broadleaf Arrowhead	*Sagittaria latifolia*
032	Hooded Arrowhead	*Sagittaria montevidensis*
032	Nipplebract Arrowhead	*Sagittaria papillosa*
032	Delta Arrowhead	*Sagittaria platyphylla*
034	Blyxa	*Blyxa aubertii*
034	Elodea	*Egeria densa*
034	Hydrilla	*Hydrilla verticillata*
034	American Frog's-bit	*Limnobium spongia*
034	Ducklettuce	*Ottelia alismoides*
034	Wildcelery	*Vallisneria americana*
036	Elliot Bentgrass	*Agrostis elliottiana*
036	Ticklegrass	*Agrostis hyemalis*
036	Carolina Foxtail	*Alopecurus carolinianus*
036	Bushy Bluestem	*Andropogon glomeratus*
036	Broomsedge	*Andropogon virginicus*
036	Purple Silkyscale	*Anthaenantia rufa*
036	Slimspike Threeawn	*Aristida longespica*

036	Oldfield Threeawn	*Aristida oligantha*
036	Fringed Arthraxon	*Arthraxon hispidus*
036	Giant Reed	*Arundo donax*
036	Common Oats	*Avena sativa*
036	Carpetgrass	*Axonopus affinis*
036	Big Carpetgrass	*Axonopus furcatus*
036	Awnless Bluestem	*Bothriochloa exaristata*
036	King Ranch Bluestem	*Bothriochloa ischaemum*
036	Silver Bluestem	*Bothriochloa saccharoides*
036	Broadleaf Signalgrass	*Brachiaria platyphylla*
036	Sprawling Panicum	*Brachiaria reptans*
036	Little Quakinggrass	*Briza minor*
036	Rescuegrass	*Bromus unioloides*
036	Southern Sandbur	*Cenchrus echinatus*
036	Coast Sandbur	*Cenchrus incertus*
036	Dune Sandbur	*Cenchrus tribuloides*
036	Longleaf Uniola	*Chasmanthium sessiliflorum*
036	Rhodesgrass	*Chloris gayana*
036	Pampasgrass	*Cortaderia selloana*
036	Bermudagrass	*Cynodon dactylon*
036	Durban Crowfootgrass	*Dactyloctenium aegyptium*
036	Needle Panicum	*Dichanthelium aciculare*
036	Woolly Panicum	*Dichanthelium acuminatum*
036	Variable Dichanthelium	*Dichanthelium commutatum*
036	Clute Panic	*Dichanthelium dichotomum*
036	Scribner Panicum	*Dichanthelium oligosanther*
036	Velvet Panicum	*Dichanthelium scoparium*
036	Roundseed Panicum	*Dichanthelium sphaerocarpon*
036	Southern Crabgrass	*Digitaria ciliaris*
036	Hairy Crabgrass	*Digitaria sanguinalis*
036	Seashore Saltgrass	*Distichlis spicata*
036	Junglerice	*Echinochloa colonum*
036	Barnyardgrass	*Echinochloa crusgalli*
036	Walter's Millet	*Echinochloa walteri*
036	Goosegrass	*Eleusine indica*
036	Virgina Wildrye	*Elymus virginicus*
036	Bahia Lovegrass	*Eragrostis bahiensis*
036	Gummy Lovegrass	*Eragrostis curtipedicellata*
036	Elliott Lovegrass	*Eragrostis elliottii*
036	Teal Lovegrass	*Eragrostis hypnoides*
036	Carolina Lovegrass	*Eragrostis pectinacea*
036	Red Lovegrass	*Eragrostis secundiflora*
036	Purple Lovegrass	*Eragrostis spectabilis*
036	Centipedegrass	*Eremochloa ophiuroides*
036	Sugarcane Plumegrass	*Erianthus giganteus*
036	Prairie Cupgrass	*Eriochloa contracta*
036	Louisiana Cupgrass	*Eriochloa punctata*
036	Stiffleaf Chloris	*Eustachys petraea*
036	Meadow Fescue	*Festuca pratensis*
036	African Jointgrass	*Hemarthria altissima*
036	Little Barley	*Hordeum pusillum*
036	Watergrass	*Hydrochloa caroliniensis*
036	Clubhead Cutgrass	*Leersia hexandra*
036	Rice Cutgrass	*Leersia oryzoides*

036	Whitegrass	*Leersia virginica*
036	Bearded Sprangletop	*Leptochloa fascicularis*
036	Neally Sprangletop	*Leptochloa nealleyi*
036	Amazon Sprangletop	*Leptochloa panicoides*
036	Mexican Sprangletop	*Leptochloa uninervia*
036	Ozarkgrass	*Limnodea arkansana*
036	Perennial Ryegrass	*Lolium perenne*
036		*Manisuris exaltata*
036	Shoregrass	*Monanthochloa littoralis*
036	Thintail	*Monerma cylindrica*
036	Hairawn Muhly	*Muhlenbergia capillaris*
036	Nimblewill	*Muhlenbergia schreberi*
036	Common Basketgrass	*Oplismenus hirtellus*
036	Rice	*Oryza sative*
036	Bitter Panicum	*Panicum amarulum*
036	Beaked Panicum	*Panicum anceps*
036	Witchgrass	*Panicum capillare*
036		*Panicum dichatum*
036	Fall Panicum	*Panicum dichotomiflorum*
036	Paille Fine	*Panicum hemitomon*
036		*Panicum ramosum*
036	Torpedograss	*Panicum repens*
036	Redtop Panicum	*Panicum rigidulum*
036	Switchgrass	*Panicum virgatum*
036	Sicklegrass	*Parapholis incurva*
036	Water Panicum	*Paspalidium geminatum*
036	Combs Paspalum	*Paspalum almum*
036	Fringeleaf Paspalum	*Paspalum ciliatifolium*
036	Dallasgrass	*Paspalum dilatatum*
036	Mudbank Paspalum	*Paspalum dissectum*
036	Knotgrass	*Paspalum distichum*
036	Florida Paspalum	*Paspalum floridanum*
036	Water Paspalum	*Paspalum hydropilum*
036	Field Paspalum	*Paspalum laeve*
036	Rustyseed Paspalum	*Paspalum langei*
036	Longtom	*Paspalum lividum*
036	Mat Paspalum	*Paspalum minus*
036	Gulfdune Paspalum	*Paspalum monostachyum*
036	Bahiagrass	*Paspalum notatum*
036	Brownseed Paspalum	*Paspalum plicatulum*
036	Early Paspalum	*Paspalum pracox*
036	Fringeleaf Paspalum	*Paspalum setaceum*
036	Sand Paspalum	*Paspalum stramineum*
036	Vaseygrass	*Paspalum urvillei*
036	Seashore Paspalum	*Paspalum vaginatum*
036	Pearl Millet	*Pennisetum typhoides*
036	Timothy Canarygrass	*Phalaris angusta*
036	Carolina Canarygrass	*Phalaris caroliniana*
036	Savannah Panic	*Phanopyrum gymnocarpon*
036	Common Reed	*Phragmites australis*
036		*Phyllostachys aurea*
036	Annual Bluegrass	*Poa annua*
036	Rabbitfootgrass	*Polypogon monspeliensis*
036	American Cupscale	*Sacciolepis striata*

036	Brown Beardgrass	*Schizachyrium scoparium*
036	Slender Bluestem	*Schizachyrium tenerum*
036	Knotroot Bristlegrass	*Setaria geniculata*
036	Giant Bristlegrass	*Setaria magna*
036		*Setaria pallide-fusca*
036	Indiangrass	*Sorghastrum avenaceum*
036		*Sorghum almum*
036	Sorghum	*Sorghum bicolor*
036	Johnsongrass	*Sorghum halapense*
036	Smooth Cordgrass	*Spartina alterniflora*
036	Big Cordgrass	*Spartina cynosuroides*
036	Marshhay Cordgrass	*Spartina patens*
036	Gulf Cordgrass	*Spartina spartinae*
036	Prairie Wedgescale	*Sphenopholis obtusa*
036	Tall Dropseed	*Sporobolus asper*
036	Smutgrass	*Sporobolus indicus*
036	Whorled Dropseed	*Sporobolus pyramidatus*
036	Seashore Dropseed	*Sporobolus virginicus*
036	Gaping Panicum	*Steinchisma hians*
036	St. Augustinegrass	*Stenotaphrum secundatum*
036	Texas Needlegrass	*Stipa leucotricha*
036	Purpletop	*Tridens flavus*
036	Longspike Tridens	*Tridens strictus*
036	Eastern Gammagrass	*Tripsacum dactyloides*
036	Seaoats	*Uniola paniculata*
036	Sixweeks Fescue	*Vulpia octoflora*
036	Giant Cutgrass	*Zizaniopsis miliacea*
037	Greenish-white Sedge	*Carex albolutescens*
037	Atlantic Sedge	*Carex atlantica*
037	Carolina Sedge	*Carex caroliniana*
037	Woodbank Sedge	*Carex cephalophora*
037	Cherokee Sedge	*Carex cherokeensis*
037	Blue Sedge	*Carex complanata*
037	Crowfoot Sedge	*Carex crus-corvi*
037	Fescue Sedge	*Carex festucacea*
037	Thinfruit Sedge	*Carex flaccosperma*
037	Frank's Sedge	*Carex frankii*
037	Pale Sedge	*Carex glaucescens*
037	Meadow Sedge	*Carex granularis*
037	Thinscale Sedge	*Carex hyalinolepis*
037	Bristlestalk Sedge	*Carex leptalea*
037	Louisiana Sedge	*Carex louisianica*
037	Hop Sedge	*Carex lupulina*
037	Cedar Sedge	*Carex reniformis*
037	Reflexed Sedge	*Carex retroflexa*
037	Bristlebract Sedge	*Carex tribuloides*
037	Warty Sedge	*Carex verrucosa*
037	Fox Sedge	*Carex vulpinoidea*
037	Jamaica Sawgrass	*Cladium jamaicensis*
037	Taperleaf Flatsedge	*Cyperus acuminatus*
037	Jointed Flatsedge	*Cyperus articulatus*
037	Shortleaved Flatsedge	*Cyperus brevifolius*
037	Poorland Flatsedge	*Cyperus compressus*
037		*Cyperus digitatus*

037	Sticky Flatsedge	*Cyperus elegans*
037	Redroot Flatsedge	*Cyperus erythrorhizos*
037	Chufa	*Cyperus esculentus*
037	Nerved Flatsedge	*Cyperus filicimus*
037	Baldwin Flatsedge	*Cyperus globulosus*
037	Sheathed Flatsedge	*Cyperus haspan*
037	Southcentral Flatsedge	*Cyperus hermaphroditus*
037		*Cyperus huarmensis*
037	Ricefield Flatsedge	*Cyperus iria*
037		*Cyperus ochraceus*
037	Fragrant Flatsedge	*Cyperus odoratus*
037	Globe Flatsedge	*Cyperus ovularis*
037	Sharpscale Flatsedge	*Cyperus oxylepis*
037	Manyspiked Flatsedge	*Cyperus polystachyos*
037	Green Flatsedge	*Cyperus pseudovegetus*
037	Nutgrass	*Cyperus rotundus*
037	Strawcolored Nutsedge	*Cyperus strigosus*
037	Thinleaved Flatsedge	*Cyperus tenuifolius*
037	Green Flatsedge	*Cyperus virens*
037	Starrush Whitetop-Sedge	*Dichromena colorata*
037	Sandswamp Whitetop-Sedge	*Dichromena latifolia*
037	Needle Spikesedge	*Eleocharis acicularis*
037	Saltmarsh Spikesedge	*Eleocharis albida*
037	Purple Spikesedge	*Eleocharis atropurpea*
037	Baldwin's Spikesedge	*Eleocharis baldwinii*
037	Gulfcoast Spikesedge	*Eleocharis cellulosa*
037	Water Spikesedge	*Eleocharis elongata*
037	Northern Jointed Spikesedge	*Eleocharis equisetoides*
037	Crowned Spikesedge	*Eleocharis fallax*
037	Yellow Spikesedge	*Eleocharis flavascens*
037	Capitate Spikesedge	*Eleocharis geniculata*
037	Creeping Spikesedge	*Eleocharis macrostachya*
037	Torrey's Spikesedge	*Eleocharis microcarpa*
037	Mountain Spikesedge	*Eleocharis montana*
037	Sand Spikesedge	*Eleocharis montevidensis*
037	Blunt Spikesedge	*Eleocharis obtusa*
037	Bright-green Spikesedge	*Eleocharis olivacea*
037	Dwarf Spikesedge	*Eleocharis parvula*
037	Squarestem Spikesedge	*Eleocharis quadrangulata*
037	Weak Fimbry	*Fimbristylis annua*
037	Slender Fimbry	*Fimbristylis autumnalis*
037	Hairy Fimbristylis	*Fimbristylis caroliniana*
037	Corm Fimbry	*Fimbristylis castanea*
037	Twoleaf Fimbristylis	*Fimbristylis dichotoma*
037	Globe Fimbry	*Fimbristylis miliacea*
037	Hairy Fimbry	*Fimbristylis puberula*
037		*Fimbristylis spadicea*
037		*Fimbristylis tomentosa*
037	Saltmarsh Umbrellasedge	*Fuirena breviseta*
037	Umbrellagrass	*Fuirena squarrosa*
037	Shortbeak Baldrush	*Psilocarya nitens*
037	Baldwin's Beakrush	*Rhynchospora baldwinii*
037	Falling Beakrush	*Rhynchospora caduca*
037	Horned Beakrush	*Rhynchospora corniculata*

