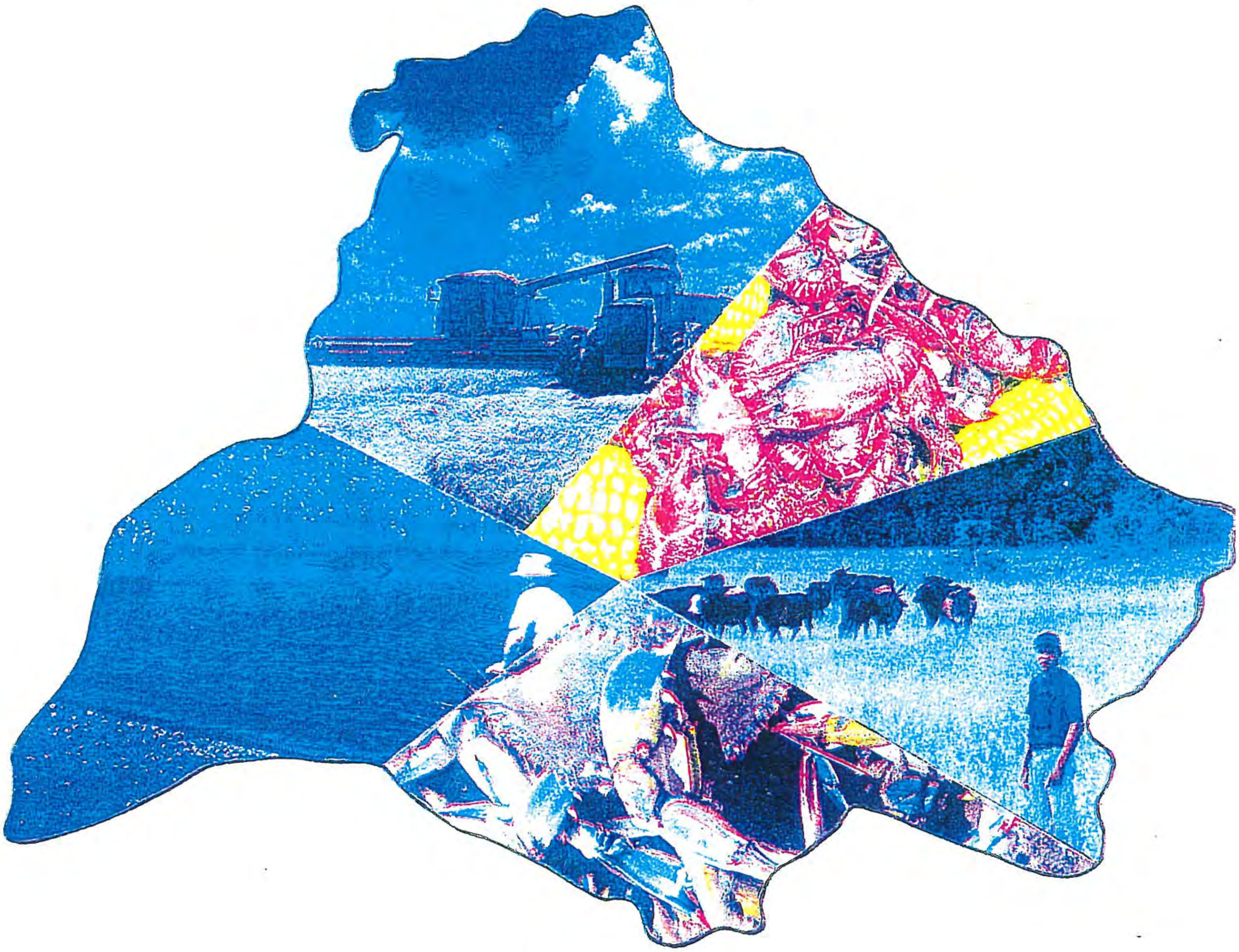
TECHE/VERMILION

Cooperative River Basin Study Report
United States Department Of Agriculture
Natural Resources Conservation Service
Alexandria, Louisiana



In Cooperation With:
Iberia Soil and Water Conservation District
St. Mary Soil and Water Conservation District
Vermilion Soil and Water Conservation District
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources
U.S. Fish and Wildlife Service

Teche/Vermilion Cooperative River Basin Study

Prepared for:
The Citizens of Iberia, St. Mary and Vermilion Parishes

January 1999

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EXECUTIVE SUMMARY

Coastal wetlands in Louisiana are being lost at the rate of about 35 square miles per year. Louisiana contains forty percent of the nations coastal wetlands and has eighty percent of the total loss to these habitats annually. Wetlands are not only an important linkage for wildlife and fisheries productivity, but also the productivity of man. Wetlands produce an abundance of diverse wildlife and fisheries species, many of which are commercially and industrially valuable to man-kind.

Wetlands in the Teche/Vermilion Basin are stable relative to many other Louisiana coastal marshes with only 50,368 acres (78.7 square miles) land lost since 1932. The basin's land loss between 642 and 850 acres per year accounts for less than 3% of Louisiana's total coastal land loss. Efforts are currently underway to further reduce these loses, so that the quality of life for area residents will not be impaired. The Iberia, St. Mary and Vermilion Soil and Water Conservation Districts have requested investigation and documentation of area problems and the development of alternative solutions. The focus of this study is on the conservation, restoration, and enhancement of wetland resources.

The Teche/Vermilion Cooperative River Basin Study is authorized under Section 6 of Public Law 83-566, as amended. The Natural Resources Conservation Service(NRCS), representing the United States Department of Agriculture, worked with State, Federal, and local agencies and private citizens in compiling the information and preparing this document. Participants include: Iberia, St. Mary and Vermilion Soil and Water Conservation Districts; Louisiana Department of Agriculture and Forestry; United States Fish and Wildlife Service; Louisiana Department of Wildlife and Fisheries; United States Army Corps of Engineers; Louisiana Department of Natural Resources; Louisiana Department of Environmental Quality; Louisiana Geological Survey; Iberia Parish Council; St. Mary Parish Council; and the Vermilion Parish Police Jury.

Cooperating agencies include the United States Environmental Protection Agency, National Marine Fisheries Service, Louisiana Department of Transportation and Development, Louisiana State University-Department of Agricultural Economics and Agricultural Business.

The study analyzed four alternatives: 1) No Action; 2) Regional Scale Hydrologic Management; 3) Local Scale Hydrologic Unit Management, and 4) Shoreline Stabilization. The study does not include an extended economic evaluation of the impacts of each alternative nor of each element within an alternative. The No Action alternative contains information on projected wetlands losses without project conditions. The Regional Scale Hydrologic Management alternative describes measures that will increase freshwater introduction and sedimentation on a regional basis. The Local Scale Hydrologic Unit Management describes measures that will increase freshwater introduction on a local scale. Measures to address the shoreline erosion are included in the shoreline stabilization alternative.. The alternatives contain information on environmental conditions, current problems, and potential solutions for the hydrologic units in the basin. The No Action alternative did not seem to be beneficial because it was not projected to improve the long-term problems associated with wetland loss and freshwater introduction in the basin. While no funding mechanism is in place to implement recommended alternative solutions, potential sources have been identified in Appendix B.

Arresting wetland habitat loss in the study area will require a concentrated and concerted effort by landowners, Federal and State agencies, local governments, and industry. Local organizations must initiate requests for assistance when possible, but also take a personal initiative to protect, conserve, and enhance their coastal wetlands.

INTRODUCTION

This introduction section of the report describes the evolution of the Cooperative River Basin Study. The background subsection discusses the need for and initiation of the study, and authority subsection presents the legislation that allows the Natural Resources Conservation Service to provide leadership and guidance in the formulation of a river basin study. The sponsors and conservation agencies, public and private organizations involved in the study process are listed in the report. The use of the report subsection will detail the structure of the report and the use of informational maps and appendices.

Background

During the time period time period from May to June, 1993, the Soil Conservation Service (now known as the Natural Resources Conservation Service) received letters from local sponsoring organizations requesting a study to identify the problems and needs of the fragile Teche/Vermilion River Basin. For many years coastal property owners have witnessed increased progression of the marsh erosion problem in the basin.

The Teche/Vermilion Basin lost 50,368 acres of marsh since 1932. Nearly half of this loss occurred between 1951 and 1974. The way the coastal lands have been leveed, dredged and managed combined with natural forces have caused land loss problems in the Teche/Vermilion Basin. The Teche/Vermilion is a classic example of abandoned delta lobes near the endpoint of their natural deterioration. This condition, coupled with geologic stability and sources of freshwater and sediment (mostly the Atchafalaya River, but also the Vermilion River), provide unusually stable conditions, so that areas of wetlands stress or loss tend to be localized rather than regional. Shoreline erosion is a relatively common problem, and wetlands losses do occur in several areas, such as on Marsh Island, near Pt. Marone, and along the GIWW. Factors influencing loss include oil and gas development and herbivores.

In August 1993, representatives from local, state and federal agencies met to discuss problems/issues/concerns in the Teche/Vermilion Basin. Major study elements, expected products, dates and the responsible agency and/or individual were identified during this meeting also. The group concluded that 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.

Also in 1993, NRCS received six requests from Soil and Water Conservation Districts (SWCD) and local governing bodies from Iberia, St. Mary and Vermilion Parishes to initiate a study of the Teche/Vermilion River Basin. A study start was granted in October, 1993. A field investigation was conducted in April 1995.

In June 1996, farmers in Vermilion parish met with local, state, and federal agencies to discuss one of the worst droughts Vermilion Parish experienced in the last 30 years. The impacted area consisted of approximately 180,000 acres of fresh marsh and approximately 195,000 acres of cropland. In July 1996, NRCS received a request from the Vermilion Parish

Police Jury to initiate an investigation that could help develop a comprehensive strategy to alleviate or reduce both the long and short term water shortage problems in the impacted area of Vermilion Parish. Alternatives addressing water shortage problems will be described in this study.

Authority

The Teche/Vermilion Cooperative River Basin Study (CRBS) is authorized under Section 6 of Public Law 566 (PL-566), as amended. Public Law - 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 resources development programs. Planning procedures are based on the principals and guidelines that were signed by the President on February 3, 1983, and became effective on July 8, 1983.

Sponsors and Cooperating Agencies

Sponsors for the study are the Iberia Soil and Water Conservation District, St. Mary Soil and Water Conservation District, Vermilion Soil and Water Conservation District, Louisiana Department of Wildlife and Fisheries, U.S. Fish and Wildlife Service, Louisiana Department of Natural Resources, Iberia Parish Council, St. Mary Parish Council, and the Vermilion Parish Police Jury. The Natural Resources Conservation Service has overall responsibility for the study.

Cooperating agencies include the United States Army Corps of Engineers, Louisiana Department of Natural Resources, Louisiana Department of Environmental Quality, Louisiana Geological Survey, National Marine Fisheries, Louisiana Department of Transportation and Development, Louisiana Department of Health and Hospitals, and the Louisiana Department of Recreation and Tourism.

Use of the Report

An overall plan was developed for the entire study area with seventy-nine management (hydrologic) units designated within Iberia, St. Mary and Vermilion Parishes. The objective of the overall plan is to provide a method wherein plans for each of the seventy-nine hydrologic units may be installed independently of one another and still fit into the overall plan. Federal, state, and local government agencies, private companies, or individuals can install structural or vegetative measures in hydrologic units in accordance with the overall plan.

The report is designed with the goal of easier use and readability by separating hydrologic units. Each hydrologic unit will have a description of its physical setting, problems, alternatives, and analysis of 'with" and "without project" conditions. The format allows one to look at one section of the report and find a particular hydrologic unit and get the needed information.

Maps

The report has special maps that are used in the description of each hydrologic unit.

Hydrologic Units. The map delineating hydrologic unit boundaries, Map 1, may be used as a reference for the hydrologic unit descriptions and will also be useful as a location map.

General Soils Map. The map delineating general soils information, Map 2, is a reference for the discussion of soils located in each hydrologic unit. This information is important in planning structures and calculating associated costs.

Important Biological Areas. The map illustrating important biological areas, Map 3, shows locations of environmentally sensitive bird species and oyster grounds.

Marsh-Land-Water 1956 - 1984. The map illustrating the marsh- land -water changes between the time period of 1956 to 1984, Map 4, is useful in estimating future rates of change in those resources. The map interprets changes within the area wetlands. The broken marsh category can be interpreted as a half marsh and half water ratio. This information can be compared to Map 5, 1990 Classified Landsat Thematic Mapper Satellite Data. However, the satellite image data is calculated differently than the Map 4 data. Therefore, the maps are roughly comparable for general planning purposes only.

1990 Classified Landsat Thematic Mapper Satellite Data. The map containing the landsat data, Map 5, is useful to see the result of changes in land, marsh, and water depicted in 1956 - 1990 Marsh Land Water Change Map. Landsat data has a classification scheme different from the comparative map of 1956 -1990. The maps complement each other because satellite information makes it difficult to discern one marsh type from another, and the other map has only changes from one time period to another.

1949 Vegetative Type Map. This vegetative type map, Map 6, contains information regarding the marsh types and predominant marsh species in the river basin. The left hand-side of the map contains a legend showing the different vegetative categories. The information is useful to compare to all the vegetative maps, Map 6 to Map 9, to measure the change of the marsh environment over time.

1968 Vegetative Type Map. This vegetative type map, Map 7, contains information regarding the marsh types and predominant marsh species in the river basin. The legend categorizes the vegetative communities according to marsh types and non-marsh. It differs from the 1949 marsh categories, but is still useful for some comparative purposes. The information is useful to compare to the other vegetative maps, Map 6 to Map 9, to measure the change of the marsh environment over time. The vegetative data was compiled by Robert Chabreck.

1978 Vegetative Type Map. This vegetative type map, Map 8, contains information regarding the marsh types and predominant marsh species in the river basin. The legend categorizes the vegetative communities according to marsh types and non-marsh. The information is useful to the other vegetative maps, Map 6 to Map 9, to measure the change of the marsh environment over time. The vegetative map data was compiled by Robert Chabreck and Greg Linscombe.

1988 Vegetative Type Map. This vegetative map, Map 9, contains information regarding the marsh types and predominant marsh species in the river basin. The left-hand side categorizes the vegetative communities according to marsh categories and a non-marsh category. The information is useful to compare across all the vegetative maps, map 6 to this map, to measure the change of the marsh environment over time. The vegetative map data was compiled by Robert Chabreck and Greg Linscombe.

Department of Health and Hospital Sample Stations Map The Louisiana Department of Health and Hospitals has a Molluscan shellfish Program whereby sampling stations are randomly located in the coastal regions to monitor fecal coliform, salinity and other pertinent information relative to shellfish production. This map is shown as Map 10

Land Ownership Map. The land ownership map, Map 11, contains a color coding system that delineates areas by the predominant land owner or land owner size tract. The categories are federal land, Iberia, St. Mary and Vermilion Parish School Board (Section 16 of every township), private lands predominately held by landowners with more than 500 acres, and private lands predominately held by land owners with less than 500 acres.

Marsh Island Map. The Marsh Island map, which is identified as Map 12, shows a transect configuration of marsh island showing the relation between succession and various topographic conditions of the island. A fifty mile census trip taken in 1941 is depicted in red on the map. A fifty mile census trip taken in 1942 is depicted in blue on the map.

Appendices

The report has several appendices that contain information that may be useful when detailed planning is initiated on a hydrologic unit. These sections will also provide more detailed information that participants and readers will find helpful in understanding the report or for directing further research on the river basin.

Appendix A: Range Report for the Teche/Vermilion River basin Area. This report details the impact of range land/use and livestock production within the basin. It includes utilization by livestock on specific soil and wetland types, management practices, and economic and cultural impacts of ranching in the basin.

Appendix B. Private Lands Conservation Menu. The purpose of this section is to provide a readily available source of information for landowners, biologist, land resource professionals and others who help to conserve and restore wetlands and fish and wildlife resources. Specifically this appendix identifies and briefly explains technical and financial assistance programs available to private landowners interested in implementing conservation and restoration practices.

Appendix C: Plant Species Found in Basin Area. Taxonomic listing of the plants found within the river basin project area..

Appendix D: Animals that Inhabit Basin Area. Taxonomic listing of the animal species that are found within the river basin project area. This appendix provides information for animal species listed in the document by common name only. The appendix list includes marine invertebrates, fish, amphibians, reptiles, birds, and mammals.

Appendix E: New Iberia Louisiana Christmas Bird Count. Summary of the species and individuals observed during the day of the count for 1931.

PHYSICAL SETTING

Location and Size

The Teche/Vermilion Cooperative River Basin Study is located in south-central Louisiana and encompasses about 380,000 acres in Vermilion, Iberia, and St. Mary parishes. The basin extends westward from Point Chevreuil through East and West Cote Blanche Bays, and includes Marsh Island and Vermilion Bay. The basin is bordered on the east by the western Atchafalaya Basin Guide Levee, on the west by Freshwater Bayou Canal and Louisiana Highway 82, on the north by the Lafayette/Vermilion and St. Martin/Iberia Parish lines, and on the south by the Gulf of Mexico. Two state wildlife management areas (State and Marsh Island) and the Paul J. Rainey Wildlife Sanctuary, owned by the Audubon Society, encompass over 113,000 acres.

Climate

The Teche/Vermilion River Basin is located in the central part of south Louisiana. Warm, moist, maritime tropical air moving northward and cold, dry continental air moving southward have alternating effects on this subtropical, humid climatic region. As these flows transition from one to the other the region is subjected to significant, and sometimes abrupt, weather changes.

The proximity of the basin to the Gulf of Mexico, the abundance of lakes and bayous and the prevailing southerly winds all tend to prevent sudden temperature changes. Typical summers in the basin are long and consistently warm. Due to the fact that the basin is in the immediate vicinity of the gulf, maximum temperatures rarely exceed 100°F. The fall season has generally mild temperatures that continue into the winter with the exception of a few cold days. Most years have one or more days where the temperature drops to 32°F or lower. The spring season commonly begins in February and gradually becomes warmer. By April, the temperature has become warm and mild. In the approximate center of the basin at New Iberia, the extreme temperatures were recorded as 101°F on July 28, 1960 for the high and 6°F on February 13, 1899 for the low.

Precipitation occurs regularly throughout the basin. Although thunderstorms occur during all seasons, they are prevalent in the spring and summer. During tropical storms, the storm intensity produces 3 inches or more of rain within a 24-hour period. Average annual precipitation is 66.84 inches in Franklin, LA and 55.7 inches in New Iberia, LA. Heaviest amount of precipitation, an average of 18.7 inches, occurs from July to August. It is lowest during the period from October through December, when there is an average of 11.3 inches.

Humidity ranges from moderate to high throughout the year, with the period from May through September recording the highest readings. The average mean relative humidity is 77 percent in New Iberia, LA. Evaporation throughout the basin is typical of the Class A Weather Service pans in New Iberia. At this site, the mean annual pan evaporation is about 67 inches and the mean annual open lake evaporation is about 49 inches.

Average wind speeds throughout the basin are typically under 10 miles per hour. Due to the proximity of the basin to the Gulf of Mexico, there is a frequent exposure to tropical storm and hurricane force wind velocities. The direction of the wind is generally southerly, except during the fall when it usually follows an easterly route. In Iberia Parish, the 50 year recurrence sustained wind speed is estimated to be 90 to 95 miles per hour.

Major Land Resource Areas

Major Land Resource Areas (MLRA's) are composed of soil series having similar origin and characteristics. The Study Area contains four MLRA's.

Gulf Coast Marsh (MLRA 151)

This area borders the Gulf of Mexico. Almost all the marsh overlies a buried Pleistocene terrace. Originally, almost all this area was freshwater marsh suitable for range and wildlife; now about one-half is freshwater marsh and the remainder is brackish marsh that is affected periodically by tides. The few sandy ridges in this area are called cheniers. In some areas, the mineral soil materials are overlain by layers of organic material. Soil that are firm enough for cattle to walk on are used for range and wildlife. Allemands, Clovelly, Larose, Scatlake, Kenner, and Lafitte, the major marsh soils in this MLRA.

Gulf Coast Prairies (MLRA 150A)

This area includes the nearly level, poorly drained portion of southwest Louisiana. Rice, soybeans, and pasture are major crops. The native vegetation was prairie grasses and there are only a few acres of forest along streams in this area. Fertility level is medium. Drainage and irrigation are important agricultural practices. Crowley, Morey, Mowata, Kaplan, Midland, and Vidrine are the major soils.

Southern Mississippi Valley Silty Uplands (MLRA 134)

This area includes the nearly level to gently rolling loess terraces and uplands that border the bottom land of the Mississippi River Alluvium. The land is principally used to grow sugarcane, corn, soybeans and pasture. Soil fertility is medium. The soils erode easily in sloping areas. Drainage is needed in most level areas. Calhoun, Frost, Jeanerette, Coteau, and Patoutville are the major soils.

Southern Mississippi Valley Alluvium (MLRA 131)

This area includes the level bottom land along the Mississippi, Red, and Ouachita Rivers. The soils are fertile and productive. Surface drainage is needed for most crops. Flooding is a hazard in places. Corn, soybeans, sugarcane, and pasture are the main crops where drainage is adequate. Undrained and frequently flooded areas are mainly in hardwood forests. Dundee and Sharkey are major soils on the Mississippi River bottom land. Gallion, Perry, Portland, and Buxin are the major soil types.

Soils

Soils in the basin occur in an orderly pattern that is related to geology, landform, 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 an association may occur in another association but in a different pattern or proportion.

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

Allemands-Kenner This map unit is composed of very fluid, very poorly drained organic soils. Soils in this map unit are found in freshwater marshes, and are about 50% Allemands, 30% Kenner and 20% soils of minor extent.

The Allemands soils have dark brown muck, mucky peat, or peat surface layers to a depth of about 50 inches overlying gray clayey or mucky clay material to a depth of 72 inches. The Kenner soils have very dark brown muck, mucky peat, or muck surface layers, and are black muck or mucky peat to a depth of 72 inches. The underlying material is also stratified with few to common thin mineral layer of fluid gray clay, mucky clay, or silty clay.

Of minor extent are Aquents and Udifluvents on spoil banks along waterways, and the very poorly drained, very fluid, mineral Larose, Balize, and Barbary soils. Also included are small areas of very poorly drained, organic Clovelly soils and mineral Bancker, Andry, and Delcomb soils in brackish marshes.

Bancker-Creole This map unit is composed of slightly fluid and very fluid, very poor drained, mineral soils. Soils in this map unit are found in brackish marshes, and are about 50% Bancker, 30% Creole and 20% soils of minor extent.

The Bancker soils have very dark grayish brown mucky clay or muck surface layers to a depth of about 10 inches, overlying a gray clay or mucky clay very fluid material to a depth of 70 inches. The Creole soils have slightly fluid black mucky clay or clay surface layers to a depth of 12 inches, overlying a slightly fluid gray clay to a depth of about 40 inches. The underlying material to a depth of 72 inches is a very fluid gray clay or mucky clay.

Table 1. Distribution of Soils in the Teche-Vermilion Basin

	Acres	Percent
Soils of the Gulf Coast Marsh		
Allemands-Kenner	68,000	18
Bancker-Creole	36,452	10
Clovelly-Lafitte	140,126	37
Placedo-Scatlake	8,163	2
Scatlake	5	
Soils of the Swamp		
Maurepas-Barbary	834	1
Perry-Barbary-Fausse	243	
Soils of the Loess Mantled Terrace Uplands		
Coteau-Frost-Patoutville	3,970	1
Jeanerette-Patoutville-Frost	81,706	18
Memphis-Frost-Coteau	5,273	1
Patoutville-Frost	4,970	1
Soils of the Mississippi River Alluvium		
Baldwin-Iberia-Galvez	4,504	1
Harahan	3,683	1
Gueydan	9,090	2
Sharkey-Baldwin-Iberia	6, 985	2
Soils of the Gulf Coast Chenieres		
Mermentau-Hackberry	4,810	1
Total Soils	380,000	100
Total Inland Water	1,186	

Of minor extent are the very poorly drained, very fluid, organic Lafitte, Delcomb, and Clovelly soils in brackish marshes; and the very poorly drained, very fluid, mineral Larose soils in freshwater marshes. Also included are very poorly drained, firm, Andry soils adjoining uplands in brackish marshes.

Clovelly-Lafitte This map unit is composed of very poorly drained, very fluid organic soils. Soils in this map unit are found in brackish marshes and are about 60% Clovelly, 30% Lafitte, and 10% soils of minor extent.

The Clovelly soils have black muck, or mucky peat surface layers to a depth of about 48 inches overlying gray clay or mucky clay to a depth of 72 inches. The Lafitte soils have a black muck or mucky peat surface layer. The underlying material to a depth of 68 inches is muck. Of minor extent are Aquents on spoil banks along waterways, and the very poorly drained, mineral Bancker, Andry, Delcomb, and Scatlake soils.

Placedo-Scatlake This map unit is composed of very fluid to firm, very poorly drained mineral soils. Soils of this map unit are found in brackish marshes along the Gulf rim of Marsh Island and the adjoining saline marshes. Placedo soils make up about 40% of the unit, Scatlake 40%, and 20% are soils of minor extent.

The Placedo soils have firm to slightly fluid, dark gray mucky clay, mucky peat or muck surface layers to a depth of about 9 inches overlying a firm gray clay to a depth of 60 inches. The Scatlake soils have very fluid, dark gray mucky peat, muck, or mucky clay surface layers to a depth of about 12 inches overlying a very fluid gray clay or mucky clay to a depth of 60 inches. Of minor extent are the very poorly drained, mineral Bancker and Creole soils in brackish marshes.

Scatlake This map unit is composed of very fluid, very poorly drained mineral soils. Soils in this map unit are found in saline marshes, and are about 80% Scatlake, and 20% soils of minor extent.

The Scatlake soils have very fluid, dark gray mucky peat, muck, or mucky clay surface layers to a depth of about 12 inches overlying a very fluid gray clay or mucky clay to a depth of 60 inches. Of minor extent are the very poorly drained, mineral Bancker, Placedo, and Creole soils in brackish marshes and the very poorly drained, very fluid, organic Clovelly and Lafitte soils in brackish marshes.

Maurepas-Barbary This map unit is composed of very poorly drained, very fluid organic soils in swamps. Soils in this map unit are about 50% Maurepas, 30% Barbary, and 20% soils of minor extent.

The Maurepas soils have very fluid, dark brown peat, mucky peat, or muck surface layers to a depth of about 12 inches overlying a very fluid black muck or mucky peat to a depth of 102 inches. The Barbary soils have very fluid, very dark grayish brown muck or mucky clay surface layers about 8 inches thick overlying very fluid, gray mucky clay or clay to a depth of 60 inches. Of minor extent are the very fluid to slightly fluid, poorly drained, mineral Fausse soils in nearby swamps, and the very fluid, very poorly drained Larose, Allemands, and Kenner soils in freshwater marshes.

Perry-Barbary-Fausse This map unit is composed of very fluid, slightly fluid, and firm very poorly drained mineral soils in swamps. Soils in this map unit are about 30% Perry, 30% Barbary, 20% Fausse and 20% soils of minor extent.

The Perry soils have firm dark grayish brown silty clay loam surface layers about 10 inches thick overlying 18 inches of firm gray clay. The substrate to a depth of 86 inches is a firm, dark red clay. They formed in Red River alluvium.

The Barbary soils have very fluid, dark gray muck or mucky clay surface layers about 8 inches thick overlying very fluid, gray mucky clay or clay to a depth of 60 inches.

The Fausse soils have slightly fluid, dark gray clay or mucky clay surface layers about 12 inches thick overlying slightly fluid, gray clay in the upper part and firm gray clay in the lower part to a depth of 60 inches.

Of minor extent are the very poorly drained, very fluid, mineral Larose soils in nearby freshwater marshes, and the very fluid, very poorly drained, organic Maurepas soils in adjoining swamps. Also included are small areas of Aquents, and Udifluvents on spoil banks along waterways.

Coteau-Frost-Patoutville This map unit is composed of somewhat poorly and poorly drained soil that formed in silty sediments on the uplands. Soils in this map unit are about 40% Cootie, 30% Frost, 20% Patoutville and 10% soils of minor extent.

The Coteau soils are at the highest elevations and are on the most sloping landscapes. They have a surface layer of dark grayish brown silt loam and a subsoil of dark yellowish brown and brown silty clay loam. They are somewhat poorly drained and moderately slowly permeable.

The Frost soils are at the lowest elevations on swales, flats, depressions and along drainageways. They have a surface layer of dark grayish brown, mottled silt loam and subsurface layer of gray mottled silt loam. The subsoil is dark gray, mottled silty clay loam and gray silt loam in the upper part and gray, mottled silty clay loam in the lower part.

The Patoutville soils are at intermediate elevations and are on flats or slightly convex ridges. They have a surface layer of dark grayish brown silt loam and a subsoil of dark grayish brown silty clay loam over yellowish brown ad light olive gray silt loam. They are somewhat poorly drained and slowly permeable.

Of minor extent are the somewhat poorly drained Jeanerette, Coteau and Frozard soils on low ridges and broad flats, and the well drained Memphis soils on dissected landscapes.

Jeanerette-Patoutville-Frost This map unit is composed of somewhat poorly drained, mineral soils formed in silty sediments on the uplands. Soils in this map unit are about 30% Jeanerette, 30% Patoutville, 20% Frost, and 20% soils of minor extent.

The Jeanerette soils are on broad flats and somewhat poorly drained. The surface layer is a black silt loam. The subsoil is black silt loam in the upper part; dark grayish brown, mottled silty clay loam in the middle part; and grayish brown and gray, mottled silty clay loam in the lower part. The substratum is gray, mottled silty clay loam.

The Patoutville soils are on low, slightly convex ridges and short side slopes. These somewhat poorly drained soils are level, very gently sloping, and gently undulating. They have a surface layer of brown or dark brown silt loam. The subsurface layer is light brownish gray, mottled silt loam. The subsoil is dark grayish brown, mottled silty clay loam in the upper part; grayish brown, mottled silty clay loam in the middle part; and gray and yellowish brown silty clay loam in the lower part.