037	Elliott's Beakrush	*Rhynchospora elliottii*
037	Fasciculate Beakrush	*Rhynchospora fascicularis*
037	Grasslike Beakrush	*Rhynchospora globularis*
037	Clustered Beakrush	*Rhynchospora glomerata*
037	Nodding Beakrush	*Rhynchospora inexpansa*
037	Tall Beakrush	*Rhynchospora macrostachya*
037	Littleseed Beakrush	*Rhynchospora microcarpa*
037	Millet Beakrush	*Rhynchospora miliacea*
037		*Rhynchospora perplexa*
037	Thread Beakrush	*Rhynchospora rariflora*
037	Hardstem Bulrush	*Scirpus acutus*
037	American Bulrush	*Scirpus americanus*
037	California Bulrush	*Scirpus californicus*
037	Swamp Bulrush	*Scirpus etuberculatus*
037	Keeled Bulrush	*Scirpus koilolepsis*
037	Salt-marsh Bulrush	*Scirpus maritimus*
037	Olney Bulrush	*Scirpus olneyi*
037	Saltmarsh Bulrush	*Scirpus robustus*
037	Softstem Bulrush	*Scirpus validus*
037		*Websteria submersa*
038	Dwarf Palmetto	*Sabal minor*
040	Taro	*Colocasia antiquorum*
040	Goldenclub	*Orontium aquaticum*
040	Arrow-Arum	*Peltandra virginica*
040	Waterlettuce	*Pistia stratiotes*
041	Lesser Duckweed	*Lemna minor*
041	Minute Duckweed	*Lemna persusilla*
041	Pale Duckweed	*Lemna valdiviana*
041	Common Ducksmeat	*Spirodela polyrhiza*
041		*Spirodela punctata*
041	Florida Mudmidget	*Wolffiella floridana*
041	Tongue Mudmidget	*Wolffiella lingulata*
046	Southern Yellow-eye-grass	*Xyris difformis*
046	Irisleaf Yellow-eye-grass	*Xyris iridifolia*
046		*Xyris jupicai*
049	Small Ballmoss	*Tillandsia recurva*
049	Spanishmoss	*Tillandsia usneoides*
050		*Commelina caroliniana*
050	Spreading Dayflower	*Commelina diffusa*
050	Narrowleaf Dayflower	*Commelina erecta*
050		*Rhoeo spathacea*
050	Hairystem Spiderwort	*Tradescantia hirsutiflora*
050	Prairie Spiderwort	*Tradescantia occidentalis*
050	Ohio Spiderwort	*Tradescantia ohioensis*
051	Waterhyacinth	*Eichhornia crassipes*
051	Longleaf Mudplantain	*Heteranthera limosa*
051	Pickerelweed	*Pontederia cordata*
051	Lance Pickerelweed	*Pontederia cordata lanceolata*
051	Waterstargrass	*Zosterella dubia*
053	Tapertip Rush	*Juncus acuminatus*
053		*Juncus biflorus*
053	Short-fruited Rush	*Juncus brachycarpus*
053	Toad Rush	*Juncus bufonius*
053	Forked Rush	*Juncus dichotomus*

053	Diffuse Rush	*Juncus diffusissmus*
053	Soft Rush	*Juncus effusus*
053	Bog Rush	*Juncus elliottii*
053	Inland Rush	*Juncus interior*
053	Shore Rush	*Juncus marginatus*
053	Stout Rush	*Juncus nodatus*
053	Manyheaded Rush	*Juncus polycephalus*
053	Creeping Rush	*Juncus repens*
053	Black Needlerush	*Juncus roemerianus*
053	Slender Rush	*Juncus tenuis*
053	Torrey Rush	*Juncus torreyi*
053	Roundhead Rush	*Juncus validus*
055	False Garlic	*Allium bivalve*
055	Canada Garlic	*Allium canadense*
055	Tawny Daylily	*Hemerocallis fulva*
055	Saw Greenbrier	*Smilax bona-nox*
055	Cat Greenbrier	*Smilax glauca*
055	Bristly Greenbrier	*Smilax hispida*
055	Small's Greenbrier	*Smilax smallii*
055	Aloe Yucca	*Yucca aloefolia*
057	Swamp Lily	*Crinum americanum*
057		*Habranthus tubispathus*
057	Carolina Spiderlily	*Hymenocallis caroliniana*
057	Eula Spiderlily	*Hymenocallis eulae*
057		*Hymenocallis liriosome*
057	Bristleseed Goldstar	*Hypoxis micrantha*
057		*Narcissus tazetta*
057	Autumn Zephyrlily	*Zepranthes canida*
061	Herbertia	*Alophia drummondii*
061	Lamance Iris	*Iris brevicaulis*
061	Giantblue Iris	*Iris giganticaerulea*
061	Yellow Iris	*Iris pseudacorus*
061	Southern Blue-Flag	*Iris virginica*
061	Stout Blue-eye-grass	*Sisyrinchium angustifolium*
061	Eastern Blue-eye-grass	*Sisyrinchium atlanticum*
061	Yellow Blue-eye-grass	*Sisyrinchium exile*
061	Pale Blue-eye-grass	*Sisyrinchium langloisii*
061	Least Blue-eye-grass	*Sisyrinchium minus*
061	Annual Blue-eye-grass	*Sisyrinchium rosulatum*
061	Spearbract Blue-eye-grass	*Sisyrinchium sagittiferum*
062	Common Banana	*Musa x paradisiaca*
064	Golden Canna	*Canna flaccida*
064	Common Garden Canna	*Canna generalis*
064	Louisiana Canna	*Canna glauca*
064	Indian Canna	*Canna indica*
065	Powdered Thalia	*Thalia dealbata*
067	Waterspider Orchid	*Habenaria repens*
067	Grassleaf Ladies'-tresses	*Spiranthes preacox*
067	Spring Ladies'-tresses	*Spiranthes vernalis*
069	Lizard's-tail	*Saururus cernuus*
073	White Poplar	*Populus alba*
073	Eastern Cottonwood	*Populus deltoides*
073	Weeping Willow	*Salix babylonica*
073	Black Willow	*Salix nigra*

074	Southern Waxmyrtle	*Myrica cerifera*
077	Bitter Pecan	*Carya aquatica*
077	Common Pecan	*Carya illinoiensis*
077	Black Walnut	*Juglans nigra*
079	Cherrybark Oak	*Quercus falcata leucophylla*
079	Cherrybark Oak	*Quercus falcata pagodaefolia*
079	Laurel Oak	*Quercus laurifolia*
079	Overcup Oak	*Quercus lyrata*
079	Swamp Chestnut Oak	*Quercus michauxii*
079	Water Oak	*Quercus nigra*
079	Nuttall's Oak	*Quercus nuttallii*
079	Willow Oak	*Quercus phellos*
079	Delta Post Oak	*Quercus stellata paludosa*
079	Live Oak	*Quercus virginiana*
080	Sugarberry	*Celtis laevigata*
080	Hackberry	*Celtis reticulata*
080	Water Elm	*Planera aquatica*
080	Winged Elm	*Ulmus alata*
080	American Elm	*Ulmus americana*
080	Chinese Elm	*Ulmus parvifolia*
080	Slippery Elm	*Ulmus rubra*
081	Paper Mulberry	*Broussonetia paprifera*
081	Common Fig	*Ficus carica*
081	Osage Orange	*Maclura pomifera*
081	White Mulberry	*Morus alba*
081	Black Mulberry	*Morus nigra*
081	Red Mulberry	*Morus rubra*
082	False Nettle	*Boehmeria cylindrica*
082	Pennsylvania Pellitory	*Parietaria pensylvanica*
082	Stinging Nettle	*Urtica chamaedryoides*
094	Buckwheat Vine	*Brunnichia cirrhosa*
094	Prostrate Knotweed	*Polygonum aviculare*
094	Pink Smartweed	*Polygonum bicorne*
094		*Polygonum brasiliense*
094	Cepitose Knotweed	*Polygonum cespitosum*
094	Stout Smartweed	*Polygonum densiflorum*
094	Mild Water Pepper	*Polygonum hydropiperoides*
094	Willow Weed	*Polygonum lapthifolium*
094	Water Smartweed	*Polygonum punctatum*
094	Bristly Smartweed	*Polygonum setaceum*
094	Jumpseed	*Polygonum*
095	Glasswort	*Salicornia europaea*
095	Woody Glasswort	*Salicornia virginica*
095	Annual Seepweed	*Suaeda linearia*
097	Alligatorweed	*Alternanthera philoxeroides*
097	Chaff-flower	*Alternathera paronychioides*
097	Amaranth Tumbleweed	*Amaranthus albus*
097	Gulf Coast Water-hemp	*Amaranthus australis*
097	Seaside Amaranth	*Amaranthus greggii*
097	Pigweed	*Amaranthus hybridis*
097	Redroot Pigweed	*Amaranthus retroflexus*
097	Nuttall's Water-hemp	*Amaranthus rudis*
097	Sticky Careless	*Amaranthus spinosus*
097	Pigweed	*Amaranthus viridis*

097	Bloodleaf	*Iresine rhizomatosa*
097	Tidestroemia	*Tidestroemia lanuginosa*
098	Scarlet Spiderling	*Boerhaavia diffusa*
098	Upright Spiderling	*Boerhaavia erecta*
098	Common Four-O'Clock	*Mirabilis jalapa*
099	Maritime Saltwort	*Batis maritima*
101	Poke	*Phytolacca americana*
101	Pigeon-Berry	*Rivina humilis*
102	Carpetweed	*Mollugo verticillata*
102	Seaside Purslane	*Sesuvium maritimum*
102	Coast Purslane	*Sesuvium portulacastrum*
103	Spring Beauty	*Claytonia virginica*
103	Common Purslane	*Portulaca oleracea*
103	Hairy Purslane	*Portulaca pilosa*
105	Sandwort	*Arenaria seryllifoloa*
105	Mouse-ear Chickweed	*Cerastium glomeratum*
105	Trailing Pearlwort	*Sagina decumbens*
105	Sleepy Catch-fly	*Silene antirrhina*
105	Bristleseed Sand-Spurry	*Spergularia echinosperma*
105	Marine Sand-Spurry	*Spergularia mariana*
105	Common Chickweed	*Stellaria media*
105	Chickweed	*Stellaria prostrata*
106	Watershield	*Brasenia schreberi*
106	Carolina Fanwort	*Cabomba caroliniana*
106	American Lotus	*Nelumbo lutea*
106	Spadderdock	*Nuphar luteum*
106	Blue Waterlily	*Nymphaea elegans*
106	White Waterlily	*Nymphaea odorata*
107	Coontail	*Ceratophyllum demersum*
107	Pimpled Hornwort	*Ceratophyllum muricatum*
109	Windflower	*Anemone caroliniana*
109	Blue Jasmine	*Clematis crispa*
109	Sweet Autumn Clematis	*Clematis ternifolia*
109	Tiny Mousetail	*Myosurus minimus*
109	Spearwort	*Ranunculus laxicaulis*
109	Roughseed Buttercup	*Ranunculus muricatus*
109	Sticktight Buttercup	*Ranunculus parviflorus*
109		*Ranunculus platensis*
109	Low Spearwort	*Ranunculus pusillus*
109	Hairy Buttercup	*Ranunculus sardous*
109	Celeryleaf Buttercup	*Ranunculus sceleratus*
109	Threelobed Buttercup	*Ranunculus trilobus*
112	Red-berried Moonseed	*Cocculus carolinus*
113	Southern Magnolia	*Magnolia grandiflora*
121	Camphor Tree	*Cinnamomum camphora*
121	Sassafras	*Sassafras albidum*
123	White Prickly Poppy	*Argemone albiflora*
123	Scrambled Eggs	*Corydalis micrantha*
124	Leaf Mustard	*Brassica juncea*
124	Turnip	*Brassica rapa*
124	American Sea-Rockets	*Cakile edentula*
124	Gulf Sea-Rockets	*Cakile geniculata*
124	Hairy Bitter Cress	*Cardamine hirsuta*
124	Small-flowered Bitter Cress	*Cardamine parviflora*