The Frost soils are at the lowest elevations on swales, flats, depressions and along drainageways. They have a surface layer of dark grayish brown, mottled silt loam and subsurface layer of gray mottled silt loam. The subsoil is dark gray, mottled silty clay loam and gray silt loam in the upper part and gray, mottled silty clay loam in the lower part.

Of minor extent are the somewhat poorly drained Coteau and Frozard soils on low ridges, and the poorly drained Judice soils on broad flats, in swales, and along drainageways.

<u>Memphis-Frost-Coteau</u> This map unit is composed of well drained and poorly drained silty loess soils on the dissected landscapes of salt domes. Soils in this map unit are about 30% Memphis, 30% Frost soils, 20% Coteau, and 20% soils of minor extent.

The Memphis soils are at the highest elevations and on some of the most sloping terrain. They have a surface layer of dark brown silt loam and a subsoil of dark brown silty clay loam and silt loam. They are well drained and moderately permeable.

The Frost soils are in valleys, swales, and on foot slopes. They have a surface layer of dark grayish brown, black, and gray silt loam and a subsoil of gray silty clay loam. They are poorly drained and slowly permeable.

The Coteau soils are on moderately sloping landscapes. They have a surface layer of dark grayish brown silt loam and a subsoil of dark yellowish brown and brown silty clay loam. They are somewhat poorly drained and moderately slowly permeable.

Of minor extent are the somewhat poorly drained Patoutville and Jeanerette soils on intermediate landscape positions.

<u>Patoutville-Frost</u> This map is composed of the somewhat poorly drained and poorly drained, mineral soils formed in silty sediments on the uplands. Soils in this map unit are about 50% Patoutville, 30% Frost, and 20% soils of minor extent.

The Patoutville soils are on low, slightly convex ridges and short side slopes. These somewhat poorly drained soils are level, very gently sloping, and gently undulating. They have a surface layer of brown or dark brown silt loam. The subsurface layer is light brownish gray, mottled silt loam. The subsoil is dark grayish brown, mottled silty clay loam in the upper part; grayish brown, mottled silty clay loam in the middle part; and gray and yellowish brown silty clay loam in the lower part.

The Frost soils are in valleys, swales, and on foot slopes. They have a surface layer of dark grayish brown, black, and gray silt loam and a subsoil of gray silty clay loam. They are poorly drained and slowly permeable.

Of minor extent are the somewhat poorly drained Jeanerette, Coteau and Frozard soils on low ridges and broad flats, and the well drained Memphis soils on dissected landscapes.

Gueydan This map unit is composed of very poorly drained, mineral soils in former swamps and marshes that are protected from flooding. Soils in this map unit are found adjoining swamps, and are about 80% Gueydan and 20% soils of minor extent.

The Gueydan soils are in pump-off systems of the marshes of the Chenier Plain. They occur on the lowest positions of the landscape. They have surface layers of black mucky clay or muck, overlying dark gray or gray firm clay.

Of minor extent are the very poorly drained Ged soils on similar landscape positions, and the poorly drained Midland and Judice soils on slightly higher landscape positions.

Baldwin-Iberia-Galvez This map unit is composed of level, poorly drained clayey and somewhat poorly drained loamy soils on the Mississippi River alluvial uplands. Soils in this map unit are about 30% Baldwin, 30% Iberia, 20% Galvez, and 20% soils of minor extent.

The Baldwin soils are at intermediate positions on the landscape and are poorly drained. They have a surface layer of very dark grayish brown silty clay loam and a subsoil of dark gray and olive gray clay or silty clay loam.

The Iberia soils are poorly drained, clayey soils in low areas. They have a surface layer of black silty clay and a subsoil of dark grayish brown and dark gray clay.

The Galvez soils are somewhat poorly drained, loamy soils on the highest part of the landscape. They have a surface layer of dark grayish brown silt loam about 9 inches thick overlying a grayish brown, mottled silty clay loam subsoil to a depth of 60 inches.

Of minor extent are the very poorly drained Sharkey and Alligator soils on the adjoining low areas. Also included are areas of the somewhat poorly drained Loreauville soils on similar positions of the landscape.

Harahan This map unit is composed of very poorly drained, mineral soils in former swamps and marshes that are protected from flooding. Soils in this map unit are found adjoining swamps, and are about 80% Harahan, and 20% soils of minor extent.

The Harahan soils are at the lowest elevations within the pump-off and may be subsided below sea level. They have dark gray to black clay or mucky clay surface layers overlying firm gray clay in the upper part, and slightly fluid to very fluid, very dark gray or gray, clay or mucky clay.

Of minor extent are the very poorly drained Alligator, Sharkey, Rita, and Westwego soils on similar landscape positions, and the poorly drained Baldwin and Iberia soils on slightly higher landscape positions.

Sharkey-Baldwin-Iberia This map unit is composed of level, poorly drained clayey and somewhat poorly loamy soils on the Mississippi River alluvial uplands. Soils in this map unit are about 30% Sharkey, 30% Baldwin, 20% Iberia and 20% soils of minor extent.

The Sharkey soils are on higher landscape positions within the pump-off systems of the Mississippi River Alluvium and are very poorly drained. They have surface layers of dark gray clay overlying a firm gray to olive gray clay.

The Baldwin soils are at intermediate positions on the landscape and are poorly drained. They have a surface layer of very dark grayish brown silty clay loam and a subsoil of dark gray and olive gray clay or silty clay loam.

The Iberia soils are poorly drained, clayey soils in low areas. They have a surface layer of black silty clay and a subsoil of dark grayish brown and dark gray clay.

Of minor extent are the very poorly drained Alligator soils on the adjoining low areas. Also included are areas of the somewhat poorly drained Galvez and Loreauville soils on higher positions of the landscape.

Mermentau-Hackberry This map unit is composed of level to gently undulating, clayey, poorly drained and loamy to sandy somewhat poorly drained soils on the Chenieres.

The Mermentau soils are poorly drained, clayey soils on low ridges and in swales between ridges. They 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 part; and gray clay loam in the lower part.

The Hackberry soils are somewhat poorly drained, sandy soils on low ridges and on toe slopes of ridges. They have a surface layer of very dark gray sandy clay loam or 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 part; and brown, mottled fine sand in the lower part. The substratum is brown and grayish brown sand.

Of minor extent are the very poorly drained Bancker, Creole, Larose, and Scatlake soils in marshes and the somewhat excessively drained Chenier soils on ridges.

Geomorphology

Through studies of the modern Mississippi Delta and other deltas, much insight has been obtained into the processes that determine the deposition of sediments in a deltaic environment. In a low wave energy environment such as Atchafalaya Bay, the most important element is the velocity pattern as river water flows from the river into the bay. At the river mouth, currents entering the bay flare out and lose velocity (Figure 1). As a result, sediments are laid down in a broad arc centered around the river mouth. The first to be deposited as velocities decrease are the coarser sand particles. A sandy bar forms across and around the river mouth, called the river mouth bar. Farther away from the mouth, the intermediate size silt particles can no longer be transported and are laid down along the seaward side of the river mouth bar area referred to as the delta front. Yet farther away decreased turbulence and the changes in water chemistry mentioned earlier allow deposition of the finest sediment, the clays; this is the pro delta environment. Of course discharge of the river fluctuates so that the various zones of deposition shift back and forth seasonally and annually and boundaries overlap. Consequently there will be intermediate zones of sandy silt and silty clay layers of silt alternating with thin layers of clay.

The above pattern of deposition is shown schematically in Figure 3a and should approximate conditions in the 1950's when fine sand began to arrive at the mouths of both the lower Atchafalaya River and Wax Lake Outlet. The delta front is the area of maximum deposition and represents the leading edge of the prograding delta.

The above pattern of sedimentation largely results from a change in conditions from the river mouth seaward. There is, however, a second direction of change; that is one to each side of the main current thread as it comes out of the river mouth. As was shown in Figure 1, current velocity and turbulence also decrease toward the side of the outflowing current. Sedimentation related to this change is shown in Figure 2. The first condition shows that away from the center line of the flaring current field, velocities and turbulence also decrease. As result, deposition of coarser sediments takes place to a large extent also on each side of the center line and gives rise to subaqueous natural levee ridges that will eventually build up to above the water surface. Reflecting the current pattern, the levee ridges flare, moving farther apart when going away from the river mouth. Associated with this is an area of low velocity and turbulence in the center of the developing channel between the levee ridges so that a central bar or middle ground builds up. The result is a bifurcation or branching of the channel into two distributary channels where the same processes will be repeated. Distributary channels may further develop through breaks in the natural levee ridges giving rise to an additional system of bifurcating channels. In this way the delta builds out into open water much like a tree branches out into the air. It is this pattern that is recognized in the newly emerging delta.

At the same time the delta builds outward it also builds upward. Natural levee ridges grow in height and width and protected areas between distributaries are increasingly filled in with finer sediments. For two major reasons the upward building continues even after that. The first reason is the establishment of vegetation which will add organic matter and trap sediment delivered by overflowing waters. The second is that through seaward building of the delta the river is extended so that in the upper part of the delta, average river stages move upward and overflow continues even through surface elevations increase.

As the delta builds out into the bay, one can visualize that the zones of deposition shift seaward with it. Sand associated with bars at the mouths of major distributaries move over the earlier deposited delta front silts, and delta front silts discharged beyond the new bars are moving over the pro-delta clays laid down before. Likewise, the pro-delta environment is forced seaward. On the basis of detailed bottom sediments studies by the Louisiana Wildlife and Fisheries Commission (Barrett, 1974, and Cratsley, 1975), 1970 conditions can be depicted in Figure 3b.

The outline of Louisiana's gulf coast began to develop its characteristic shape some 6000 years ago when sea level reached its present stand. Then, as now, the water from the center of the North American continent drained out into the Gulf of Mexico, the earth's crust below the Louisiana coast was subsiding, and waves eroded the shoreline. But the enormous sediment load, delivered from the mouth of the Mississippi River, was enough to offset the losses, and the delta system reached a kind of equilibrium which blessed Louisiana with a coastal area rich in renewable resources.

These resources are renewable because of the vast input of fresh water and sediment of the Mississippi River. Under natural conditions, an interaction between deltaic processes and marine processes ensures the renewability of the resources. The river builds out and the Gulf erodes away. The river would shift its course from time to time. After it had built out a delta lobe at the mouth of one course, it would tend to change routes to take advantage of the shorter route to sea level offered by the length of coastline that had been eroded back. Since the river periodically shifted its course, it would rebuild in one area the deltaic environments that were being lost to erosion and subsidence in another area.

The Teche Vermilion River Basin is located partially in the extreme eastern portion of the Chenier Plain and partially in the extreme Western portion of the Deltaic Plain. The natural ridges found within the basin are Bayou Teche, Bayou Cypremort Bayou Sale and the Vermilion River ridges which are all abandoned delta lobes of the Mississippi River which influenced the area some 6000 years ago. The Vermilion and Cote Blanche Bays complex and surrounding marshes are the remaining forms of a delta complex that developed when the Mississippi River followed a course now occupied by Bayou Teche.

The history of a typical delta cycle is represented in the four drawings of Figure 4. In the first drawing, representing Phase I, a river has just begun building a small delta, newly emerged. In the second drawing, representing Phase II, the delta is large and broad, there are many distributaries, and the delta marsh is maintained by the inflow of fresh water and sediment into all of its parts.

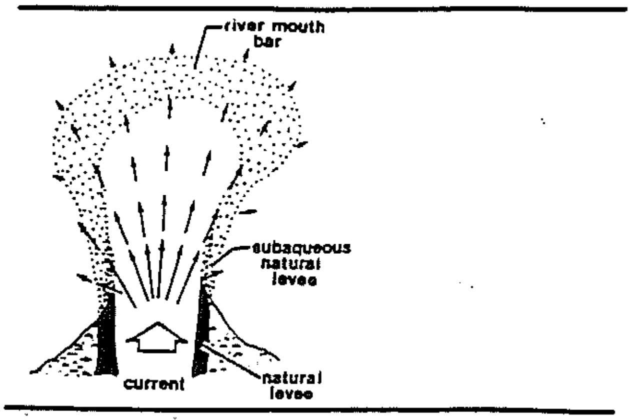


Figure 1. Flaring of Current and Bar Deposition
(Deltas of the World)
at the River Mouth.

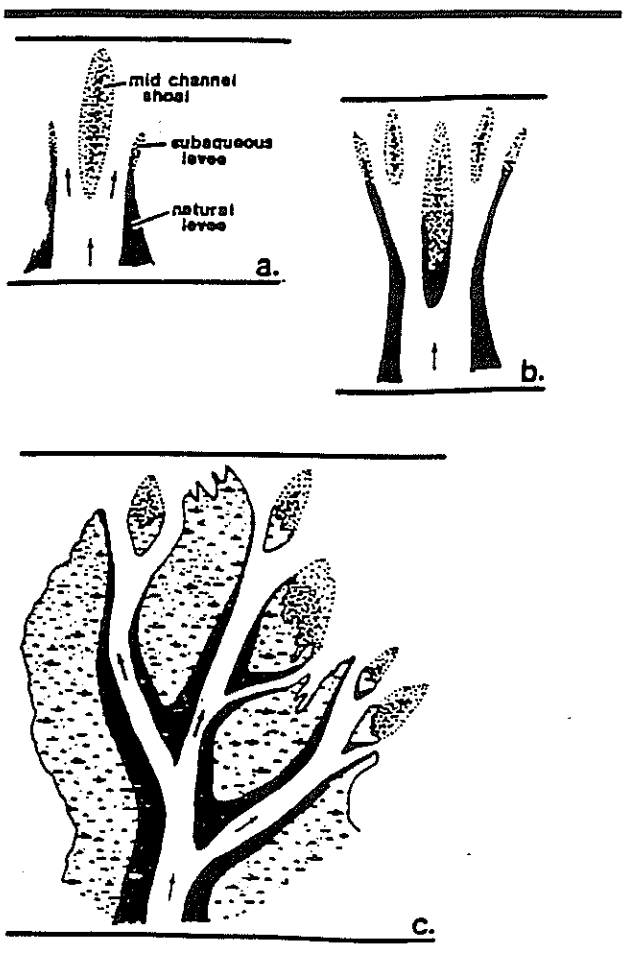


Figure 2. Sequential Development of Branching
(Deltas of the World)
Delta Channels.

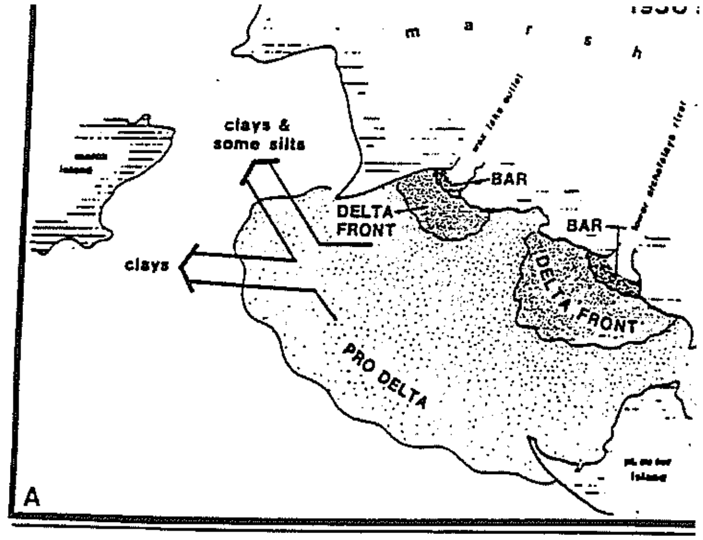


Figure 3a. Deposition of Bar Sediments at River
(Deltas of the World)
Mouth in the 1950's.