124	Pennsylvania Bitter Cress	*Cardamine pensylvanica*
124	Swine Cress	*Coronopus didymus*
124	Whitlow-Grass	*Draba brachycarpa*
124	Pepperwort	*Lepidium ruderale*
124	Virginia Pepperweed	*Lepidium virginicum*
124	Sessile-flowered Yellow Cress	*Rorippa sessiliflora*
124	Marsh Cress	*Rorippa teres*
124	Mustard	*Sinapis arvensis*
124	Hedge-Mustard	*Sisymbrium officinale*
131	Dwarf Sundew	*Drosera brevifolia*
134	Common Pigmy-Weed	*Crassula aquatica*
136	Little People	*Lepurapetalon spathulatum*
136	Ditch Stonecrop	*Penthorum sedoides*
142	Sweetgum	*Liquidambar styracifera*
143	American Sycamore	*Platanus occidentalis*
145	Green Hawthorn	*Crataegus viridis*
145	Loquat	*Eriobotyra japonica*
145	White Avens	*Geum canadense*
145	Chickasaw Plum	*Prumus angustifolia*
145	Cherry Laurel	*Prumus caroliniana*
145	Big-tree Plum	*Prumus mexicana*
145	Peach	*Prumus persica*
145	Wild Black Cherry	*Prumus serotina*
145	Firethorn	*Pyracantha coccinea*
145	Common Pear	*Pyrus communis*
145	Yeddo Hawthorn	*Raphiolepis umbellata*
145	McCartney Rose	*Rosa bracteata*
145	Cherokee Rose	*Rosa laevigata*
145	Multiflora Rose	*Rosa multiflora*
145	Champney Rose	*Rosa noisettiana*
145	Louisiana Blackberry	*Rubus louisianus*
145	Southern Dewberry	*Rubus trivialis*
147	Sweet Acacia	*Acacia smallii*
147	American Joint-Vetch	*Aeschynomene americana*
147	Joint Vetch	*Aeschynomene indica*
147	Mimosa	*Albizzia julibrissin*
147	False Monkeywort	*Alysicarpus vaginalis*
147	Dull-leaf Indigo	*Amorpha fruticosa*
147	American Potatobean	*Apios americana*
147	Slimpod Milkvetch	*Astragalus leptocarpus*
147	Nuttal Milkvetch	*Astragalus nuttalianus*
147	Cream Wild Indigo	*Baptisia bracteata glabrescens*
147	Plains Wild Indigo	*Baptisia bracteata laevicaulis*
147	Round Wild Indigo	*Baptisia sphaerocarpa*
147	Ringworm Senna	*Cassia alata*
147	Partridge Pea	*Cassia fasciculata*
147		*Cassia fasciculata puberula*
147	Maryland Senna	*Cassia marilandica*
147	Sicklepod	*Cassia obtusifolia*
147	Coffee Senna	*Cassia occidentalis*
147	Butterfly Pea	*Centrosema virginianum*
147	Redbud	*Cercis canadensis*
147	Prairie Clover	*Dalea emarginatum*
147	Bunchflower	*Desmanthes brevipes*

147	Illinois Bunchflower	*Desmanthes illinoensis*
147	Canada Tickclover	*Desmodium canescens*
147	Littleleaf Tickclover	*Desmodium ciliare*
147	Dillen Tickclover	*Desmodium dillenii*
147	Cherokee Tickclover	*Desmodium tortuosum*
147	Coral-Bean	*Erythrina herbacea*
147	Milkpea	*Galactia macreei*
147	Downy Milkpea	*Galactia volubilis*
147	Honey Locust	*Gleditsia tricanthos*
147	Anil Indigo	*Indigofera suffruticosa*
147	Australian Pea	*Lathyrus aphaca*
147	Japanese Bush Clover	*Lespedeza striata*
147	Black Medic	*Medicago lupulina*
147	Bur Clover	*Medicago polymorpha*
147	Sour Clover	*Melilotus indica*
147	Yellow Sweet Clover	*Melilotus officinalis*
147	Herbaceous Mimosa	*Mimosa strigillosa*
147	Tropical Neptunia	*Neptunia pubescens*
147	Jerusalem Thorn	*Parkinsonia aculeata*
147	Scurf-Pea	*Psoralea rhombifolia*
147	Snoutbean	*Rhynchosia minima*
147	Black Locust	*Robinia pseudo-acacia*
147	Sensitive Briar	*Schrankia hystericina*
147	Sensitive Briar	*Schrankia microphylla*
147	Drummond's Rattlebush	*Sesbania drummondii*
147	Colorado River-Hemp	*Sesbania exalta*
147	Bladderpod	*Sesbania vesicarium*
147	Trailing Wildbean	*Strophostyles helvola*
147	Slick-seed Bean	*Strophostyles leiosperma*
147	Pink Wildbean	*Strophostyles umbellata*
147	Pencil Flower	*Stylosanthes biflora*
147	Hoary Pea	*Tephrosia onobrychoides*
147	Big Hop Clover	*Trifolium campestre*
147	Carolina Clover	*Trifolium carolinianum*
147	Red Clover	*Trifolium pratense*
147	Dutch White Clover	*Trifolium repens*
147	Persian Clover	*Trifolium resupinatum*
147	Deerpea Vetch	*Vicia ludoviciana*
147	Deerpea	*Vigna luteola*
147	Kentucky Wisteria	*Wisteria macrostachya*
149	Wild Geranium	*Geranium sphaerospermum*
150	Creeping Lady Sorrel	*Oxalis corniculata*
150	Yellow Lady Sorrel	*Oxalis dillenii*
150		*Oxalis rubra*
150	Yellow Wood Sorrel	*Oxalis stricta*
150	Violet Wood Sorrel	*Oxalis violacea*
157	Satsuma Orange	*Citrus reticulata*
157	Trifoliate Orange	*Poncirus trifoliata*
157	Prickly Ash	*Zanthoxylum clava-herculis*
160	Chinaberry	*Melia azedarach*
165	Pink Milkwort	*Polygala incarnata*
165	Swamp Milkwort	*Polygala leptocaulis*
165	Maryland Milkwort	*Polygala mariana*
165	Whorled Milkwort	*Polygala verticillata*

167	Slender Copperleaf	*Acalypha gracilens*
167	Hophornbeam Copperleaf	*Acalypha ostryaefolia*
167	Caperonia	*Caperonia palustris*
167	Goatweed	*Croton capitatus*
167	Tropic Croton	*Croton glandulosus*
167	Prairie-Tea	*Croton monanthogynus*
167	Beach-Tea	*Croton punctatus*
167		*Euphorbia ammannioides*
167	Heartleaf Euphorbia	*Euphorbia cordifolia*
167		*Euphorbia dentata*
167		*Euphorbia glyptosperma*
167		*Euphorbia heterophylla*
167	Spotted Spurge	*Euphorbia maculata*
167	Large Spotted Spurge	*Euphorbia nutans*
167		*Euphorbia prostrata*
167		*Euphorbia serpens*
167		*Euphorbia spathulata*
167		*Phyllanthus caroliniensis*
167		*Phyllanthus urinaria*
167	Chinese Tallow Tree	*Sapium sebiferum*
167	Queen's-Delight	*Stillingia sylvatica*
168	Larger Water-Starwort	*Callitriche heterophylla*
168	Mat Water-Starwort	*Callitriche peploides*
169	Small-leaf Boxwood	*Buxus microphylla*
173	Winged Sumac	*Rhus copallina*
173	Smooth Sumac	*Rhus glabra*
173	Poison Ivy	*Toxicodendron radicans*
177	Deciduous Holly	*Ilex decidua*
177	American Holly	*Ilex opaca*
177	Yaupon	*Ilex vomitoria*
183	Drummond Red Maple	*Acer rubrum drummondii*
185	Balloon-vine Heartseed	*Cardiospermum halicacabum*
185	Golden Rain-Tree	*Koelreuteria paniculata*
185	Western Soapberry	*Sapindus saponaria drummondii*
189	Rattanvine	*Berchemia scandens*
189	Carolina Buckthorn	*Rhamnus caroliniana*
190	Peppervine	*Ampelopsis arborea*
190	Raccoon Grape	*Ampelopsis cordata*
190	Ivy Treebine	*Cissus incisa*
190	Virginia Creeper	*Parthenocissus quinquefolia*
190	Summer Grape	*Vitis aestivalis*
190	Pigeon Grape	*Vitis cinerea*
190	Mustang Grape	*Vitis mustangensis*
190	Muscadine	*Vitis rotundifolia*
194	Orinoco Jute	*Corchorus hirtus*
195	Rough Rose-Mallow	*Hibiscus aculeatus*
195	Large-flowered Rose-Mallow	*Hibiscus grandiflorus*
195	Halberd-leaved Rose-Mallow	*Hibiscus laevis*
195	Swamp Rose-Mallow	*Hibiscus moschuetos*
195	Wooly Rose-Mallow	*Hibiscus moschuetos lasiocarpus*
195	Virginia Saltmarsh-Mallow	*Kosteletzkya virginica*
195	Malva-De-Caballo	*Malachra capitata*
195	False Mallow	*Malvastrum coromandelianum*
195	Texas Mallow	*Malviscus arboreus*

195	Carolina Bristly-Mallow	*Modiola caroliniana*
195	Showy Sida	*Sida lindheimeri*
195	Broomjute Sida	*Sida rhombifolia*
195	Prickly Teaweed	*Sida spinosa*
198	Chocolate Weed	*Melochia corchorifolia*
198	Broom-wood	*Melochia pyramidata*
207	St. Andrew's Cross	*Ascyrum hypericoides*
207	St. Peter's Wort	*Ascyrum stans*
207	Shrubby St. John's Wort	*Hypericum densiflorum*
207	Nits-and-Lice	*Hypericum drummondii*
207	Bedstraw St. John's Wort	*Hypericum galioides*
207	Clasping-leaved St. John's Wort	*Hypericum gymnanthum*
207	Dwarf St. John's Wort	*Hypericum mutilum*
207	Purple St. John's Wort	*Triadenum virginicum*
209		*Elatine triandra*
211	Salt Cedar	*Tamarix gallica*
213		*Lechea tenuifolia*
218	Stemless Blue Violet	*Viola esculenta*
218	Lance-leaved Violet	*Viola lanceolata*
218	Bayou Violet	*Viola langloisii*
223	Yellow Liliko'i	*Passiflora edulis*
230	Prickly Pear	*Opunthia vulgaris*
230	Texas Prickly Pear	*Opuntia lindheimeri lehmanni*
230	Prickly Pear	*Opuntia stricta*
236	Purple Ammannia	*Ammannia coccinea*
236	Tarweed Cuphea	*Cuphea carthagensis*
236	Water-Willow	*Decodon verticillatus*
236	Crape Myrtle	*Lagerstroemia indica*
236	Winged Lythrum	*Lythrum alatum*
236	Linear-leaved Loosestrife	*Lythrum lineare*
236	Toothcup	*Rotala ramosior*
244	Maryland Meadow-Beauty	*Rhexia mariana*
245	White Gaura	*Gaura lindheimeri*
245	Bigflower Gaura	*Gaura longiflora*
245	Velvetleaf Gaura	*Gaura parviflora*
245	Primrose-Willow	*Ludwigia decurrens*
245	Cylindric-fruited Water Primrose	*Ludwigia glandulosa*
245	Anglestem Water-Primrose	*Ludwigia leptocarpa*
245	Narrowleaf Water Primrose	*Ludwigia linearis*
245	Shrubby Water-Primrose	*Ludwigia octovalvis*
245	Marsh Purslane	*Ludwigia palustris*
245	Perennial Water-Primrose	*Ludwigia peploides*
245	Hairy Ludwigia	*Ludwigia pilosa*
245	Globe Ludwigia	*Ludwigia sphaerocarpa*
245	Uraguay Water-Primrose	*Ludwigia uraguayensis*
245	Beach Evening Primrose	*Oenothera drummondii*
245		*Oenothera grandis*
245	Cutleaf Evening Primrose	*Oenothera laciniata*
245	Showy Evening Primrose	*Oenothera speciosa*
247	Parrotfeather	*Myriophyllum brasiliense*
247	Variable Water-Milfoil	*Myriophyllum heterophyllum*
247	Pinnate Water-Milfoil	*Myriophyllum pinnatum*
247	Eurasian Water-Milfoil	*Myriophyllum spicatum*
247	Marsh Mermaidweed	*Proserpinaca palustris*

251	Bowlesia	*Bowlesia incana*
251	Spadeleaf	*Centella asiatica*
251	Wild Chervil	*Chaerophyllum tainturieri*
251	Marsh Parsley	*Ciclospermum leptophyllum*
251	Spotted Water Hemlock	*Cicuta maculata*
251	Mexican Water Hemlock	*Cicuta mexicana*
251	Dwarf Wild Carrot	*Daucus pusillus*
251	Creeping Eryngo	*Eryngium prostratum*
251	Rattlesnakemaster	*Eryngium yuccifolium*
251	Large-leaf Pennywort	*Hydrocotyle bonariensis*
251	Floating Pennywort	*Hydrocotyle ranunculoides*
251	Umbrella Pennywort	*Hydrocotyle umbellata*
251	Whorled Pennywort	*Hydrocotyle verticillata*
251	Carolina Lilaeopsis	*Lilaeopsis attenuata*
251	Eastern Lilaeopsis	*Lilaeopsis chinensis*
251	Pinnate Cynosciadium	*Limnosciadium pinnatum*
251	Dog-sunshade	*Limnosciadium pumilum*
251	Parsley	*Petroselinum crispum*
251	Mock Bishop's-weed	*Ptilimnium capillaceum*
251	Nuttall Mock Bishop's-weed	*Ptilimnium nuttallii*
251	Black Snakeroot	*Sanicula canadensis*
251	Spiny Scale Seed	*Spermolepis echinata*
251	Aethusa-like Trepocarpus	*Trepocarpus aethusae*
252	Rough-leaf Dogwood	*Cornus drummondii*
252	Swamp Dogwood	*Cornus foemina*
252	Tupelogum	*Nyssa aquatica*
252	Blackgum	*Nyssa sylvatica*
256	Farkleberry	*Vaccinium arboreum*
261	Scarlet Pimpernel	*Anagallis arvensis*
261	Chaffweed	*Centunculus minimus*
261	Bractless Brookweed	*Samolus ebracteatus*
261	Water Pimpernel	*Samolus parviflorus*
262	Carolina Sea-Lavender	*Limonium carolinianum*
263	Gum Bumelia	*Bumelia lanuginosa*
263	Buckthorn Bumelia	*Bumila lycioides*
264	Persimmon	*Diospyros virginiana*
265	Two-winged Silverbell	*Halesia diptera*
265	Small Snowbell	*Styrax americana*
267	White Ash	*Fraxinus americana*
267	Green Ash	*Fraxinus pensylvanica*
267	Jasmine	*Jasminium ovalifolium*
267	California Privit	*Ligustrum ovalifolium*
267	Chinese Privit	*Ligustrum sinense*
269	Lax Hornpod	*Cynoctonum mitreola*
269	Wand Hornpod	*Cynoctonum sessilifolium*
269	Yellow Jasmine	*Gelsemium sempervirens*
269	Juniperweed	*Polypremum procumbens*
270	Lady Bird's Centaury	*Centaurium texense*
270	Catch-fly Gentian	*Eustoma exaltatum*
270	Big Floating-Heart	*Nymphoides aquatica*
270	Prairie Rose-Gentain	*Sabatia campestris*
271	Blue-star	*Amsonia glaberrima*
271	Willow Amsonia	*Amsonia tabernaemontana*
271	Indian-Hemp Dogbane	*Apocynum cannabinum*

271	Oleander	*Nerium oleander*
271	Climbing Dogbane	*Trachelospermum difforme*
272	Pacific Milkweed	*Asclepias lanceolata*
272	Longleaf Milkweed	*Asclepias longifolia*
272	Savannah Milkweed	*Asclepias obvata*
272	Whorled Milkweed	*Asclepias verticillata*
272	Antelope-Horn	*Asclepias viridis*
272	Marsh Shallow-wort	*Cynanchum angustifolium*
272	Anglepod	*Matelea gonocarpa*
273	Hedge Bindweed	*Calystegia sepium*
273	Field Bindweed	*Convolvulus arvensis*
273		*Cuscuta campestris*
273		*Cuscuta compacta*
273	Lovevine	*Cuscuta cuspidata*
273		*Cuscuta glabrior*
273	Gonovius Dodder	*Cuscuta gronovii*
273	Showy Dodder	*Cuscuta indecora*
273	False Pennywort	*Dichondra carolinensis*
273	Evolvulus	*Evolvulus sericeus*
273	Red Morningglory	*Ipomocea coccinea*
273	Ivyleaf Morningglory	*Ipomoea hederacea*
273	Railroad Vine	*Ipomoea pes-caprae*
273	Common Morningglory	*Ipomoea purpurea*
273	Marsh Morningglory	*Ipomoea sagittata*
273	Beach Morningglory	*Ipomoea stolonifera*
273	Small-flowered Pink Morningglory	*Ipomoea trichocarpa*
273	Pitted Morningglory	*Ipomoea x leucantha*
273	Tie Vine	*Jacquemontia tamnifolia*
275	Hairy Waterleaf	*Hydrolea ovata*
275	Waterpod	*Hydrolea quadrivalvis*
275	Small-flowered Nemophila	*Nemophila aphylla*
275	Phacelia	*Phacelia hirsuta*
276	Seaside Heliotrope	*Heliotropium curvassicum*
276	Indian Heliotrope	*Heliotropium indicum*
276	Fourspike Heliotrope	*Heliotropium procumbens*
276	Gromwell	*Lithospermum incisum*
276	White Forget-Me-Not	*Myosotis macrosperma*
276	Hairy False Gromwell	*Onosmodium molle hispidissimum*
277	French Mulberry	*Callicarpa americana*
277	Glorybower	*Clerodendron bungei*
277	West Indian Lantana	*Lantana camara*
277		*Lantana urticoides*
277	Northern Frog-fruit	*Phyla lanceolata*
277	Common Frog-fruit	*Phyla nodiflora*
277	Frog-fruit	*Phyla x intermedia*
277	South American Vervain	*Verbena bonariensis*
277	Brasilian Vervain	*Verbena brasiliensis*
277	Rose Vervain	*Verbena canadensis*
277	Texas Vervain	*Verbena halei*
277		*Verbena montevidensis*
277	Sandpaper Vervain	*Verbena scabra*
277	Gulf Vervain	*Verbena xutha*
277	Chaste-Tree	*Vitex agnus-castus*
278	Rough Pennyroyal	*Hedeoma hispidum*

278	Cluster Bushmint	*Hyptis alata*
278	Henbit	*Lamium amplexicaule*
278	Dead Nettle	*Lamium purpureum*
278	Lion's Ears	*Leonotis nepetaefolia*
278	Stalked Water-Hoarhound	*Lycopus rubellus*
278	Applemint	*Mentha rotundifolia*
278	Spearmint	*Mentha spicata*
278	Spotted Beebalm	*Monarda punctata*
278	Beefsteak Plant	*Perilla frutescens*
278	Correll's Dragonhead	*Physostegia correllii*
278	False Dragonhead	*Physostegia virginiana*
278	Self-Heal	*Prunella vulgaris*
278	White-leaved Mountain-Mint	*Pycnanthemum albescens*
278	Slender Mountain-Mint	*Pycnanthemum tenuifolium*
278	Blue Sage	*Salvia azurea*
278	Scarlet Sage	*Salvia coccinea*
278	Lyre-leaf Sage	*Salvia lyrata*
278	Skullcap	*Scutellaria drummondii*
278	Hyssop Skullcap	*Scutellaria integrifolia*
278	Heart-leaved Skullcap	*Scutellaria ovata*
278		*Scutellaria parvula*
278	Shade Betony	*Stachys agraria*
278	Chinese Artichoke	*Stachys floridana*
278	Smooth Hedge-Nettle	*Stachys tenuifolia*
278	Canada Germander	*Teucrium canadense*
278	Germander	*Teucrium cubense*
278	Forked Blue Curls	*Trichostema dichotomum*
280	Bird Pepper	*Capsicum annuum*
280	Carolina Wolf-Berry	*Lycium carolinianum*
280	Tomato	*Lycoperscon esculentum*
280	Seaside Petunia	*Petunia parviflora*
280	Cutleaf Ground-Cherry	*Physalis angulata*
280		*Physalis cordata*
280	Downy Ground-Cherry	*Physalis pubescens*
280	Prairie Ground-Cherry	*Physalis pumila*
280	Beach Ground-Cherry	*Physalis viscosa maritima*
280	Nightshade	*Solanum americanum*
280	Carolina Horsenettle	*Solanum carolinense*
280	Silver-leaf Nightshade	*Solanum elaeagnifolium*
280	Jerusalem-Cherry	*Solanum pseudocapsicum*
280	Jerusalem-Cherry	*Solanum pseudogracile*
281	Fascicled False-Foxglove	*Agalinis fasciculata*
281	Prairie False-Foxglove	*Agalinis heterophylla*
281	Seaside Purple False-Foxglove	*Agalinis maritima*
281	Blue Water-Hyssop	*Bacopa caroliniana*
281	Coast Bacopa	*Bacopa monnieri*
281	Roundleaf Bacopa	*Bacopa rotundifolia*
281	Florida Bluehearts	*Buchera floridana*
281	Sticky Hedge-Hyssop	*Gratiola brevifolia*
281	Clammy Hedge-Hyssop	*Gratiola neglecta*
281	Hairy Hedge-Hyssop	*Gratiola pilosa*
281	Round-fruited Hedge-Hyssop	*Gratiola virginiana*
281	Limnophila	*Limnophila indica*
281	Blue Toad-Flax	*Linaria canadensis*