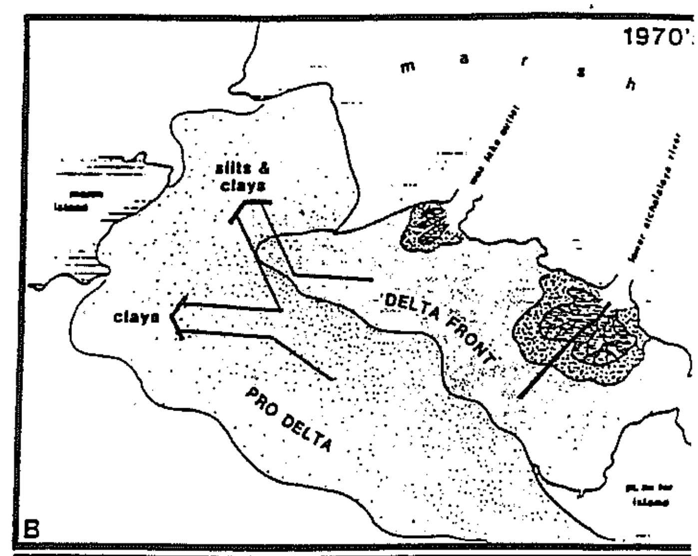


Figure 3b. Deposition of Bar Sediments at River
(Deltas of the World)
Mouth in the 1970's.

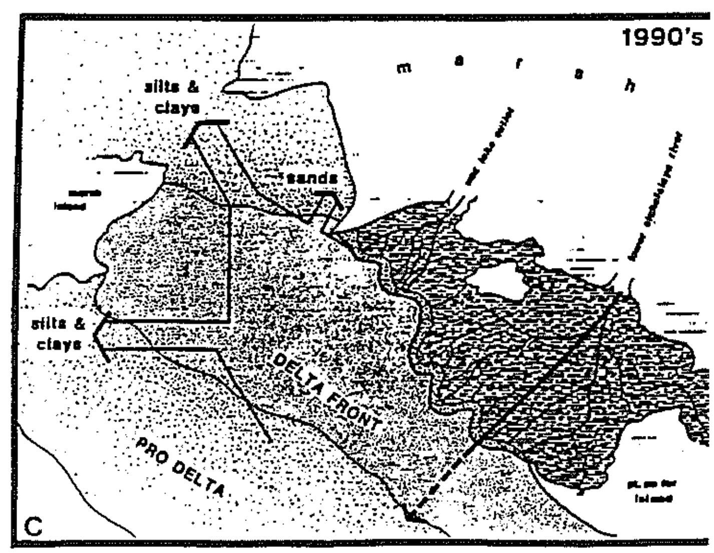


Figure 3c. Deposition of Bar Sediments at River
(Deltas of the World)
Mouth in the 1990's.

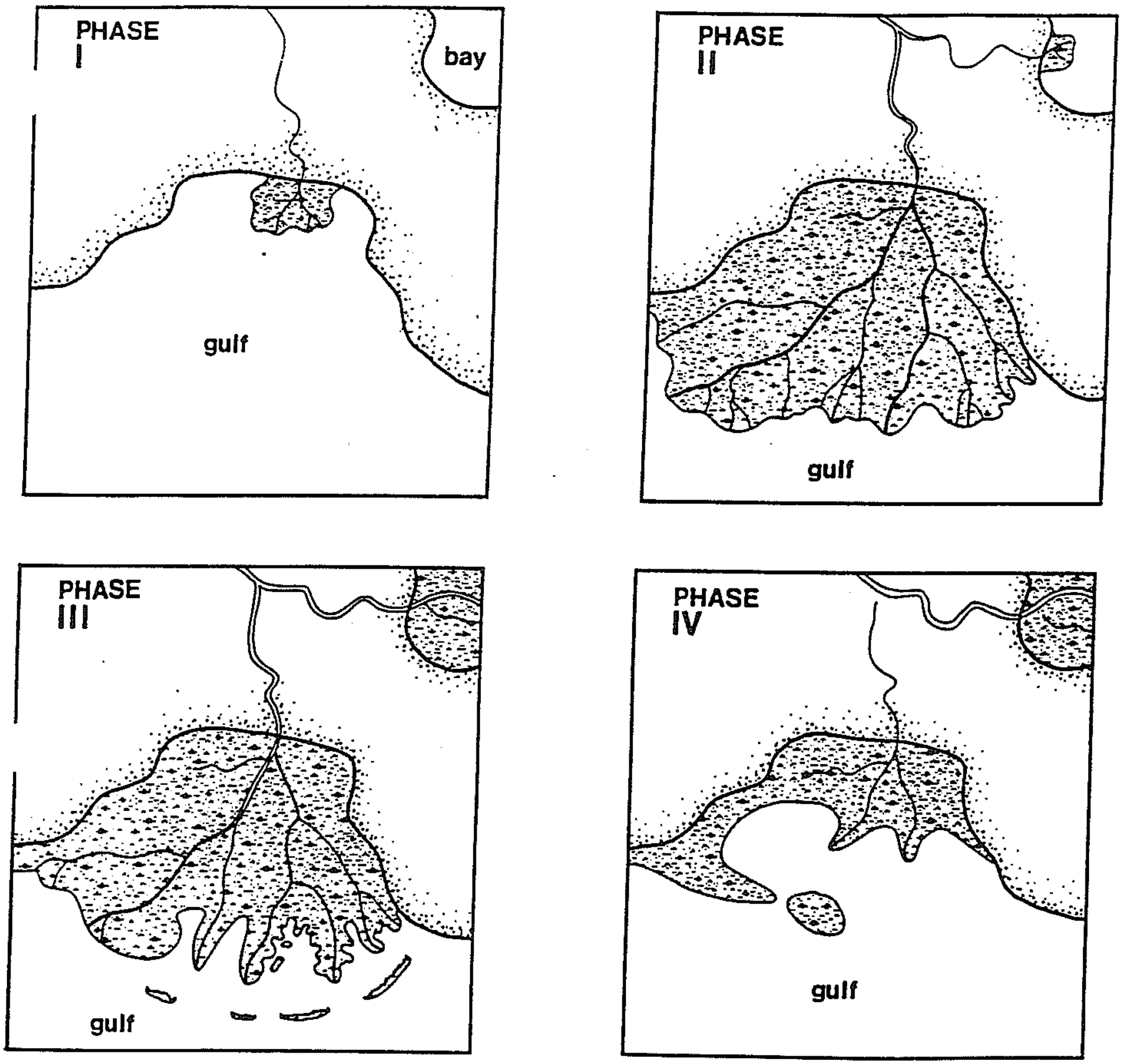


Figure 4. Phases in the Life of a Delta Cycle *(Deltas of the World)*

Notice, however, that just north, a diversion has formed, and some of the river's water has begun to travel to the sea by a different, shorter route. At the mouth of that new river course, another delta is initiated. In the third drawing, representing Phase III, most of the river's water has been captured by the new river route and our delta is no longer supplied with enough sediment to keep ahead of subsidence and erosion. In some places, the natural levee ridges of the former distributaries are all that is left above sea level, as the abandoned delta slowly disintegrates. Notice particularly that in this phase the shoreline is very complicated. This phase has the longest lands-water interface of any of the four. In the fourth drawing, representing Phase IV, the delta is completely abandoned by the river. Even most of the levee ridges have fallen victim to the sea's advance. The bodies of water are becoming more regular in form while they are expanding, as all the tiny peninsulas and islands are eaten away. The shoreline is a series of bays that curve gently inward between natural levee ridges of a few major distributaries. With the increase in bay size, there is an increased exchange of water with the Gulf during each tidal cycle. The bays are fringed by a relatively narrow zone of marshes. The shore or land-water interface is much shorter than in Phase III.

Of course, these drawings are a simplification, but even so these phases are evident on a map of the coast of Louisiana.(Figure 5) Phase I is presently found at the emerging Atchafalaya Delta. Phase II, where the Delta has reached its maximum extent is seen in the modern Mississippi Delta in Plaquemines Parish. The present Mississippi delta has a birdfoot pattern rather than a broad area with a number of distributary channels fanning out through it. The bird foot pattern formed because the modern delta built out into deeper water than did the delta in our drawing. When the Lafourche and St. Bernard delta complexes were at their maximum development fifteen hundred and twenty five hundred years ago, they were shaped much like our second drawing. These two deltas now are in a state disintegration and are described by phase III. The Lafourche delta extends between Atchafalaya Bay and Barataria Bay, and the St. Bernard delta extends eastward from New Orleans. Notice that these two areas of our coast exhibit the complicated, long shoreline with numerous tiny islands and indentations. This phase is most productive biologically.

Phase IV describes the area along the coast where the Teche Vermilion River Basin area is located. In this phase we recognize the Atchafalaya-Vermilion Bay Complex without the new Atchafalaya delta. The bay complex represents the results of the delta cycle that initiated 6000 year ago by the Teche Mississippi with Bayou Sale and Cypermort being two of the major distributaries (hence the remnant ridge system). Soil borings indicate that both of these ridges extended westward. The shoreline has been smoothed out into large bays.

Much of the information discussed above about the geologic history of Louisiana's coastal zone has been unraveled by the investigations of a large number of scientists (Russell, 1936; Kolb and Van Lopik, 1958; Coleman and Gagliana, 1964).

The sequence of delta building at the mouth of the Mississippi River on the Gulf Coast is presented in Figure 6. It shows the five delta complexes developed during the last 6000 years beginning in the Vermilion Atchafalaya Bay complex and returning to Atchafalaya Bay. The development of each delta complex initiates a cycle that is governed by three major sets of processes: the introduction of freshwater and sediments, by the Mississippi River, the subsidence of the area as related to movement of the earth's crust and compaction of sediments, and the combined action of waves, tides and currents which redistributes the deltaic sediments, and together with river water inflow, governs salinity.

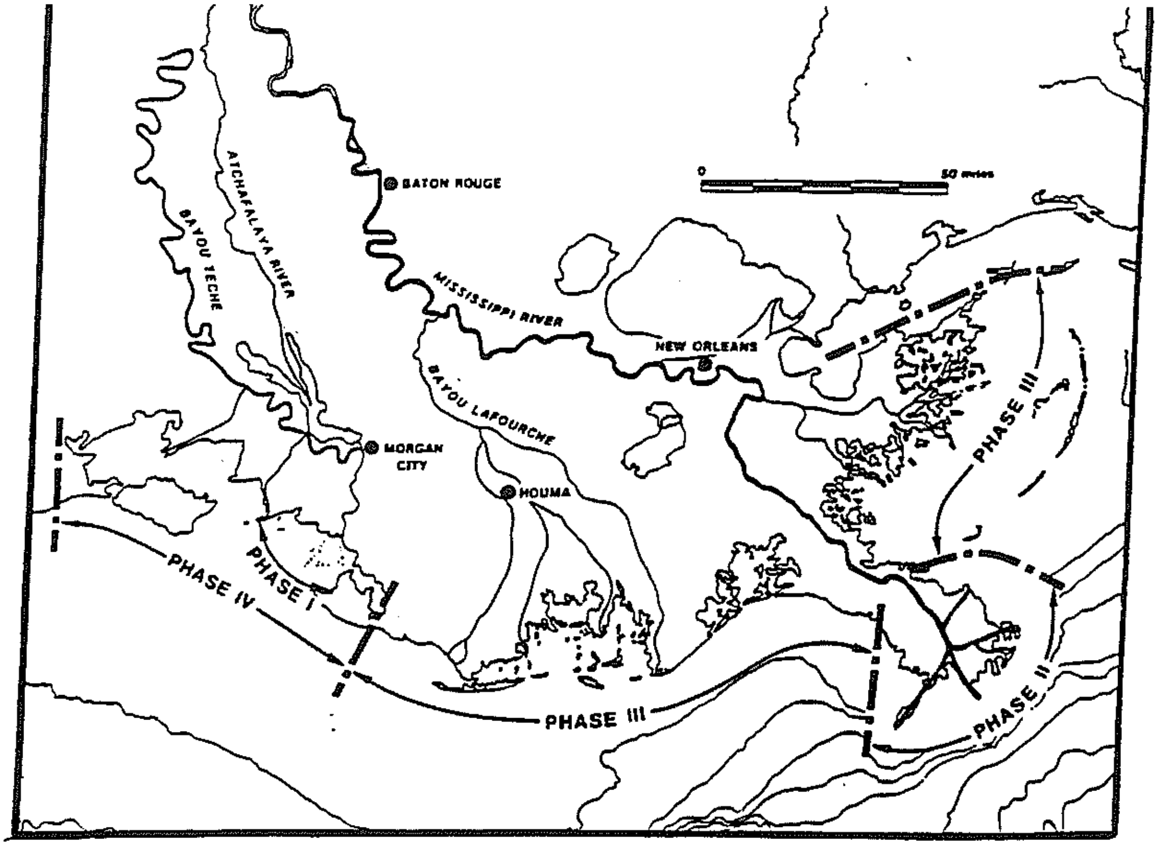


Figure 5. Delta Phases of Coastal Development in Southeast Louisiana (*Deltas of the World*)

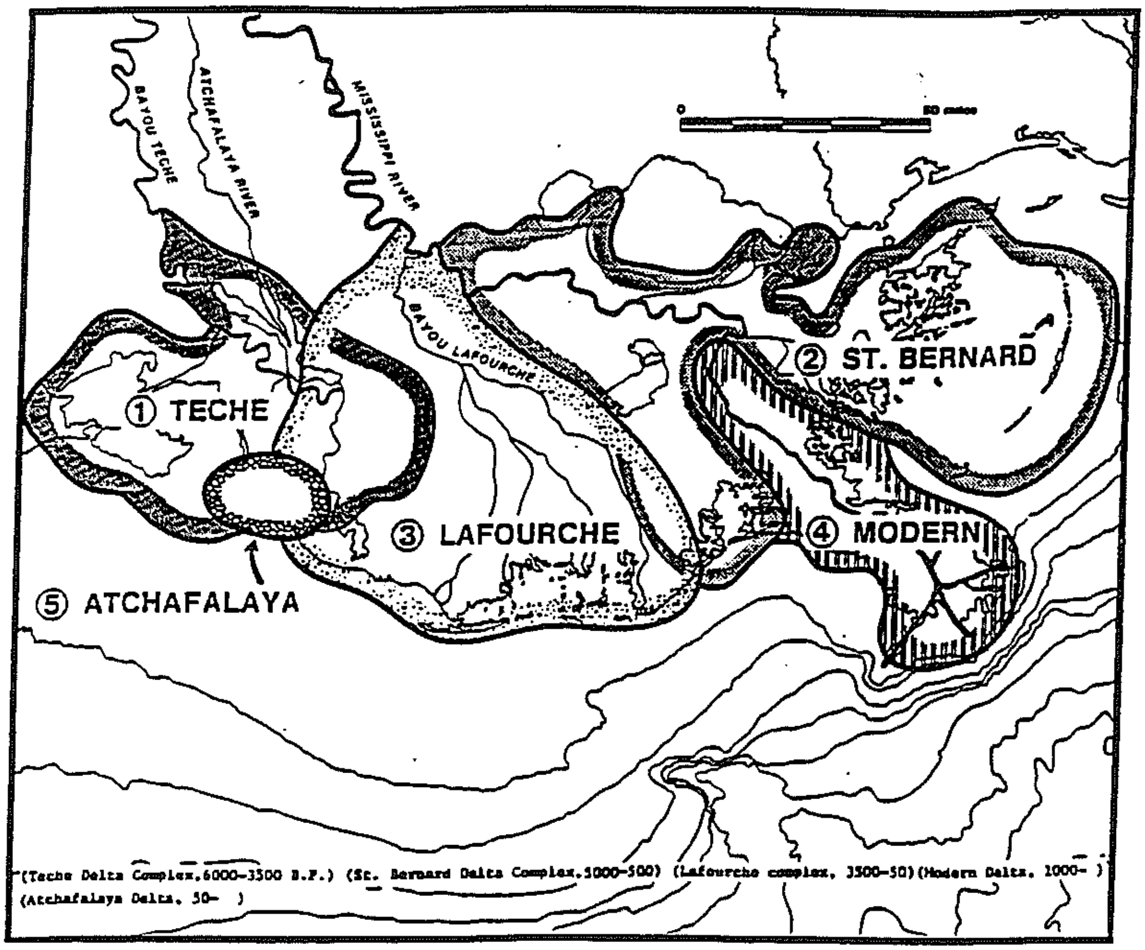


Figure 6. Sequences of the Delta Building Processes in Southeast Louisiana *(Deltas of the World)*

Existing Conditions

As people came more and more to control the coastal zone, the balance was disturbed between the process that were building out and the processes that are taking away. In order to be able to depend on the river, to have flood control, to reclaim more land for development, people confined the river. The periodic shifts in course, so necessary to maintaining a productive coastal area, were stopped. The river has developed a delta as far as is possible at its present mouth in Plaquemine Parish because it is leveed and then channelized all the way out into deep water. The water carries its valuable sediments out to be dissipated in the deep Gulf.