281	Texas Toad-Flax	*Linaria texana*
281	Linaria (int. between L. can. & L. tex.)	
281	Clasping False Pimpernel	*Lindernia anagallidea*
281	Mazus	*Mazus pumilus*
281	Purple Mecardonia	*Mecardonia acuminata*
281	Sweet Broomwort	*Scoparia dulcis*
281	Common Mullein	*Verbascum thaspus*
281	Common Sppedwell	*Veronica arvensis*
281	Purslane Speedwell	*Veronica peregrina*
282	Trumpet Creeper	*Campsis radicans*
282	Catalpa	*Catalpa bignonioides*
288	Two-flowered Bladderwort	*Utricularia biflora*
288	Horned Bladderwort	*Utricularia cornuta*
288	Fibrous Bladderwort	*Utricularia fibriosa*
288	Giant Bladderwort	*Utricularia foliosa*
288	Humped Bladderwort	*Utricularia gibba*
288	Floating Bladderwort	*Utricularia inflata*
288	Common Bladderwort	*Utricularia macrorhiza*
288	Purple Bladderwort	*Utricularia purpurea*
288	Little Floating Bladderwort	*Utricularia radiata*
290	Lake Acanthus	*Hygrophila lacustris*
290	Lance-leaf Water-Willow	*Justicia ovata lanceolata*
290	Prairie Petunia	*Ruellia humilis*
293	Buckhorn	*Plantago aristata*
293	Variable-leaf Plantain	*Plantago heterophylla*
293	Common Plantain	*Plantago major*
293	Dwarf Plantain	*Plantago virginica*
294	Buttonbush	*Cephalanthus occidentalis*
294	Rough Buttonweed	*Diodia teres*
294	Virginia Buttonweed	*Diodia virginiana*
294	Cleavers	*Galium aparine*
294	Hairy Bedstraw	*Galium pilosum*
294	Dye Bedstraw	*Galium tinctorium*
294	Fragrant Bedstraw	*Galium triflorum*
294	Small Bluets	*Houstonia minima*
294		*Houstonia nigricans*
294		*Olenlandia boscii*
294		*Olenlandia fasciculata*
294	Prairie Buttonweed	*Richardia tricocca*
295	Japanese Honeysuckle	*Lonicera japonica*
295	Elderberry	*Sambucus canadensis*
295	Southern Arrowwood	*Viburnum dentatum*
295	Viburnum	*Viburnum suspensum*
297	Corn-Salad	*Valerianella radiata*
299	Watermelon	*Citrullus lanatus*
299	Stinkmelon	*Cucumis melo*
299	Sponge Gourd	*Lagenaria siceraria*
299	Creeping Cucumber	*Melothria pendula*
300	Pale Lobelia	*Lobelia appendiculata*
300	Downy Lobelia	*Lobelia puberula*
300	Chicken Spike	*Sphenoclea zeylandica*
300	Venus' Lookingglass	*Triodanis biflora*
300	Venus' Lookingglass	*Triodanis perfoliata*
304	Creeping Spotflower	*Acmella oppositifolia*

304	Common Ragweed	*Ambrosia artisiifolia*
304	Western Ragweed	*Ambrosia psilostachya*
304	Giant Ragweed	*Ambrosia trifida*
304	Mayweed Dogfennel	*Anthemis cotula*
304	Lazy Daisy	*Aphanostephus skirrhobasis*
304	Western Mugwort	*Artemisia ludoviciana*
304	Bushy Aster	*Aster dumosus*
304	Calico Aster	*Aster lateriflorus*
304	Devilweed Aster	*Aster spinosus*
304	Annual Saltmarsh Aster	*Aster subulatus*
304	Hierba-del-Marrano	*Aster subulatus ligulatus*
304	Saline Aster	*Aster tenuifolius*
304	Sea Myrtle	*Baccharis angustifolia*
304	Eastern Baccharis	*Baccharis halimifolia*
304	Fouchet	*Bidens laevis*
304	Marsh Boltonia	*Boltonia asteroides*
304	Doll's Daisy	*Boltonia diffusa*
304	Bushy Sea-oxeye	*Borrichia frutescens*
304	Prostrate Lawnflower	*Calyptocarpus vialis*
304	Boneset	*Chromolaena ivifolia*
304	Bull Thistle	*Cirsium horridulum*
304	Mist Flower	*Conoclinium coelestinum*
304		*Conyza bonariensis*
304	Canada Horseweed	*Conyza canadensis*
304		*Conyza canadensis pusillus*
304	Goldmane Coreopsis	*Coreopsis basalis*
304	Thickleaf Coreopsis	*Coreopsis lanceolata*
304	Painted Tickseed	*Coreopsistinctoria*
304	Spanish-Needles	*Cosmos bipennata*
304	Clasping Coneflower	*Dracopis amplexicaulis*
304	Pale Purple Coneflower	*Echinacea pallid*
304	Yerba-del-Tago	*Eclipta alba*
304	Leafy Elephant's-Foot	*Elephantopus carolinianus*
304	Fireweed	*Erechtites hieracifolia*
304	Philadelphia Fleabane	*Erigeron philadelphicus*
304	Blue Fleabane	*Erigeron tenuis*
304	Cypressweed	*Eupatorium capillifolium*
304	Yankeeweed	*Eupatorium compositifolium*
304	Hyssop-leved Boneset	*Eupatorium hyssopifolium*
304	Lanceleaf Eupatorium	*Eupatorium lancifolium*
304	Thoroughwort	*Eupatorium perfoliatum*
304	Boneset	*Eupatorium pinnatifidum*
304	Small-flowered Thoroughwort	*Eupatorium semiserratum*
304	Late Eupatorium	*Eupatorium serotinum*
304	Euthamia	*Euthamia gymnospermoides*
304	Slimhead Goldenrod	*Euthamia leptocephala*
304	Facelis	*Facelis retusa*
304	Pink Boneset	*Fleischmannia incarnata*
304	Winkler Gaillardia	*Gaillardia aestivalis*
304	Indian Blanket	*Gaillardia pulchella*
304		*Gamochaeta calviceps*
304	Wandering Cudweed	*Gamochaeta pensylvanicum*
304	Purple Cudweed	*Gamochaeta purpurea*
304	Fragrant Cudweed	*Gnaphalium obtusifolium*

304	Bitterweed	*Helenium amarum*
304	Sneezeweed	*Helenium drummondii*
304	Purple-headed Sneezeweed	*Helenium flexuosum*
304	Narrowleaf Sunflower	*Helianthus angustifolius*
304	Ashy Sunflower	*Helianthus mollis*
304	Jerusalem Artichoke	*Helianthus tuberosus*
304	Sunflower Everlasting	*Heliopsis helianthoides*
304	Camphorweed	*Heterotheca subaxillaris*
304	Cat's-Ears	*Hypochoeris microcephala*
304	Narrow-leaf Sumpweed	*Iva angustifolia*
304	Rough Sumpweed	*Iva annua*
304	Big-leaf Sumpweed	*Iva frutescens*
304	Dune Sumpweed	*Iva imbricata*
304	Dwarf Dandelion	*Krigia cespitosa*
304	Potato Dandelion	*Krigia dandelion*
304	Canada Lettuce	*Lactuca canadensis*
304	Florida Lettuce	*Lactuca floridana*
304	Prickly Lettuce	*Lactuca serriola*
304	Ox-eye Daisy	*Leucanthemum vulgare*
304	Slender Gayfeather	*Liatris acidota*
304	Pinkscale Gayfeather	*Liatris elegans*
304	Camphor Daisy	*Machaeranthera phyllocephola*
304		*Machaeranthera spinulosus*
304	Climbing Hempvine	*Mikania scandens*
304	False Ragweed	*Parthenium hysterophorus*
304	Camphorweed	*Pluchea camphorata*
304	Stinking Fleabane	*Pluchea foetida*
304	Seaside Stinking Fleabane	*Pluchea odorata*
304	Stinkweed	*Pluchea rosea*
304	Wand Blackroot	*Pterocaulon virgatum*
304	Carolina False Dandelion	*Pyrrhopappus carolinianus*
304	Upright Prairie-Coneflower	*Ratibida columnifera*
304	Naked Prairie-Coneflower	*Ratibida peduncularis*
304	Narrowleaf Black-eyed Susan	*Rudbeckia hirta angustifolia*
304	Late Brown-eyed Sysan	*Rudbeckia hirta pulcherrima*
304	Sweet Coneflower	*Rudbeckia subtomentosa*
304	Butterweed	*Senecio glabellus*
304	Threadleaf Groundsel	*Senecio imparipinnatus*
304	Yellowtop	*Senecio tampicanus*
304	Slender Rosin-weed	*Silphium gracile*
304		*Silphium radula*
304		*Silphium simpsonii*
304	Bear's-Foot	*Smallanthus uvedalia*
304	Canada Goldenrod	*Solidago canadensis*
304	Shiny Goldenrod	*Solidago nitida*
304	Hackberry-leaved Rough Goldenrod	*Solidago rugosa celtidifolia*
304	Seaside Goldenrod	*Solidago sempervirens*
304	Noble Goldenrod	*Solidago speciosa*
304	Elmleaf Goldenrod	*Solidago ulmifolia*
304		*Soliva mutisii*
304		*Soliva pterosperma*
304	Prickly Sow Thistle	*Sonchus asper*
304	Common Sow Thistle	*Sonchus oleraceus*
304	Creeping Spot Flower	*Spilanthes americana*

304	Common Dandelion	*Taraxacum officinale*
304	Frostweed	*Verbesina virginica*
304	Tall Ironweed	*Vernonia gigantea*
304	Missouri Ironweed	*Vernonia missourica*
304	Cocklebur	*Xanthium strumarium*
304	Oriental Hawkbeard	*Youngia japonica*
304	Zinnia	*Zinnia elegans*

APPENDIX C

Fish and wildlife species that could occur in the Mermentau River Basin are provided in taxonomic order. The list includes common and scientifie names.

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MARINE INVERTEBRATES OBSERVED WITHIN RIVER BASIN

Common Name	Scientific Name
Portugese man-of-war	*Physalia physalis*
Sea nettle	*Chrysaora quinquecirrha*
Cabbagehead jellyfish	*Stomolophus meleagris*
Phosphorus jellyfish	*Mnemiopsis mccradyi*
Blood worm	*Glycera americana*
Periscope tube worm	*Oiopatra cuprea*
Oyster blister worm	*Polydora websteri*
Marsh periwinkle	*Lettorina irrorata*
Common mud snail	*Nassarius vibex*
White slipper shell	*Crepidula plana*
Atlantic slipper shell	*Crepidula fornicata*
Common marsh snail	*Melampus bidentatus*
Southern oyster drill	*Thais haemostoma*
Ribbed mussel	*Geukensea demissa*
Hooked mussel	*Ishadium recurvum*
Eastern oyster	*Crassostrea virginica*
Road shell clam	*Rangia cuneata*
Small macoma	*Macoma mitchelli*
Constricted macoma	*Macoma constricta*
Stout razor clam	*Tagelus plebeis*
Southern quahog	*Mercenaria campechiensis*
Bean clam	*Donax variabillis*
Squid	*Loligo pealei*
Acorn barnacles	*Chelonibia* spp.
Speckled crab	*Arenaeus cribrarius*
Blue crab	*Callinectes sapidus*
Blue crab	*Callinectes similis*
Flat mud crab	*Eurypanoplus depressus*
Stone crab	*Menippe mercenaria*
Common mud crab	*Panopeus herbstii*
Harris mud crab	*Rithropanopeus harrisii*
Red-jointed fiddler crab	*Uca minax*
Sand fiddler	*Uca picgillator*
Mud fiddler	*Uca pugnax*
-	*Uca rapax*
-	*Uca spinicarpa*
Wharf crab	*Sesarma cinereum*
Purple marsh crab	*Sesarma reticulatum*
Shore crab	*Pachygrapsus gracilis*
-	*Pachygrapsus transversus*
-	*Petrolisthes armatus*
-	*Porcellana sigsbeiana*
Mussel crab	*Pinnotheres maculatus*
Oyster crab	*Pinnotheres ostreum*
Spider crab	*Libinia dubia*
Striped hermit crab	*Clibanarius vittatus*
-	*Isocheles wurdemanni*
Long-armed hermit crab	*Pagurus longicarpus*
White River crayfish	*Procambarus acutus*

Marine Invertebrates (continued)

Common Name	Scientific Name
Red Swamp crayfish	*Procambarus clarkii*
Flat-browed mud shrimp	*Upogebia affinis*
Brown shrimp	*Penaeus aztecus*
White shrimp	*Penaeus setiferus*
Pink shrimp	*Penaeus duorarum*
Sea bob	*Xiphopeneus kroyeri*
-	*Solenocerinae* spp.
-	*Acetes americanus*
Freshwater shrimp	*Macrobrachium ohione*
Freshwater shrimp	*Macrobrachium acanthurus*
Grass shrimp	*Palaemonetes pugio*
Grass shrimp	*Palaemonetes vulgaris*
Big-clawed snapping shrimp	*Alpheus heterochaelis*
Mantis shrimp	*Squilla empusa*
Wood-boring isopod	*Limnoria tripunctata*
Rock louse	*Ligia exotica*
-	*Bopyrissa wolffi*
Smooth-backed sphaeroma	*Sphaeroma quadridentatum*
Fish louse	*Cymothous* sp.
Wharf roach	*Ligia* sp.
Beach flea	*Orchestia grillus*
-	*Gammarus mucronatus*
Marsh hopper	*Talorchestia* sp.