Since the river is prevented from renewing the resource base of the coastal area, people must assume this responsibility. The need to assume this responsibility and initiate actual management before time runs out has been stressed on several occasions (Gagliano and Van Beek, 1974). This need has become even more urgent in Teche Vermilion River Basin with rapid changes of the coastline of central Louisiana, the shoreline from south of Delcambre to south of Franklin. That area is occupied by a large embayment of irregular shape with fairly smooth shores. Large embayments with fairly smooth land-water interface are a sign of advanced shoreline retreat. When a former delta lobe has eroded and subsided to this advanced stage, the biological productivity begins to fall off rapidly. This is true of the Teche Vermilion River Basin study area. Careful management is needed in this area.

The retreat of the shoreline in the Atchafalaya-Vermilion Bay complex together with the over extension of the modern Mississippi delta set the stage for development of the youngest delta lobe (The Atchafalaya Wax Lake Delta) and history began to repeat itself. The upstream diversion of the Mississippi River at Simmesport and an advantageous route to the sea through the Atchafalaya Basin set again in motion the process of abandonment of one delta, the modern delta, and the initiation of a new complex, at the mouth of the Atchafalaya River and Wax Lake Outlet.

Even though full development of the Atchafalaya distributary has been prevented, the importance of this latest development to the Teche/Vermilion Basin can be easily understood when considering the inevitability of the delta cycle and the constraints of growth of the modern Mississippi delta. The delta cycle, as illustrated in the four drawings (Figure 4 found in the Geomorphology section), predicts gradual disintegration of all those parts of the coastal area that have been served from the flow of water and sediments provided by the Mississippi River (The Teche Delta). The maintenance of the coastal area as a whole thus rests solely on the growth of new delta complexes to replace those lost to subsidence and erosion. At present, 70% of the Mississippi River's water and sediment are delivered to the modern delta. Yet new delta building is virtually absent because flow remains confined until it reaches water whose depths are unfavorable to delta growth. Thus, the only physical development that now counters the disintegration of the entire Mississippi Delta system is the growth of the Atchafalaya / Wax Lake Delta's. The emerged land of these deltas is preceded by years of delta building beneath the surface of the water often called " sub aqueous development".

A delta is like an iceberg-you see only the part above the water, but you are in trouble if you ignore the rest. Figure 7 is a simplified model of a delta. The "delta front" is not yet above the water, but it fringes the emerged area. The delta front is composed mostly of silt, and in the Vermilion-Atchafalaya Bay complex, this delta front condition already extends past the shell reefs on the south, and east to west from point Au Fer to Point Chevreuil. The delta front, in fact, has covered all of what we call Atchafalaya Bay. The "Pro delta" is also below the water surface, but it precedes the delta front and is composed mostly of clays. It is the pro delta, deposits of clays from the Atchafalaya River, that has extended southward into the gulf

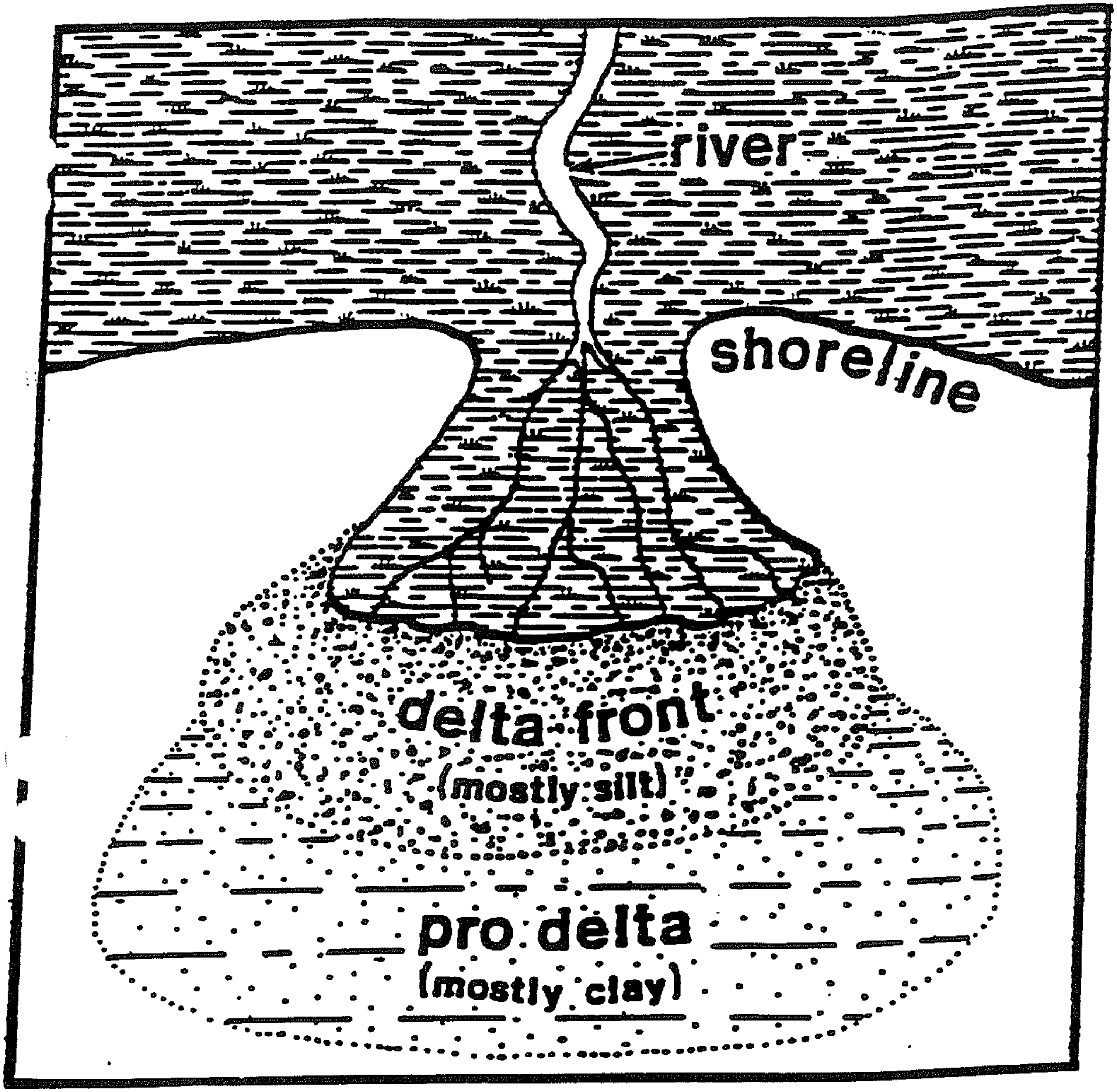


Figure 7. Delta Growth Model *(Deltas of the World)*

of Mexico and westward into the Cote Blanche Bays and Vermilion Bay. The East and West Cote Blanche bays and Vermilion bay are growing shallower. The Atchafalya River carries its
enormous load of sediment out the river mouth and out the Wax Lake Outlet, into Atchafalaya Bay just to the east of the Cote Blanche Bays and Vermilion Bay. This sediment is deposited wherever the river current slows down or mixes with the saline gulf waters. Tides and prevailing winds are forcing the sediments from Atchafalaya bay westward into the Teche Vermilion River basin and bay complex. This is very important to the Teche-Vermilion Basin since these abandoned delta lobes of the Mississippi River are near the endpoint of their natural deterioration. These lobes are the Bayou Teche, Bayou Cypremort, Bayou Sale and Vermilion River ridge systems. These remnant ridge systems are principal features in the landscape of the Basin. Other features which can be found within the Teche Vermilion Basin are three salt domes which are Weeks Island, Avery Island and Cote Blanche Island.

It should be noted that of most of the channels in Table 2 are man made while the Vermilion River which is an old distributary channel of Teche Delta era it has an average discharge of 1,016 cubic feet per second (cfs)). These man made channels have altered the hydrology of the basin tremendously. All of these channels provide drainage to the basin and carry freshwater and sediments into the marshes and bays Vermilion, West Cote Blanche, and East Cote Blanche which border the basin on the south and all are tidally influence by the Gulf of Mexico. Mean stage surface water elevations in the basin are 2.3 feet on the Vermilion River at Banker, 1.9 ft., at Luke Landing on East Cote Blanche Bay, 1.6 ft. at the Vermilion Locks - east, and 1.7 ft. At the Vermilion locks - west.

Table 2. Principal Hydrologic Channels within the Basin

Channel Name	Channel Type
1. Vermilion River (Four Mile Cut)	Man Made
2. GIWW	Man Made
3. Boston Canal	Man Made
4. Oaks Canal	Man Made
5. Avery Canal	Man Made
6. Commercial Canal	Man Made
7. Weeks Bayou	Natural
8. Stumpy Bayou	Natural
9. Charenton Canal	Man Made
10. Bayou Zenor	Natural
11. Muddy Bayou	Natural
12. Bayou Carlin	Natural
13. Humble Canal	Man Made
14. Jackson Bayou	Natural
15. British American Canal	Man Made
16. Yellow Bayou	Natural
17. Bayou Sale	Natural

This tidal influence in the basin is a natural important characteristic of the deltaic marine interaction process which we discussed earlier in the Geomorphology section. However the tidal influence has also been a major problem in the basin area. The various man made channels in the basin and the removal of the natural reefs which were once found from Pt. Chevreuil to Marsh Island have allowed the tidal amplitudes to increase in the Basin area. This amplified tidal influence causes flooding problems to residents in areas of St. Mary, Iberia and Vermilion Parishes. Corps of Engineers gauging stations have documented that the tide levels within the basin can change as much as 5 ft. in a 24 hour period. This drastic change in water levels is causing erosion in the inland marsh areas and causing many of the man made channels mentioned earlier to become deeper and therefore the channels to become wider. As these channels become deeper and wider the cross sectional area for flow capacity also gets larger intensifying tidal fluctuations to become more amplified.

A study of tidal data and flows in the Teche Vermilion basin done by Coastal Environments in the early 70's indicates that the tide is the primary force responsible for the exchange of water between the Gulf of Mexico and the bays and among the bays. Once or twice a day the tide moves along the coast and into the bay complex. Because of wave travel time and the effects of the estuary's geometry, high tides and low tides do not occur simultaneously or attain the same levels at all locations. Consequently, gradients develop along the water surface resulting in the movement of water in the form of tidal currents (Figure 9).

The tidal water movement may show considerable variation from week to week or season to season. There are universal changes that occur from neap to spring tide, and in this area there are further variations of water movement and changes in water level caused by wind and by the large discharge from the Atchafalaya River. Although Figures 8 and 9 are for tidal data taken during August of 1976 the data is a good indicator of the tidal movements in the Teche-Vermilion River Basin today. Figure 8 shows the tidal curve for Point Chevreuil as obtained from the 1976 tables (U.S. Department of Commerce, 1976). The curve shows the lunar variation with the range being nearly 2 feet during spring tide but less than 1 foot during neap tide. Also related to that cycle is a variation in tidal type. Some days the tide is diurnal with only one high and one low water period, while during the remaining days the tide is mixed, that is, a mixture between diurnal and semi-diurnal. For the mixed tides we notice a sequence as follows: high or lower high water, higher low water, lower or high water and lower low water and back to higher or lower high water. Frequently, however, the variation due to higher low water remains absent as a result of wind set-up or modification of the tidal surge as it moves through the bays. In that case the tide remains at a high stand for about 7 hours.

Through analysis of the tidal data, a general notice can be obtained concerning pattern, relative strength, and duration of average tidal flows in the absence of external disturbance. For this purpose, tidal curves were plotted for the average conditions of August 10,1976, (Figure 8- shaded area).for eight stations inside and along the perimeter of the Atchafalaya-Vermilion Bay Complex. These curves are presented in Figure 9.

The diagram points out a number of aspects. Most apparent is the decrease in tidal range as one moves into the bays and also westward along the coast. The highest tidal range occurs at

Point Au-Fer, and the lowest in West Cote Blanche Bay. A second salient feature is the difference in the moments of high tides and low tides for the various locations. High tides along the coast occur within half an hour of each other but low tide at southwest Pass lags two hours behind that near Atchafalaya Bay. Moving into the bays one notices equally how the tidal maxima and minima are delayed from one to more than three hours.

Since water flows from high toward low points, the diagram provides an indication of the direction of movement at every hour. Furthermore, taking into consideration the distance between tidal stations, an idea of the relative current strength at a given hour can be obtained from the vertical distance between curves. For instance, one notices that during the 18 or so hours from low water to low high water, water levels are continuously higher are Point Au-Fer than at Rabbit Island, at Rabbit Island than at South Point, and South Point than at Southwest Pass. Consequently during those 18 hours, tidal forces maintain a westward current along the coast. Water surface gradients, as indicated by the vertical distance of the four curves respectively,are seen to be largest prior to the tidal maxima so that currents are strongest at those times.

In the above manner, the tidal information was analyzed on an hourly basis and is summarized in Figure 10 showing periods I through IV. Four main conditions could be recognized and are referred to as Periods I through IV respectively corresponding to figure 9. During period I, tides are rising at all stations and water is seen to move into the bays from the Gulf of Mexico: relative strength of the flow is indicated by length of the arrows. A moderate flow is maintained westward along the coast. Most movement of water from Atchafalaya Bay into East Cote Blanche Bay occurs along the seaward side of the bay due to equality of the tidal phases and amplitudes at Shell Island and Point Chevreuil. west Cote Blanche Bay is seen to receive water from both the more saline Vermilion Bay and the fresher East Cote Blanche Bay. These conditions pervail for approximately 7 hours.

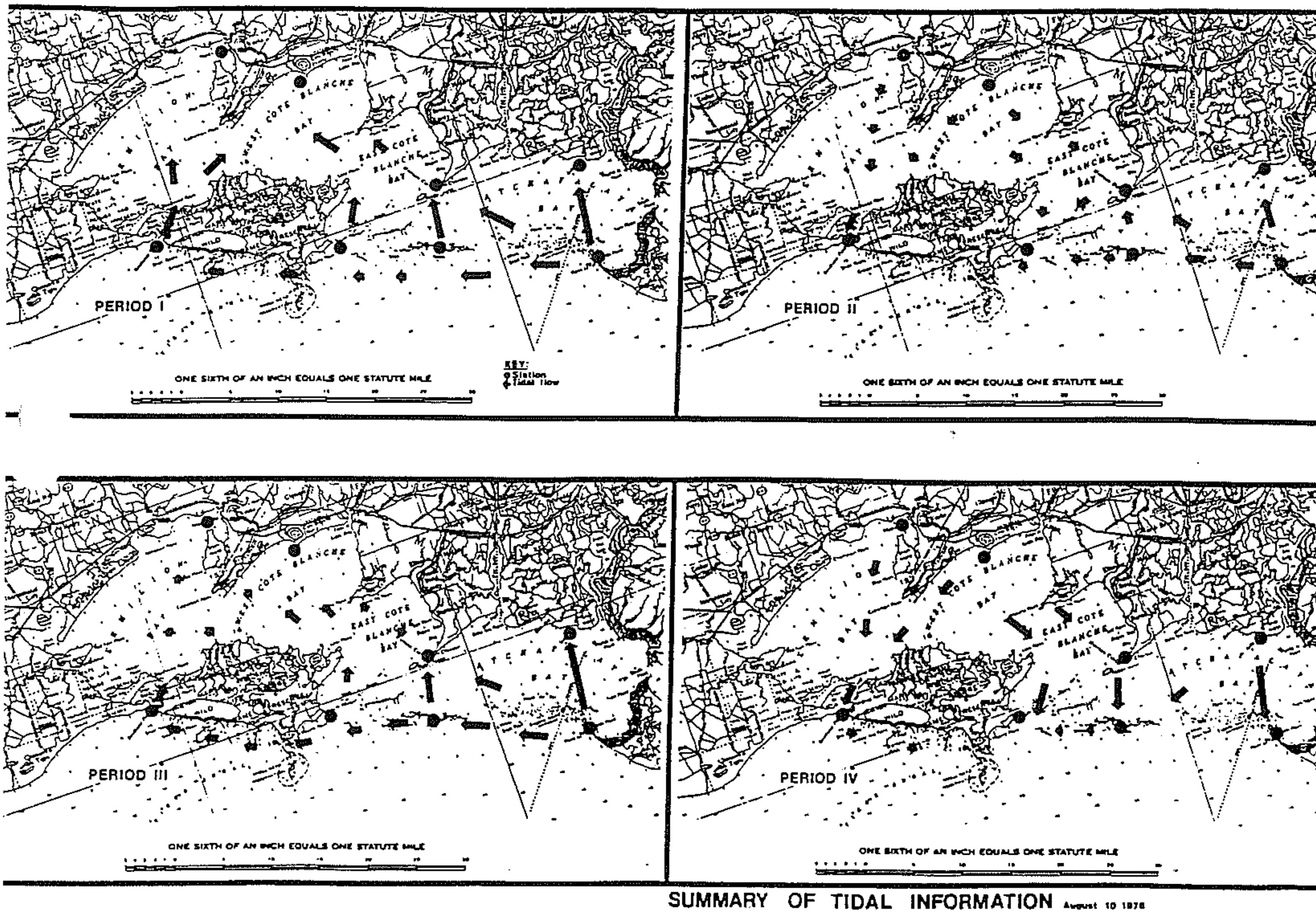


Figure 10. Summary of Tidal Periods for the Teche-Vermilion Basin

During the 3 hours of higher falling tide of Period II, conditions are largely reversed in direction except in Atchafalaya Bay. There, water still moves in a westward direction. Due to lesser gradients, rates of outflow are less than the rates of previous inflow.

Rising water toward lower tide in Period III produces essentially the same pattern as during Period I. The main difference is the much lesser flow rates since the moderate rise takes place over a five hour period. Flow has remained westward from Atchafalya Bay and into East Cote Blanche Bay. The westward longshore current has again attained greater magnitude.

Period IV represents a complete reversal of period I. All flow is outwards from the Bay into the Gulf at relatively high rates. A westerly component remains present in Atchafalaya Bay but the longshore current is virtually absent except for a slight, now eastward, flow along the shore of Marsh Island.

The above described condition may be further summarized with regard to the most important aspects through figure 10. First it is seen that during 66 percent of the time, a continuous westward movement of water exists along the Gulf shore from Atchafalaya Bay past East Cote Blanche Bay and Marsh Island toward Southwest Pass. This water is initially of very low salinity, since it is derived mostly from Atchafalaya River discharge, but increases in salinity through mixing during travel to Southwest Pass. When only considering Atchafalaya and East Cote Blanche Bays, the westward water movement is maintained even longer: 80% of the time.

The waters moving westward along the coast are the main source for flow into East Cote Blanche Bay and the eastern half of West Cote Blanche Bay. Such inflow occurs 66% of the time and transfers the properties of Atchafalya River water to the East and West Cote Blanche Bay toward the lower part of East Cote Blanche during 58% of the time.

Inflow of the more saline water through Southwest Pass appears somewhat less than that along the east side of Marsh Island when comparing durations of inflow..

Biological Productivity and Deltiac Cycles

The delta development process is important to the biological value of the Mississippi delta system. With the cyclic change of a delta complex comes a change in its natural environments. Since individual cycles are lagged in time, any particular environment is present at some time within each of the delta complexes. The sequential cycling of the deltas thus insures continuous maximum diversity of the delta system as a whole. As discussed earlier the Tech Vermilion River Basin area is in Phase IV in the natural process but the Atchafalaya-Wax Lake Delta system has begun to influence this area for the past 75 years with increased fresh water and sediments.

Within a given delta complex, diversity increases and decreases with the delta cycle that the complex goes through. Maximum diversity is attained during the early phase of deterioration of broad deltas such as Lafourche delta complex. Maximum diversity is reached, in other words, in Phase III.

Coincident with this diversity are a maximum length of land-water interface and an increase in salinities to moderate levels. The diagram Figure 11 shows the various natural environments that can be found in a delta complex and their time of occurrence as related to each phase of the delta cycle **(Note Phase IV And Phase I)**. Also shown on the curve representing "subaerial development" **(Note No. 1)** are the five delta complexes including the Atchafalaya delta. It is evident that as times goes on, the location of each delta complex will shift to the right. This means that without the Atchafalaya delta, the diversity of the entire

Mississippi delta system would decline. Only full development of the Atchafalaya delta and subsequent delta lobes will maintain overall diversity.

The "biological productivity" curve closely tracks the " length of land-water interface" curve. Fishing statistics (Lindall et al, 1971) for lengths of the coast in different "phases" will illustrate this. In Atchafalya Bay, the five year annual harvest from 1963-1967, for commercial fishing, was 221.4 pounds per acre. This is what we are calling Phase I. Out from the modern Mississippi delta, our Phase II, the catch was 218.4 pounds per acre. In the Barataria Bay, with its long land-water interface, our Phase III, the catch averaged 1,182 pounds per acre. And in the Vermilion-Cote Blanche Bay Complex, where the coastline is embayed, our Phase IV, the average catch is only 147.1 pounds per acre.

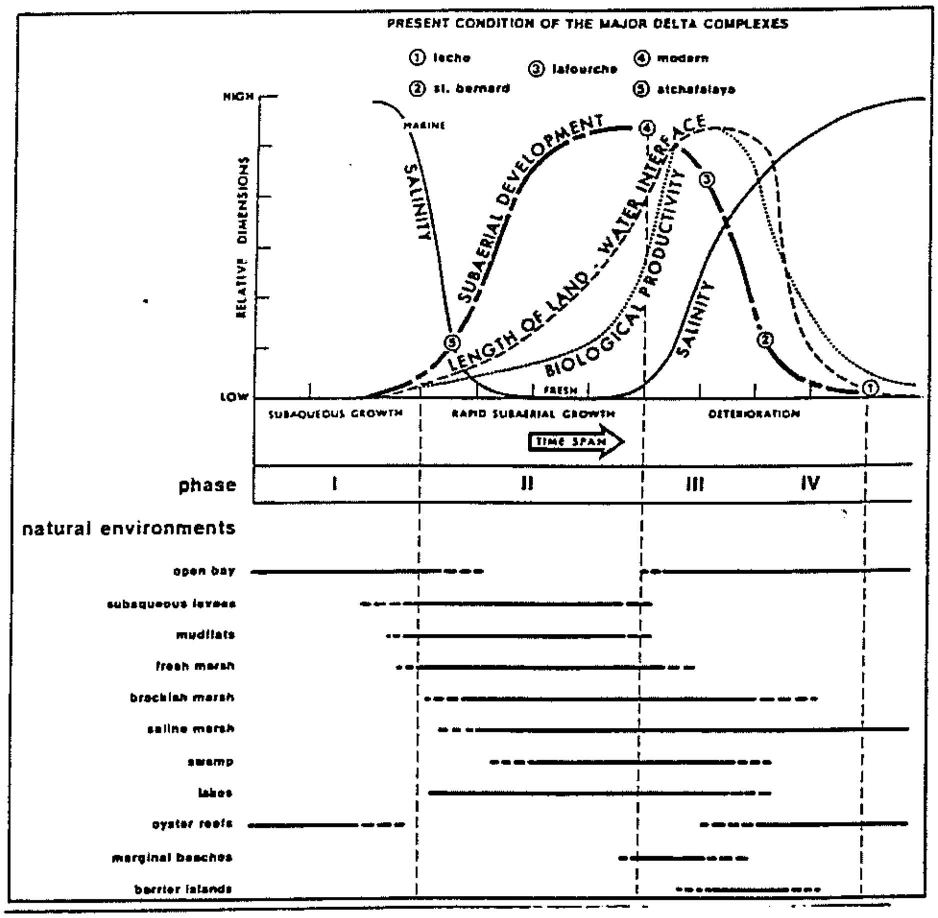


Figure 11. Environmental Diversity and Biological Productivity as a Function of the Delta Cycle *(Deltas of the World)*

This is of great importance since biological productivity, and therefore the resource value of the delta system, is largely tied to the diversity of the system as a whole and to that of a particular delta complex during the early stage of deterioration. Both conditions can only be maintained through development of new delta complexes that replace the less productive water bodies left behind by the final deterioration of older complexes (and by detrimental effects of careless human uses within the coastal zone).

The deterioration of the delta complex is a documented fact that is evident directly from a comparison of maps and aerial photography. While during the past 6000 years the river has constructed a deltaic land mass nearly 19,000 square miles in extent, and was until very recently maintaining that land mass. This trend has been drastically reversed, and land has been lost at a rate of 16.5 square miles per year. A loss of approximately 500 square miles has occurred (Gagliano and van Beek, 1970).

A second trend indicative of deterioration is found again in the fisheries statistics. The deltaic estuaries of Louisiana's coast account for approximately 25% of the total fish harvest of the coterminous United States (Lindall et al., 1971). The alarming aspect revealed by the fisheries harvest data is that the effort per catch unit for both shrimp and oysters has increased significantly, and the oyster yield per acre has decreased sharply.

Physiography and Geography

The general slope of the basin is gulfward. The altitude of land surface in the marshland is generally less than 5 feet above gulf level. Only narrow beach ridges of sand and shell rise higher to altitudes of about 20 to 25 feet. Weeks Island is over 125 feet.

The Pleistocene terraces are, from oldest to youngest, the Williana, Bentley, Montgomery, and Prairie formations. The outcrops of the formation form more or less continuous bands across the upper two-thirds of the area. Each unit consists generally of a coarse basal phase of lenticular masses of sand and gravel; a central, sandy phase with local lenses of gravel; and an upper, silty clay with local sand lenses.

Extensive deposits of Recent age lie in south-central Louisiana. The gulfward margin of this material has been under wave attack for thousands of years and it is the detrital material derived from it that has been carried along the gulf shoreline and redeposited in the coastal marshland. The deposits are characterized in four environments: (1) river meander belts composed of clays and silty clays filling abandoned channels, silty sand forming point bars, and fine grained sediment forming natural levees; (2) backswamp deposits composed principally of clays and silty clays deposited in floodbasins flanking meander belts and locally overlain by natural levee deposits; (3) deltaic plain deposits laid down in freshwater marsh and swamps, brackish water marsh, bays, lakes, or in saltwater; and (4) undifferentiated, complexly intermixed deposits of the other three types.

Contained within the area are numerous shallow natural lakes and smaller natural lakes such as river cutoffs and intermittent flood overflow lakes. Several other lakes have been constructed by State or private groups with Federal assistance.

Salt is produced primarily in Iberia, and St. Mary Parish from four islands--Jefferson Island, Avery Island, Weeks Island, and Cote Blanche Island. These islands are piercement-type salt domes. Avery Island is the largest salt mine in the world. In topography, the domes are a striking contrast to the surrounding low areas of marshland.

An Island Trust

For centuries, millions of duck, geese and other waterfowl have flown the length of the continent to spend the winter resting and feeding on the rich marshlands of the Louisiana coast. As early as 1912, Olivia Sage became concerned that these creatures should continue to find a safe haven there. Over the next three years she purchased some 80,000 acres south of Vermilion Bay, Louisiana. This territory, known as Marsh Island, was deeded to the Russell Sage Foundation in 1920 with the stipulation that the Foundation maintain the island forever as a wildlife refuge. During this same period, the Rockefeller Foundation also bought 100,000 acres to the west of Marsh Island for a wilderness preserve. Together, these areas still constitute one of the largest waterfowl sanctuaries in the United States.

About 20 miles long, 10 miles wide and averaging about 12 inches above sea level. Marsh Island is composed primarily of brackish marsh broken by numerous tidal canals and a vast number of shallow ponds and lakes where fish abound. The only large area of firm land is the southwest portion of the island facing the Gulf of Mexico, where wave action has built up a high ridge of sand, silt, and shells. This natural levee, where young shrimp and oyster reefs flourish, is a vital feature of the island, as it prevents salty Gulf water from intruding into the many pockets of fresh water on the island and helps to maintain the delicate balance in the chemistry of the soil and water that is essential if the island is to remain a home not only to migrating birds but to furbearing animals such as nutria, rabbits, muskrats and deer, as well as thousands of alligators. In addition to this diverse wildlife, dozens of varieties of grasses, trees and vegetation make Marsh Island a rich natural habitat.