FISH OBSERVED WITHIN RIVER BASIN

Common Name	*Scientific Name*
Atlantic stingray	*Dasyatis sabina*
Spotted gar	*Lepisosteus oculatus*
Longnose gar	*Lepisosteus osseus*
Alligator gar	*Atractosteus spatula*
Bowfin	*Amia calva*
Ladyfish	*Elops saurus*
American eel	*Anguilla rostrata*
Speckled worm eel	*Myrophis punctatus*
Shrimp eel	*Ophichthus gomesi*
Skipjack herring	*Alosa chrysochloris*
Gulf menhaden	*Brevoortia patronus*
Gizzard shad	*Dorosoma cepedianum*
Threadfin shad	*Dorosoma petenense*
Scaled sardines	*Harengula jaguana*
Atlantic thread herring	*Opisthonema oglinum*
Striped anchovy	*Anchoa hepsetus*
Bay anchovy	*Anchoa mitchilli*
Largescale lizardfish	*Saurida brasiliensis*
Inshore lizardfish	*Synodus foetens*
Common carp	*Cyprinus carpio*

Fish (continued)

Common Name	Scientific Name
Golden shiner	*Notemigonus crysoleucas*
Bigmouth buffalo	*Ictiobus cyprinellus*
Blue catfish	*Ictalurus furcatus*
Black bullhead	*Ictalurus melas*
Yellow bullhead	*Ictalurus natalis*
Channel catfish	*Ictalurus punctatus*
Hardhead catfish	*Ariopsis felis*
Gafftopsail catfish	*Bagre marinus*
Pirate perch	*Aphredoderus sayanus*
Gulf toadfish	*Opsanus beta*
Atlantic midshipman	*Porichthys plectrodon*
Skilletfish	*Gobiesox strumosus*
Southern hake	*Urophycis floridana*
Bearded brotula	*Brotula barbata*
Bank cusk-eel	*Ophidion holbrooki*
Atlantic needlefish	*Strongylura marina*
Diamond killifish	*Adinia xenica*
Sheepshead minnow	*Cyprinodon variegatus*
Golden topminnow	*Fundulus chrysotus*
Gulf killifish	*Fundulus grandis*
Saltmarsh topminnow	*Fundulus jenkinsi*
Starhead topminnow	*Fundulus blairae*
Bayou killifish	*Fundulus pulvereus*
Longnose killifish	*Fundulus similis*
Rainwater killifish	*Lucania parva*
Mosquitofish	*Gambusia affinis*
Least killifish	*Heterandria formosa*
Sailfin molly	*Poecilia latipinna*
Brook silversides	*Labidesthes sicculus*
Rough silversides	*Membras martinica*
Inland silversides	*Menidia beryllina*
Dusky pipefish	*Syngnathus floridae*
Chain pipefish	*Syngnathus louisianae*
Gulf pipefish	*Syngnathus scovelli*
Lined seahorse	*Hippocampus erectus*
Striped bass	*Morone saxatilis*
White bass	*Morone chrysops*
Yellow bass	*Morone mississippiensis*
Flier	*Centrarchus macropterus*
Banded pygmy sunfish	*Elassoma zonatum*
Warmouth	*Lepomis gulosus*
Bluegill	*Lepomis macrochirus*
Redear sunfish	*Lepomis punctatus*
Bantam sunfish	*Lepomis symmetricus*
Largemouth bass	*Micropterus salmoides*
White crappie	*Pomoxis annularis*
Black crappie	*Pomoxis nigromaculatus*
Bluefish	*Pomatomus saltatrix*
Cobia	*Rachycentron canadum*
Crevalle jack	*Caranx hippos*

Fish (continued)

Common Name	Scientific Name
Atlantic bumper	*Chloroscombrus chrysurus*
Bluntnose jack	*Hemicaranx amblyrhynchus*
Leatherjack	*Oligoplites saurus*
Atlantic moonfish	*Selene setapinnis*
Lookdown	*Selene vomer*
Florida pompano	*Trachinotus carolinus*
Bigeye scad	*Selar crumenophthalmus*
Gray snapper	*Lutjanus griseus*
Tripletail	*Lobotes surinamensis*
Spotfin mojarra	*Eucinostomus argenteus*
Mottled mojarra	*Eucinostomus lefroyi*
Pigfish	*Orthopristis chrysoptera*
Sheepshead	*Archosargus probatocephalus*
Pinfish	*Lagondon rhomboides*
Freshwater drum	*Aplodinotus grunniens*
Silver perch	*Bairdiella chrysoura*
Sand seatrout	*Cynoscion arenarius*
Spotted seatrout	*Cynoscion nebulosus*
Silver seatrout	*Cynoscion nothus*
Banded drum	*Larimus fasciatus*
Spot	*Leiostomus xanthurus*
Southern kingfish	*Menticirrhus americanus*
Atlantic croaker	*Micropogonias undulatus*
Black drum	*Pogonias cromis*
Red drum	*Sciaenops ocellatus*
Star drum	*Stellifer lanceolatus*
Atlantic spadefish	*Chaetodipterus faber*
Striped mullet	*Mugil cephalus*
White mullet	*Mugil curema*
Guaguanche	*Sphyraena guachancho*
Atlantic threadfin	*Polyactylus octonemus*
Southern stargazer	*Astroscopus y-graecum*
Striped blenny	*Chasmodes boquianus*
Freckled blenny	*Hypsoblennius ionthas*
Fat sleeper	*Dormitator maculatus*
Emerald sleeper	*Erotelis smargdus*
Spinycheek sleeper	*Eleotris pisonis*
Lyre goby	*Evorthodus lyricus*
Violet goby	*Gobioides broussoneti*
Darter goby	*Gobionellus boleosoma*
Sharptail goby	*Gobionellus shufeldti*
Freshwater goby	*Gobionellus shufeldti*
Naked goby	*Gobiosoma bosci*
Code goby	*Gobiosoma robustum*
Clown goby	*Microbius gulosus*
Green goby	*Microbius thalassinus*
Pink wormfish	*Microgobius longipinnis*
Atlantic cutlassfish	*Trichiurus lepturus*
Spanish mackerel	*Scomberomorus maculatus*
Harvestfish	*Peprilus alepidotus*

Fish (continued)

Common Name	Scientific Name
Gulf butterfish	*Peprilus burti*
Bighead searobin	*Prionotus tribulus*
Ocellated flounder	*Ancylopsetta quadrocellata*
Bay whiff	*Citharichthys spilopterus*
Fringe flounder	*Etropus crossotus*
Gulf flounder	*Paralichthys albigutta*
Southern flounder	*Paralichthys lethostigma*
Lined sole	*Achirus lineatus*
Hogchoker	*Trinectes maculatus*
Blackcheek tonguefish	*Symphurus plagiusa*
Pygmy filefish	*Monacanthus setifer*
Southern puffer	*Sphoeroides nephelus*
Least puffer	*Sphoeroides parvus*

AMPHIBIANS OBSERVED WITHIN RIVER BASIN

Common Name	Scientific Name
Three-toed amphiuma	*Amphiuma tridactylum*
Gulf coast toad	*Bufo valliceps*
Northern cricket frog	*Acris crepitans*
Green treefrog	*Hyla cinerea*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Bullfrog	*Rana catesbeiana*
Pig frog	*Rana grylio*
Green frog	*Rana clamitans*
Southern leopard frog	*Rana sphenocephala*

REPTILES OBSERVED WITHIN RIVER BASIN

Common Name	Scientific Name
American alligator	*Alligator mississippiensis*
Green anole	*Anolis carolinensis*
Broad-headed skink	*Eumeces laticeps*
Ground skink	*Scincella lateralis*
Common snapping turtle	*Chelydra serpentina*
Alligator snapping turtle	*Macroclemys temminckii*
Common mud turtle	*Kinosternon subrubrum*
Gulf coast box turtle	*Terrapene carolina*
Mississippi diamond-backed terrapin	*Malaclemys terrapin*
Common slider	*Trachemys scripta*
Spiny softshell turtle	*Apalone spinifer*
Southern water snake	*Nerodia fasciata*
Green water snake	*Nerodia cyclopion*
Diamondback water snake	*Nerodia rhombifera*
Brown snake	*Storeria dekayi*
Western ribbon snake	*Thamnophis proximus*

Reptiles (continued)

Common Name	Scientific Name
Rainbow snake	*Farancia erytrogramma*
Glossy crayfish snake	*Regina rigida*
Eastern hognose snake	*Heterdon platyrhinos*
Mud snake	*Farancia abacura*
Blue racer	*Coluber constrictor*
Rat snake	*Elaphe obsoleta*
Common kingsnake	*Lampropeltis getulus*
Copperhead	*Agkistrodon contortrix*
Cottonmouth	*Agkistrodon piscivorus*
Pigmy rattlesnake	*Sistrurus miliarius*

BIRDS OBSERVED WITHIN RIVER BASIN

Common Name	Scientific Name
Common Loon	*Gavia immer*
Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
Red-necked Grebe	*Podiceps grisegena*
Eared Grebe	*Podiceps nigricollis*
Western Grebe	*Aechmophorus occidentalis*
Northern Gannet	*Morus bassanus*
American White Pelican	*Pelecanus erythrorhynchos*
Brown Pelican	*Pelecanus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Olivaceous Cormorant	*Phalacrocorax olivaceus*
Anhinga	*Anhinga anhinga*
Magnificent Frigatebird	*Fregata magnificens*
American Bittern	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron	*Ardea herodias*
Great Egret	*Casmerodius albus*
Snowy Egret	*Egretta thula*
Little Blue Heron	*Egretta caerulea*
Tricolored Heron	*Egretta tricolor*
Reddish Egret	*Egretta rufescens*
Cattle Egret	*Bubulcus ibis*
Green-backed Heron	*Butorides striatus*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Yellow-crowned Night-Heron	*Nyctanassa violaceus*
White Ibis	*Eudocimus albus*
Glossy Ibis	*Plegadis falcinellus*
White-faced Ibis	*Plegadis chihi*
Roseate Spoonbill	*Ajaia ajaja*
Wood Stork	*Mycteria americana*
Fulvous Whistling-Duck	*Dendrocygna bicolr*
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*
Greater White-fronted Goose	*Anser albifrons*

Birds (continued)

Common Name	Scientific Name
Snow Goose	*Chen caerulescens*
Ross' Goose	*Chen rossii*
Canada Goose	*Branta canadensis*
Wood Duck	*Aix sponsa*
Green-winged Teal	*Anas crecca*
American Black Duck	*Anas rubripes*
Mottled Duck	*Anas fulvigula*
Mallard	*Anas platyrhynchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Canvasback	*Aythya valisneria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Common Name	Scientific Name
Greater Scaup	*Aythya marila*
Lesser Scaup	*Aythya affinis*
Oldsquaw	*Clangula hyemalis*
Black Scoter	*Melanitta nigra*
Surf Scoter	*Melanitta perspicillata*
White-winged Scoter	*Melanitta fusca*
Common Goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Black Vulture	*Coragyps atratus*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Black-shouldered Kite	*Elanus caeruleus*
Bald Eagle	*Haliaetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*
Swainson's Hawk	*Buteo swainsoni*
Red-tailed Hawk	*Buteo jamaicensis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Northern Bobwhite	*Colinus virginianus*
Yellow Rail	*Coturnicops noveboracensis*
Black Rail	*Laterallus jamaicensis*

Birds (continued)