Over the years, hunters, the oil boom, erosion and neglect all have taken their toll on the Louisiana marshlands. It is estimated that over half of this territory has vanished or become too polluted to sustain wildlife. Marsh Island, however, continues to thrive according to Mrs. Sage's wishes. What she could not have foreseen is the way the island has become an example of mineral exploration and wildlife preservation existing side by side in mutual harmony. In November 1920, the Foundation agreed to allow the State of Louisiana to hold the title and maintain Marsh Island "forever and solely as a wildlife refuge or game preserve," not selling or leasing the lands or devoting them to any other purpose. During the next decade, the only source of revenue from the island was nutria skins. Then, in the 1930s, oil was discovered nearby and several companies expressed interest in exploring for gas and oil on Marsh Island. The Foundation rejected the state's proposal to allow such exploration, since it seemed to violate Mrs. Sage's intentions. With the outbreak of World War II, however, both the Department of the Interior and the War Production Board pressed for permission to drill for oil for defense purposes.

In 1944, the state and the Foundation reached an agreement allowing Louisiana to offer leases for oil, gas and other mineral exploration. The terms of the agreement required, however, that each lease be approved separately by the Foundation, that half of the revenues from such leasing go to the Foundation and that the other half be used by the state to maintain Marsh Island as a refuge, with any surplus earmarked for statewide protection of wildlife and the promotion of health and education programs. When the Foundation agreed to oil exploration, it imposed exceptionally stringent conditions: There could be no hunting, trapping or fishing on the island by anyone. Drilling could be done only from April 1 to November 1. Any surface charges or explosions could be set off only in special geophysical tubing. Entry to the island for drilling could be only through natural water channels or specially approved, newly dredged canals. Under no circumstances could new canals be constructed on the Gulf side of the island. Before drilling, a site was to be encircled with a levee high enough above marsh level to assure against any form of drainage that might pollute the fresh water. And the only land access to a drilling rig had to be over temporary board roads built and maintained by the drilling company. Other regulations had to be observed as well to ensure that the island's wildlife remained undisturbed.

The safeguards worked and coexistence has succeeded. In fact, the specially dredged canals have even proved beneficial, creating levees useful for water management and new habitats for deer and other wildlife. The revenues funded a comprehensive scientific program of animal and water management. Each fall, for example, grass is burned to remove coarse vegetation and encourage the growth of more desirable game food. Many wooden weirs have been built six inches below marsh level to stabilize water conditions and prevent complete drainage during periods of low tide. And one of the most extensive alligator studies in the country has been underway on the island for several years.

A major threat to the island has been the severe hurricanes that plague the region. When these strike and water covers the entire territory, the island generates its own natural protection: dead grass floats to the water's surface, forming a matted Noah's Ark on which animals float until the storm subsides. Still, each hurricane causes considerable damage, which the island's revenues help to repair.

Marsh Island's oil has brought financial benefits to the Foundation, too. Between 1943 and 1983, Russell Sage received more than $25,000,000 from various leases on the island. Although oil activity has subsided in recent years, a special state fund, known as the Russell Sage of Marsh Island Refuge Fund, was established in 1973 at the Foundation's instigation to ensure the continuing protection of the island should other sources of revenue become exhausted. Halfway across the continent from the Foundation's New York home, Marsh Island is an ongoing commitment and a very special trust.

EXISTING CONDITIONS

This basin is an area of transition from the deltaic plain to the chenier plain The principal hydrologic features of the basin include the Vermilion River, Charenton Canal, the GIWW, the natural levee ridges of the Vermilion River and Bayou Teche, East and West Cote Blanche Bays and Vermilion Bay. Natural flow patterns in the Vermilion River were reduced with the construction of levees along the Red and Atchafalaya Rivers during the 1920's and 1930's. Construction of the West Atchafalaya Basin Protection Lee (WABPL) in 1935 cut off natural flows from the Atchafalaya River through Bayou Courtableau and caused water in Bayou Teche, the WABPL borrow pit parallel to the levee, and the Vermilion River to become stagnant during periods of low flow and drought Figure 14. Reduction in flows also promoted saltwater intrusion in the lower Vermilion River to at least mile 10 and severely reduced freshwater supplies for irrigation. Saltwater intrusion became severe enough in the late 1930's to penetrate adjacent groundwaters. To help offset this, the Bayou Darbonne Control Structure was built in 1941 through the WABPL to allow Bayou Courtableau flows back into the Vermilion-Teche Basin (Figure 15). For the same reason, and due to the demand of freshwater from sugar mills along the Teche, the Teche/Vermilion Pumping Station was built.

The Vermilion River has an average discharge of 1,016 cubic feet per second (cfs), and provides a moderate amount of sediment to the bays

Water from Bayou Teche and the Lake Fausse Pointe area enters the bays via Charenton Canal. The GIWW brings freshwater, sediments and nutrients into the basin from the Atchafalaya River system. East and West Cote Blanche Bays are less than 10 feet deep and partially sheltered from the Gulf of Mexico by Marsh Island and a subaqueous delta. Freshwater, nutrients and sediments enter these bays and some even reach Vermilion Bay via westward transport from Atchafalaya Bay. Vermilion Bay is also less than 10 feet in depth and is sheltered from the Gulf by Marsh Island. However, significant water exchange occurs between Vermilion Bay and the gulf through Southwest Pass.

The bays of the Teche/Vermilion Basin are dominated by Atchafalaya River discharges with a relatively high suspended sediment load (Figures 12 and 13). Freshwater from the Atchafalaya River system enter the Teche/Vermilion in four ways: a net east to west movement from Atchafalaya Bay, a westward movement from Wax Lake Outlet through the GIWW, the diversion into Bayou Teche and the Vermilion River through Bayou Courtableau, and from Fausse Pointe Basin through the Charenton Drainage and Navigation Canal. A limited flow of freshwater, sediments, and nutrients from the Mermentau Basin enters the Teche/Vermilion through the Leland-Bowman Lock and Schooner Bayou Control Structure on the GIWW.

Oil and natural gas are produced in the basin. Although many of the wells are depleted, the overall production is still quite high. There are thirty-six major oil and gas fields located within the basin encompassing three parishes. A number of access canals traverse the basin due to the natural resource extraction facilities located within the basin. Numerous transmission pipelines cross the basin. These facilities vary in size from 4 inches to 30 inches in diameter. The majority of the pipelines run in either a northwest-southeast direction or in a northeast-southwest direction. Numerous small access canals have been dredged throughout the marshes.

Figure 12. Freshwater Supply for the
Teche-Vermilion Basin

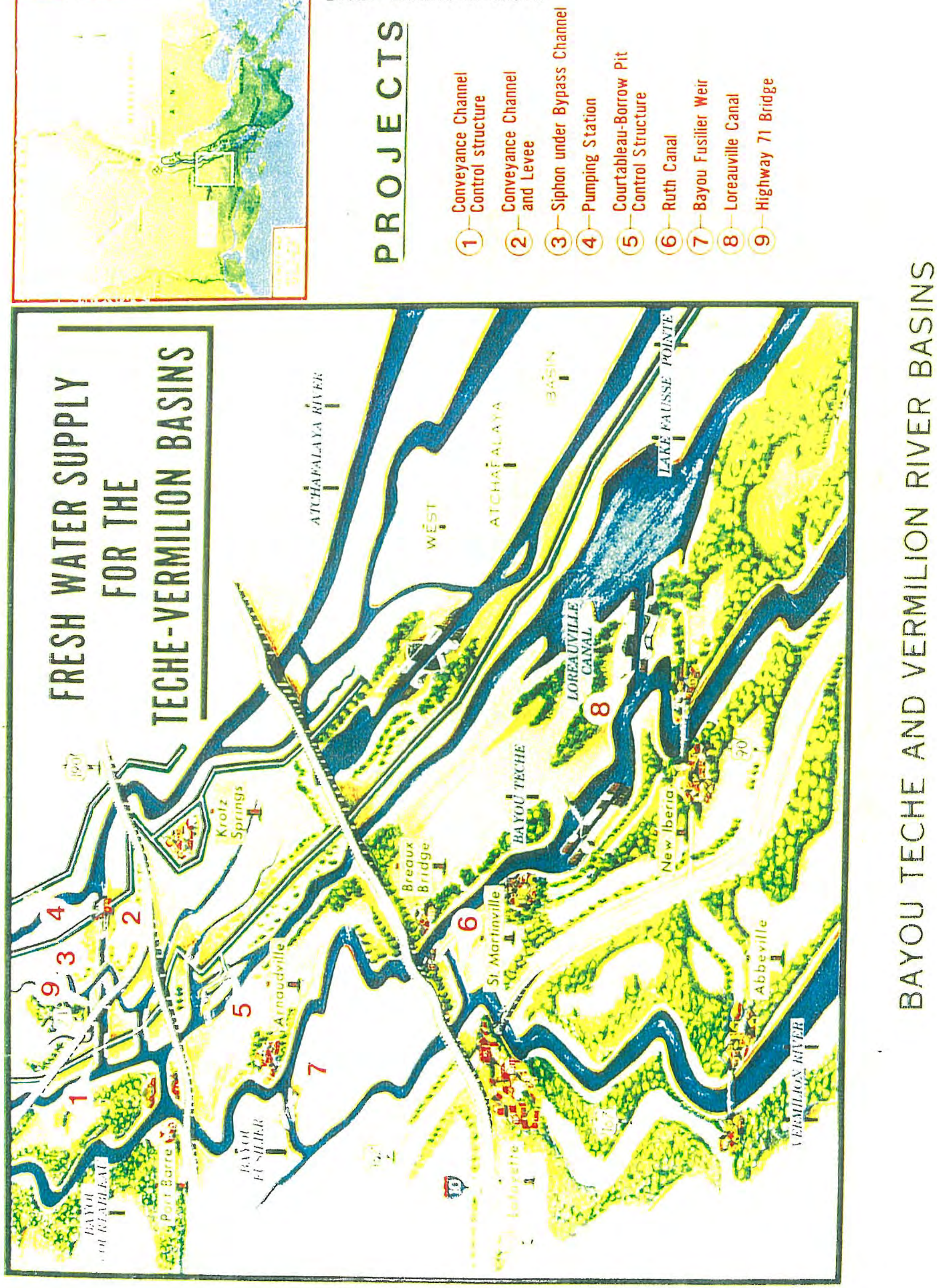
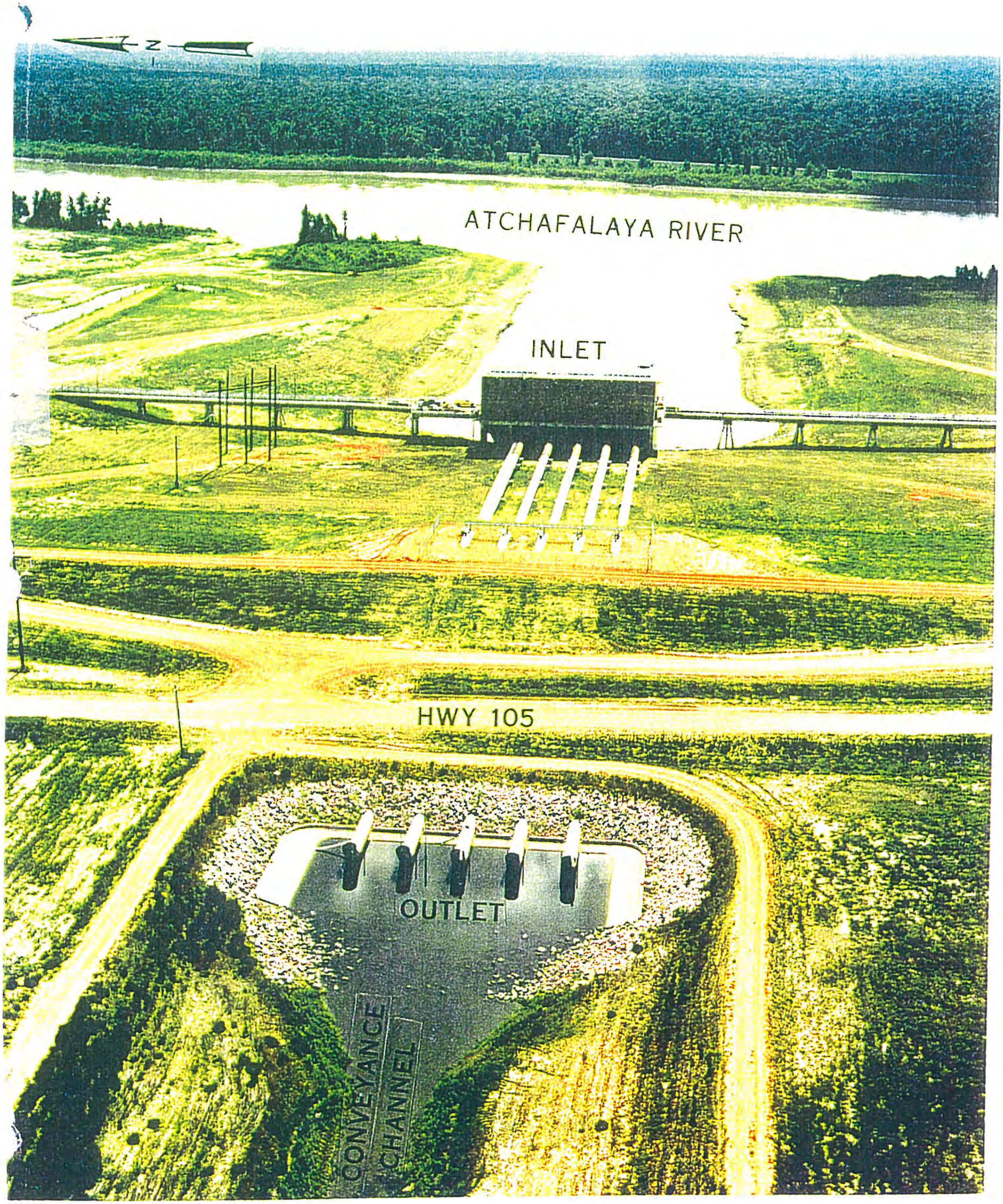


Figure 15. Teche-Vermilion Pumping S   Photo-U.S. Army Corps of Engineers



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Commercial and recreational resources in the river basin study area. The commercial resources include: 1) Shipping and navigation; 2) Fisheries; 3) Alligator and Fur harvests; and 4) Mineral extraction and oil storage facilities. The recreational resources include: 1) Fisheries; 2) Hunting; 3) Visual utilization, and 4) Water quality of the basin water bodies and watercourses.

Commercial Resources

Shipping and Navigation

Navigation channels dominate the hydrology of the basin. In 1957, the Corps of Engineers completed a large multipurpose project on the Vermilion River to further improve navigation and flood control, and increase water supply for irrigation. The improvements consisted of an 8 by 80 feet navigable channel from Vermilion Bayou to the Gulf Intracoastal Waterway (GIWW), and a 9 by 100 feet channel from the GIWW to Lafayette.

Shipping and navigation has an important influence on the economic and environmental welfare of the Teche/Vermilion river basin study area. The Gulf Intracoastal Waterway is a portion of the Inland Waterway system authorized by Congress in 1910. It provides for shipping of goods and commodities on boats that do not have a deep draft. The waterway is maintained with a bottom depth of 12 feet and primarily utilized for barge traffic.