Common Name	Scientific Name
Clapper Rail	*Rallus longirostris*
King Rail	*Rallus elegans*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Purple Gallinule	*Porphyrula martinica*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*
Black-bellied Plover	*Pluvialis squatarola*
Lesser Golden-Plover	*Pluvialis dominica*
Snowy Plover	*Charadrius alexandrinus*
Wilson's Plover	*Charadrius wilsonia*
Semipalmated Plover	*Charadrius semipalmatus*
Piping Plover	*Charadrius melodus*
Killdeer	*Charadrius vociferus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Trnga melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus sempalmatus*
Spotted Sandpiper	*Actitis maculária*
Upland Sandpiper	*Bartramia longicauda*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
White-rumped Sandpiper	*Calidris fuscicollis*
Pectoral Sandpiper	*Calidris melanotos*
Purple Sandpiper	*Calidris maritima*
Dunlin	*Calidris alpina*
Stilt Sandpiper	*Calidris himantopus*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
American Woodcock	*Scolopax minor*
Wilson's Phalarope	*Phalaropus tricolor*
Red-necked Phalarope	*Phalaropus lobatus*
Pomarine Jaeger	*Stercorarius pomarinus*
Parasitic Jaeger	*Stercorarius parasiticus*
Laughing Gull	*Larus atricilla*
Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Ring-billed Gull	*Larus delawarensis*
Herrng Gull	*Larus argentatus*
Lesser Black-backed Gull	*Larus fuscus*

Birds (continued)

Common Name	Scientific Name
Glaucous Gull	*Larus hyperboreus*
Great Black-backed Gull	*Larus marinus*
Black-legged Kittiwake	*Rissa tridactyla*
Gull-billed Tern	*Sterna nilotica*
Caspian Tern	*Sterna caspia*
Royal Tern	*Sterna maxima*
Sandwich Trn	*Sterna sandvicensis*
Common Tern	*Sterna hirundo*
Forster's Tern	*Sterna forsteri*
Least Tern	*Sterna antillarum*
Black Tern	*Chlidonias niger*
Black Skimmer	*Rynchops niger*
Rock Dove	*Columba livia*
White-winged Dove	*Zenaida asiatica*
Mourning Dove	*Zenaida macroura*
Inca Dove	*Columbina inca*
Common Ground-Dove	*Columbia passerina*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Groove-billed Ani	*Crotophaga sulcirostris*
Barn-Owl	*Tyto alba*
Eastern Screech-Owl	*Otus asio*
Great Horned Owl	*Bubo virginianus*
Burrowing Owl	*Athene cunicularia*
Barred Owl	*Strix varia*
Long-eared Owl	*Asio otus*
Short-eared Owl	*Asio flammeus*
Northern Saw-whet Owl	*Aegolius acadicus*
Lesser Nighthawk	*Chordeiles acutipennis*
Common Nighthawk	*Chordeiles minor*
Chuck-will's-willow	*Caprimulgus carolinensis*
Whip-poor-will	*Caprimulgus vociferus*
Chimney Swift	*Chaetura pelagica*
Buff-bellied Hummingbird	*Amazilia yucatanensis*
Ruby-throated Hummingbird	*Archilochus colubris*
Black-chinned Hummingbird	*Archilochus alexandri*
Anna's Hummingbird	*Calypte anna*
Rufous Hummingbird	*Selasphorus rufus*
Belted Kingfisher	*Ceryle alcyon*
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Red-bellied Woodpecker	*Melanerpes carolinus*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Northern Flicker	*Colaptes auratus*
Olive-sided Flycatcher	*Contopus borealis*
Eastern Wood-Pewee	*Contopus virens*
Yellow-bellied Flycatcher	*Empidonax flaviventris*

Birds (continued)

Common Name	Scientific Name
Acadian Flycatcher	*Empidonax virescens*
Least Flycatcher	*Empidonax minimus*
Eastern Phoebe	*Sayornis phoebe*
Say's Phoebe	*Sayornis saya*
Vermilion Flycatcher	*Pyrocephalus rubinus*
Ash-throated Flycatcher	*Myiarchus cinerascens*
Great Crested Flycatcher	*Myiarchus crinitus*
Brown-crested Flycatcher	*Myiarchus tyrannulus*
Couch's Kingbird	*Tyrannus couchii*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Scissor-tailed Flycatcher	*Tyrannus forficatus*
Horned Lark	*Eremophila alpestris*
Purple Martin	*Progne subis*
Tree Swallow	*Tachycineta bicolor*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Bank Swallow	*Riparia riparia*
Cliff Swallow	*Hirundo pyrrhonota*
Barn Swallow	*Hirundo rustica*
Blue Jay	*Cyanocitta cristata*
American Crow	*Corvus brachyrhynchos*
Fish Crow	*Corvus ossifragus*
Carolina Chickadee	*Parus carolinensis*
Tufted Titmouse	*Parus bicolor*
Red-breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia americana*
Carolina Wren	*Thryothorus ludovicianus*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Winter Wren	*Troglodytes troglodytes*
Sedge Wren	*Cistothorus platensis*
Marsh Wren	*Cistothorus palustris*
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Eastern Bluebird	*Sialia sialis*
Veery	*Catharus fusescens*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
Varied Thrush	*Ixoreus naevius*
Wood Thrush	*Hylocichla mustelina*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Sage Thrasher	*Oreoscoptes montanus*
Brown Thrasher	*Toxostoma rufum*
Curve-billed Thrasher	*Toxostoma curvirostre*
American Pipit	*Anthus rubescens*

Birds (continued)

Common Name	Scientific Name
Sprague's Pipit	*Anthus spragueii*
Cedar Waxwing	*Bombycilla cedorum*
Loggerhead Shrike	*Lanius ludovicianus*
European Starling	*Sturnus vulgaris*
White-eyed Vireo	*Vireo griseus*
Bell's Vireo	*Vireo bellii*
Solitary Vireo	*Vireo solitarius*
Yellow-throated Vireo	*Vireo flavifrons*
Warbling Vireo	*Vireo gilvus*
Philadelphia Vireo	*Vireo philadelphicus*
Red-eyed Vireo	*Vireo olivaceus*
Blue-winged Warbler	*Vermivora pinus*
Golden-winged Warbler	*Vermivora chrysoptera*
Tennessee Warbler	*Vermivora peregrina*
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Virginia's Warbler	*Vermivora virginiae*
Northern Parula	*Parula americana*
Tropical Parula	*Parula pitiayumi*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Cape May Warbler	*Dendroica tigrina*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Gray Warbler	*Dendroica nigriscens*
Townsend's Warbler	*Dendroica townsendi*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Yellow-throated Warbler	*Dendroica dominica*
Pine Warbler	*Dendroica pinus*
Prairie Warbler	*Dendroica discolor*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpoll Warbler	*Dendroica striata*
Cerulean Warbler	*Dendroica cerulea*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Prothonotary Warbler	*Prothonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Louisiana Waterthrush	*Seiurus motacilla*
Kentucky Warbler	*Oporornis formosus*
Mourning Warbler	*Oporornis philadelphia*
MacGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Hooded Warbler	*Wilsonia citrina*
Wilson's Warbler	*Wilsonia pusilla*

Birds (continued)

Common Name	Scientific Name
Canada Warbler	*Wilsonia canadensis*
Yellow-breasted Chat	*Icteria virens*
Summer Tanager	*Piranga rubra*
Scarlet Tanager	*Piranga olivacea*
Western Tanager	*Piranga ludoviciana*
Northern Cardinal	*Cardinalis cardinalis*
Rose-breasted Grosbeak	*Pheucticus ludoviciamus*
Black-headed Grosbeak	*Pheucticus melanocephalus*
Blue Bunting	*Cyanocompsa parellina*
Blue Grosbeak	*Guiraca caerulea*
Indigo Bunting	*Passerina cyanea*
Painted Bunting	*Passerina ciris*
Dickcissel	*Spiza americana*
Green-tailed Towhee	*Pipilo chlorurus*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Chipping Sparrow	*Spizella passerina*
Clay-colored Sparrow	*Spizella pallida*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow	*Pooectes gramineus*
Lark Sparrow	*Chondestes grammacus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*
Henslow's Sparrow	*Ammodramus henslowii*
LeConte's Sparrow	*Ammodramus leconteii*
Sharp-tailed Sparrow	*Ammodramus caudacutus*
Seaside Sparrow	*Ammodramus maritimus*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*
Lincoln's Sparrow	*Melospiza lincolnii*
Swamp Sparrow	*Melospiza georgiana*
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonotrichia leucophrys*
Harris' Sparrow	*Zonotrichia querula*
Dark-eyed Junco	*Junco hyemalis*
Lapland Longspur	*Calcarius lapponicus*
Red-winged Blackbird	*Agelaius phoeniceus*
Eastern Meadowlark	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Rusty Blackbird	*Euphagus carolinus*
Brewer's Blackbird	*Euphagus cyanocephalus*
Great-tailed Grackle	*Quiscalus mexicanus*
Boat-tailed Grackle	*Quiscalus major*
Common Grackle	*Quiscalus quiscalus*
Bronzed Cowbird	*Molothrus aeneus*
Brown-headed Cowbird	*Molothrus ater*
Orchard Oriole	*Icterus spurius*
Northern Oriole	*Icterus galbula*
Purple Finch	*Carpodacus purpureus*

Birds (continued)

Common Name	Scientific Name
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*
House Sparrow	*Passer domesticus*

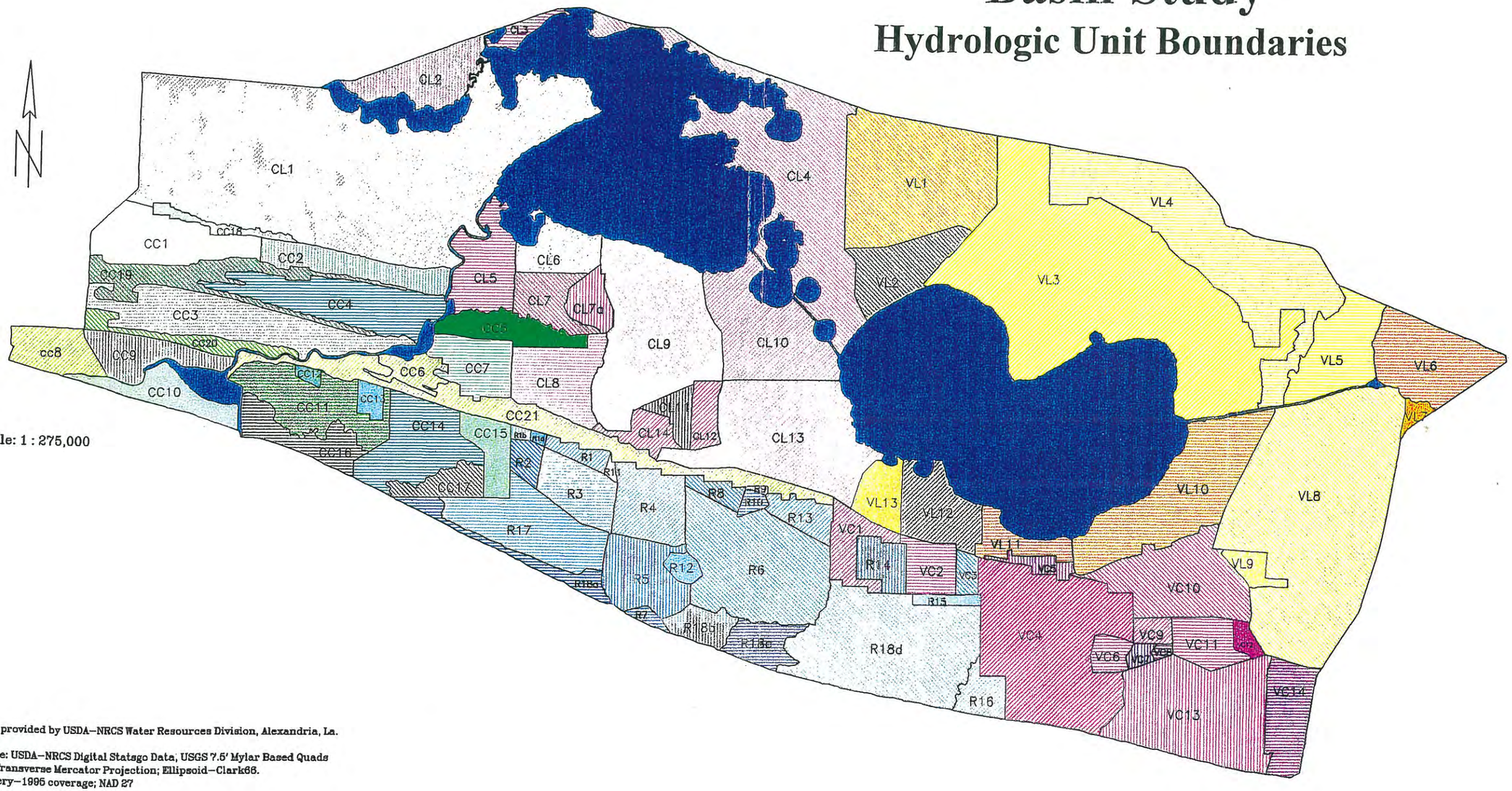
MAMMALS OBSERVED WITHIN RIVER BASIN

Common Name	Scientific Name
Vrginia opossum	*Didelphis virginiana*
Nine-banded armadillo	*Dasypus novemcinctus*
Least shrew	*Cryptotis parva*
Red bat	*Lasiurus borealis*
Seminole bat	*Lasiurus seminolus*
Eastern pipistrelle	*Pipistrellus subflavus*
Evening bat	*Nycticeius humeralis*
Brazilian free-tailed bat	*Tadarida brasiliensis*
Coyote	*Canis latrans*
Gray fox	*Urocyon cinereoargenteus*
Red fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
Striped skunk	*Mephitis mephitis*
Spotted skunk	*Spilogale putorius*
River otter	*Lutra canadensis*
Bobcat	*Lynx felis*
White-tailed deer	*Odocoileus virginianus*
Marsh rice rat	*Oryzomys palustris*
Fulvous harvest mouse	*Reithrodontomys fulvescens*
Hispid cotton rat	*Sigmodon hispidus*
Muskrat	*Ondatra zibethicus*
House mouse	*Mus musculus*
Black rat	*Rattus rattus*
Norway rat	*Rattus norvegicus*
Nutria	*Myocaster coypus*
Swamp rabbit	*Sylvilagus aquaticus*
Eastern cottontail	*Sylvilagus floridanus*

Natural Resource Conservation Service
U.S. Department of Agriculture

Mermentau River Basin Study

Hydrologic Unit Boundaries



Scale: 1 : 275,000

Field Data: provided by USDA–NRCS Water Resources Division, Alexandria, La.

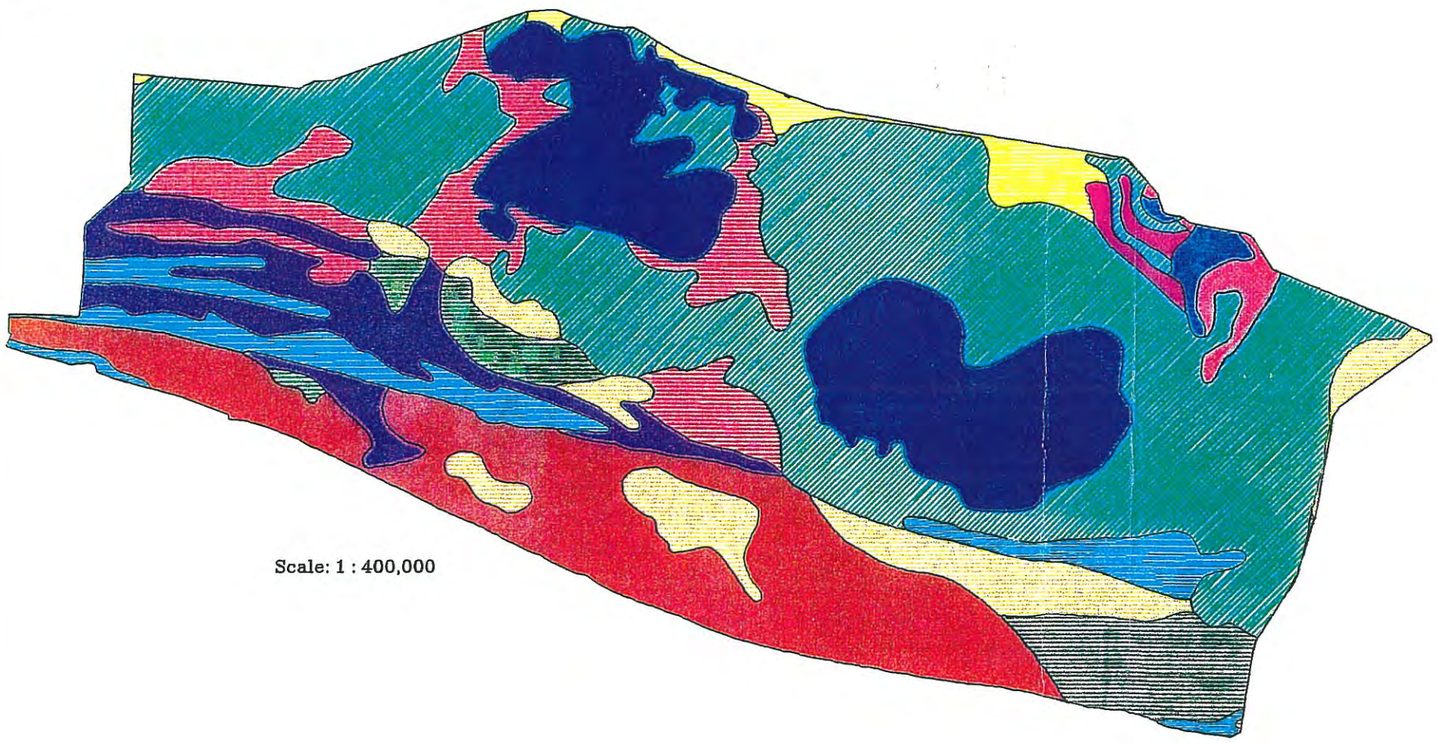
Base Source: USDA–NRCS Digital Statsgo Data, USGS 7.5' Mylar Based Quads
Universal Transverse Mercator Projection; Ellipsoid–Clark66.
SPOT Imagery–1996 coverage; NAD 27

Total Water----94,642 acres
Total Area----663,064 acres

Map produced by NRCS–GIS Lab, Alexandria, La.

Natural Resource Conservation Service
U.S. Department of Agriculture

MERMENTAU RIVER
General Soils



Legend:

- Basin Boundary
- ALLEMANDS–WATER–KENNER
- BANCKER–WATER–CREOLE
- CREOLE–WATER–BANCKER
- GUEYDAN–WATER–GED
- GED–ALLEMANDS–WATER
- KAPLAN–MIDLAND–JUDICE
- LAROSE–WATER–ALLEMANDS
- CLOVELLY–WATER–LAFITTE
- MERMENTAU–HACKBERRY–WATER
- CROWLEY–MOWATA–VIDRINE
- SCATLAKE–WATER–TIMBALIER
- LAW

Project Location

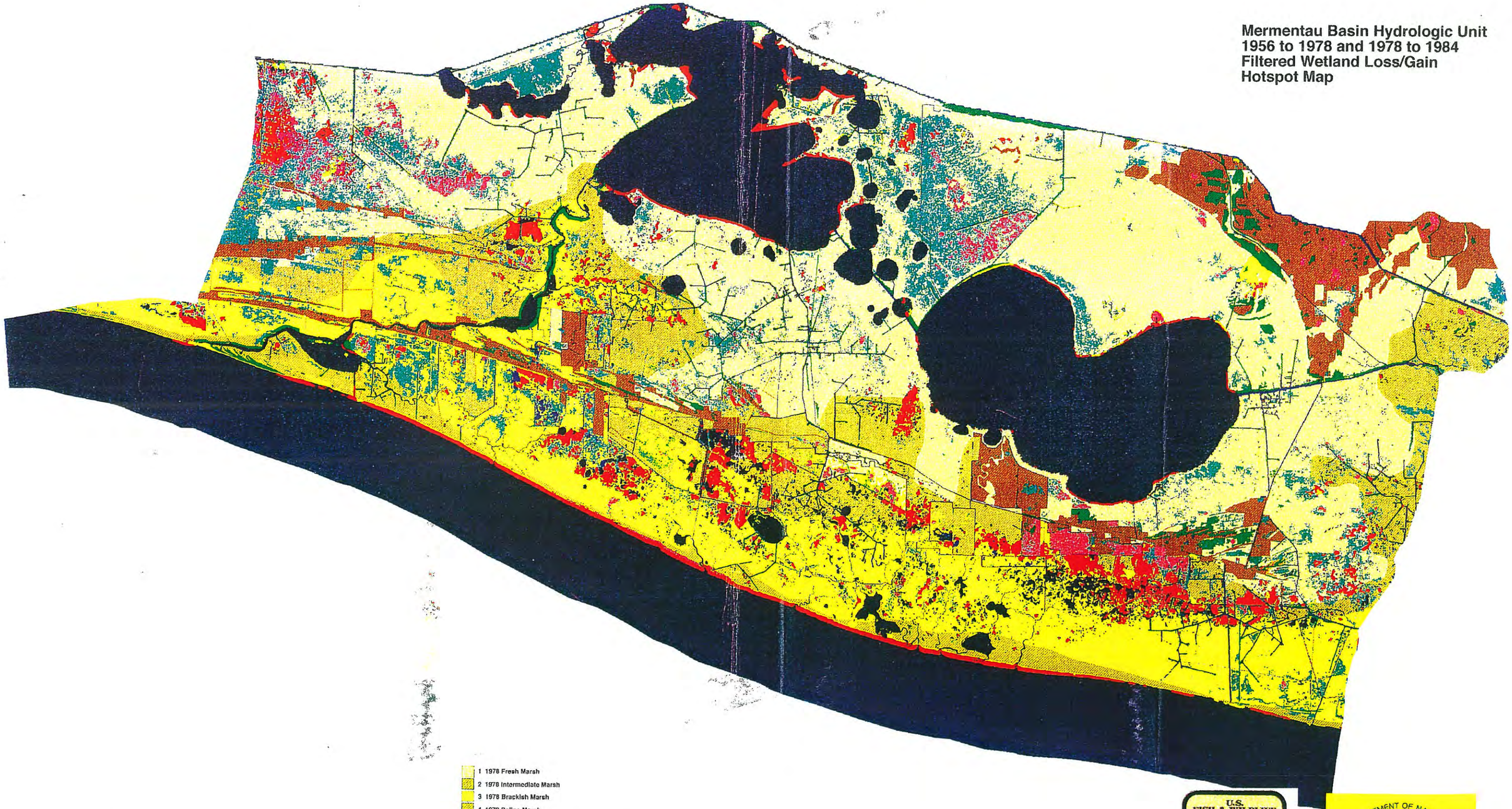
Field Data: provided by USDA–NRCS Water Resources Division, Alexandria, La.

Base Source: USDA–NRCS Digital Statsgo Data, USGS 7.5' Mylar Base Quads
Universal Transverse Mercator Projection; Ellipsoid–Clark66.
SPOT Imagery–1995 coverage; NAD 27

Total Water----94,642 acres
Total Area----663,064 acres

Map produced by NRCS–GIS Lab, Alexandria, la.

Mermentau Basin Hydrologic Unit
1956 to 1978 and 1978 to 1984
Filtered Wetland Loss/Gain
Hotspot Map



1 1978 Fresh Marsh
2 1978 Intermediate Marsh
3 1978 Brackish Marsh
4 1978 Saline Marsh
5 1978 Swamp
6 1978 Forest/Shrub Scrub/Shrub Scrub Spoil
7 1978 Agriculture/Pasture/Developed
8 1978 Inert & Beach
9 1978 Water/Aquatic Vegetation
10 1984 Broken Marsh
11 1978 Canals
12 1956 to 1978 Wetland Loss > 6 acres in size
13 1956 to 1978 Wetland Gain > 6 acres in size
14 1978 to 1984 Wetland Loss > 6 acres in size
15 1978 to 1984 Wetland Gain > 6 acres in size

U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR

NATIONAL WETLANDS RESEARCH CENTER
SPATIAL ANALYSIS BRANCH
SLIDELL, LOUISIANA

LOUISIANA DEPARTMENT OF NATURAL RESOURCES