Fisheries

This subsection contains information on important marine and estuarine species that utilize the inland marshes during their life cycles. The discussion will include landings data and limiting factors on productivity.

Tidally-influenced marshes throughout the study area serve as nursery habitat for many estuarine-dependent fish and shellfish. Estuarine-dependent species typically spawn in the Gulf of Mexico and migrate into the marsh as post-larvae or juveniles. Upon becoming sub-adult, they typically migrate to the Gulf to complete their life cycle (Table 3). Because of the many different species and differing life cycle requirements, migration occurs throughout the year.

Figure 1[illegible]. West Atchafalaya Basin Protection Levee at the Teche-Vermilion Pumping Station

Photo-U.S. Army Corps of Engineers

BAYOU DARBONNE CONTROL STRUCTURE

PHOTO TAKEN 10/82

Table 3. Ingress and Egress of Commercial and Recreational Important Estuarine Organisms[1].

Species	Ingress	Egress
Gulf Menhaden	Feb. and March	Oct. to Jan.
Red Drum	Sept. and Oct.	Dec. and Jan
Spotted Seatrout	Aug. and Sept.	Nov. and Dec.
Sand Seatrout	April, May, and Sept.	June and July
Atlantic Croaker	Dec. to Feb.	Sept. to Nov.
Southern Flounder	Jan., Feb., and March	Oct. to Dec.
Brown Shrimp	February to May	June and July
White Shrimp	August and Sept.	Oct. to Dec.

Fisheries resources, both commercial and recreational, are a vital component of the Teche/Vermilion Basin's economy. Averages of 1979 and 1989 commercial landings for the Teche/Vermilion Basin and Atchafalaya Bay are: brown shrimp $24,750,000, white shrimp $17,400,000, oysters $4,200,000, and menhaden $14,850,000. The relatively low-salinity Teche/Vermilion Basin is a prime nursery area for shrimp. However, oyster harvesting is becoming limited due to sewage contamination from point and nonpoint sources. Other commercially and recreationally important species found in the basin include red drum, spot, sand seatrout, southern flounder, striped mullet, and blue crab. Table 4 depicts the number of commercial fishing licenses and gear licenses sold in St. Mary and Iberia parishes. There was no data listed for Vermilion Parish.

Table 4. Commercial Fishing License Sold By Parish

	PARISH					
	St. Mary	Iberia	1991 Total	St. Mary	Iberia	1992 Total
TYPE LICENSE						
Commercial Fisherman	904	582	32,654	850	528	28,100
Vessel License (Resident)	931	619	34,669	896	552	29,392
Vessel License (Non-Resident)	0	2	106	0	1	50
Hoop Net	156	40	2,432	129	39	2,208
Fish Seine	29	1	111	25	1	100
Trammel Net	11	1	75	4	1	58
Gill Net	149	54	3,160	0	0	0
Salt Trap	25	4	262	18	1	86
Crab Trap	260	99	5,767	269	269	100
Eel Pot	0	0	0	0	0	0
Minnow Trap	4	0	8	3	0	6
Crab Traps on Trotline (Commercial)	10	0	20	13	0	26
Miscellaneous Gear	2	1	57	0	0	0
Wholesale/Retail Dealer	42	21	1,197	37	20	1,074
Setline License	0	0	0	147	19	1,244
Dip/Cast Net	68	5	401	63	5	376
Can	1	3	161	0	0	0
Can, Bucket, Pipe, Drum, Tire, Etc.	0	0	0	2	2	104
TOTAL	**2,592**	**1,432**	**81,080**	**2,456**	**1,438**	**62,924**

Source: LDWF, Unpublished data.

Limiting factors to the productivity of estuarine-dependent organisms may include the food and cover accessibility, and salinity ranges. Food and cover needs are met by emergent and submergent wetland vegetation. Submerged aquatic vegetation and emergent vegetation provide cover and food, while deterioration of emergent marsh and submerged aquatic vegetation provides the detrital material that drives the food chain in a nursery system. With the depletion of the resource base, and erosion of the marsh substrate, food and cover will disappear. However, detrital material stay in the system for several years. Submerged aquatic vegetation, will be impacted by increased turbidity which limits photosynthesis necessary for plant survival.

Brown Shrimp

The brown shrimp is the major species of shrimp in the Gulf shrimp industry, which is the most valuable fishery in the United States. Shrimping begins in May, peaks in June and July during seaward migration, and continues offshore through November. Spawning is reported to occur in offshore waters deeper than 60 feet and possibly as deep as 450 feet. The major spawning occurs from September to December, with a minor peak from March to May. Eggs hatch into planktonic larvae which grow by molting through nauplius, protozoa, mysis to the post-larval stage in ten to twenty-five days. Larval development takes place in Gulf waters.

The portion of the brown shrimp's life cycle spent in estuaries is critical. Peak recruitment of post-larvae may occur months after the peak of spawning. Overwintering brown shrimp post-larvae may burrow into the bottom and wait for warmer temperatures before entering the estuary. February through May are normally the peak months for ingress (Table 3), however this may vary year to year. Post-larvae are most often found in the upper portions of the water column and may modify their position according to light. As they grow and move to shallow, soft-bottom areas of the estuary, they become randomly distributed throughout the nursery areas. During this phase of their life cycle they are opportunistic omnivores, feeding on a variety of organic matter. Brown shrimp are significantly more dense in vegetated habitat than in non-vegetated water bottoms. Their greatest abundance generally occurs in salinities of 10 to 30 parts per thousand (ppt), however they have been collected from fresh areas to over 60 ppt. Peak ingress is in most cases associated with increased salinities, while egress is associated with declining salinities. June and July are normally the peak months of brown shrimp emigration, and is correlated with full moon and outgoing tide at twilight and on into the night.

White Shrimp

White shrimp compose about forty percent of the Gulf shrimp fishery. The offshore commercial fishery begins in late August and September when the shrimp leave the estuaries, and is generally concentrated with the thirty foot contour. Adult white shrimp spawn in shallow offshore Louisiana waters from the latter part of March or early April through September with a peak in June or July. The same shrimp may spawn as many as four times in one season. Growth is similar to the brown shrimp with larval development in offshore waters and movements largely governed by currents. Post-larval white shrimp begin entering the passes in small numbers in late May, but peak in August and September in Louisiana (Table 3). Often post-larvae appear in waves, depending upon environmental conditions of temperature and salinity.

Within the estuary, the juveniles disperse rapidly and are associated with the marsh-water interface, but generally in the non-vegetated areas with no seasonal difference between vegetated and non-vegetated bottoms. Juvenile white shrimp are found in lower salinity waters than brown shrimp and have been collected from freshwater to over 30 ppt, however they are more abundant in salinities ranging from 0.05 to 10 ppt. White shrimp are a warmer water species than brown shrimp. As the weather cools they begin to migrate to higher salinities and deeper waters. The magnitude of migration is dependent on total amount and abruptness of the temperature drop. White shrimp like brown shrimp are omnivorous, ingesting amphipods, polychaetes and organic detritus. Due to the extensive low salinity nursery areas in Vermilion and Atchafalaya, there is more white shrimp production inshore as white shrimp favor low salinity nursery habitat; the 1989 inshore harvest was 419,000 pounds, of which 72% was white shrimp (in 1979 the percentage was 97%).

Crawfish

Between 1986 and 1991, an average of 1,580,000 pounds of crawfish, with an average value of $719,000, were landed in St. Mary and Iberia Parishes. However, an undetermined portion of the crawfish landed could have been caught in the Atchafalaya Basin. No crawfish data is available for Vermilion Parish; however, commercial culture of crawfish is conducted in many rice fields in that parish. Crawfish ponds and rice fields in the Teche/Vermilion basin also provide habitat for wintering waterfowl, wintering shorebirds, and resident wading birds.

Atlantic Croaker

The Atlantic croaker ranges from the Gulf of Maine to Argentina, and is one of the most abundant inshore fishes of the Gulf of Mexico. They are the prime target species of the groundfish industry, as a protein source, in the Gulf of Mexico. Sport fisherman also harvest this fish even though it is less preferred than spotted seatrout and red drum. Spawning has not been observed but is believed to take place in the open Gulf near the mouths of various passes that lead into shallow bays. Spawning occurs from September to late March with a distinct peak in October. Eggs hatch in less than a week and the larvae are planktonic. By late November post-larvae croaker begin migrating into estuaries and peak in December and January (Table 3). Young-of-the-year croaker remain in estuarine nursery areas, especially deeper low salinity areas, through spring and early summer.

Emigration may begin as early as June in Louisiana (Table 3). Gulfward migration peaks from September to November and is correlated with decreasing temperatures. Very young croaker feed on zooplankton while larger croaker are omnivorous, feeding on micro and macro benthic animals, small fishes and organic detritus. Adults feed on small fishes, shrimp, crabs, and mollusks. The largest catches of post-larvae and juveniles are in salinities of 15 to 19 ppt. Sudden and prolonged cold snaps can cause mass mortalities when they are in shallower estuarine waters. Croaker rarely live longer than four or five years.

Spotted Seatrout

Spotted seatrout (commonly called "speckled trout") are probably the most popular and sought after fish by the greatest number of people along the Gulf coast. The estimated sport catch is substantially greater than the commercial catch. Adults start appearing along the shoreline, especially at tidal passes, in March and early April (Table 3).

Spawning occurs throughout the summer in both estuaries and the Gulf. Spawning is dependent upon salinity and temperature with optimum at 28 ppt and 28°C, respectively. Spotted seatrout use higher salinity areas for nursery, and so use predominately the eastern portion of the three basins (i.e., Terrebonne rather than Teche/Vermilion and Atchafalaya where salinities are lower. The first minor peak of post-larvae ingress occurs in April (Table 3) and is associated with marsh edge submergent vegetation such as widgeongrass. As they grow seatrout move and feed throughout the estuary during summer, gradually moving to lower bays as they finally migrate to the Gulf in the fall and winter.

Spotted seatrout change their feeding preference from nearly all invertebrates such as shrimp and worms to mostly fish such as anchovies, menhaden, mullet, sheepshead minnow, and silversides as they become adults. Sexual dimorphism exists in this species. As the size of the fish increases there are proportionally fewer males. By the eighth year all spotted seatrout are females, the female grows faster than the male and lives as long as ten years.

Red Drum

The red drum or redfish is a highly valued estuarine-dependent sport and food fish. Large schools of adult red drum often occur along the Gulf shoreline, especially near the tidal passes, from August to November. Along the Louisiana coast "Bull" red drum begin spawning in August. Peak spawning occurs in September and October and tapers off in November. Larva drum have been captured in the passes as early as September. Post-larvae and young juveniles immigrate to sheltered coves and bayous where they rest among shallow water grassbeds. They forage in clumps of grass, oyster beds, and muddy bottoms for small invertebrates. As they mature, during their first winter, young red drum move farther into the estuary and deeper waters.

Some migrate to the open Gulf by spring, however, the main emigration occurs with the cooling of waters in the fall (Table 3). By the time they reach the Gulf their diet has changed to crabs, penaeid shrimp, and polychaetes. They reach sexual maturity in four to five years and about thirty-five inches in length. Most captures of older juvenile and adult drum are from salinities greater than 20 ppt. The red drum is susceptible to sudden cold shocks and massive fish kills have been reported after sudden freezes.

Southern Flounder

The southern flounder is common to the Gulf coastal waters and is a valuable food and sport fish. Adult flounder are most often found on soft muddy bottoms of shallow bays and lagoons, but frequently occur on sandy beach areas. Large flounder have been captured as far inland as freshwater which suggests that the species moves extensively within the estuary. Adult southern flounder apparently migrate from estuaries to nearshore Gulf waters from October to December (Table 3) to spawn, with the peak emigration of males occurring prior to that of females. Males over three years old are not usually caught in the estuary and either may spend the latter part of their life in the Gulf or die after their third year. Growth studies indicate that males grow slower than females.

Post-larvae and juveniles have been captured from the beach near Barataria Bay and in the Caminada Pass area from December through April. Tidal stages rather than day-night cycles appear to be the more important factor affecting migration. Post-larvae and juveniles appear to concentrate in quieter waters of tidal channels during ebb tides and disperse during flood tides.

Recruitment of young flounder into inland waters occur mainly from December through April with peak ingress during February and March. Marshes of either low to high salinity may serve as nurseries. Ninety-five percent of the food items found in the stomachs of small flounder are invertebrates, while larger flounders feed mainly on fish.

Gulf Menhaden

Gulf menhaden (commonly called pogies) range along the coastline of the Gulf from Florida to Veracruz, Mexico. They constitute the largest single fishery by weight in the United States. Menhaden are a schooling species throughout their life which accounts for the success of the purse seine fishery. The bony, mealy fleshed, oily fish is not a food fish, but is processed for fishmeal and oil. The Gulf fishery, which occurs from April to October, is dependent on age-1 and age-2 fish.

Spawning has not been observed, but is reported to occur in the open Gulf from October through March in waters 6 to 420 foot deep. Menhaden may spawn four or five times during a spawning season, releasing spherical eggs that float near the surface. Larvae may spend three to five weeks in offshore waters prior to moving through the passes into the estuaries. Peak movements may vary year to year, and generally occur from December through March or April (Table 3).

Juveniles remain in low salinities, where they travel in dense schools often near the surface. The length of time they spend in the estuary is variable, ranging from six to twelve months after hatching. Emigration of adults and maturing juveniles has been reported to occur from midsummer through winter, with peak movement from October to January (Table 3). Movement back into inshore waters by surviving members of all age groups following overwintering in the Gulf occurs early the following spring in March or April. Gulf menhaden live to a maximum of four years, therefore, this cycle may be repeated several times.

Menhaden have two distinct feeding stages - larvae feed on individual zooplankton, while juveniles and adults are omnivorous filter-feeders. Research on the closely related Atlantic menhaden indicate that algal production in an estuary is insufficient to sustain even the juveniles. Juvenile Atlantic menhaden ingest significant quantities of vascular plant material and are able to digest cellulose with 75 percent efficiency. This demonstrates an efficient direct link from marsh primary production to fishery utilization.

Trapping

Fur trade was an integral part of Louisiana's coastal economy in the early 1900's. The productivity of Louisiana's marshes for fur production is the highest in the North American Continent for nutria. This is noted in Linscombe and Kinler 1985.

> Stanley Arthur wrote in 1931, Louisiana produced more pelts of fur animals than any other state in the union, or providence and territory in Canada. He further stated that during the peak period of the late 1920's, Louisiana produced more pelts of fur animals than all of the Dominion of Canada with Alaska's harvest thrown in for good measure. Between the 1913-14 season and the 1929-30 season average statewide production was over five million pelts. During the 1922-23 season estimates from fur trade indicated that ten to fifteen million muskrats were shipped from the state. Louisiana has continued to hold this prominent position in fur production. Harvest data from the 1981-82 season indicated that Louisiana was the number one state in fur production. However, the average fur harvest during the past twenty years was two and a quarter million pelts, only 45 percent of the early 1900's production.
>
> Louisiana produced 97 percent of the North American nutria harvested during 1970-71 season through 1980-81 season. The coastal area of the state accounted for 97 percent of the harvest. The Chenier Plain parishes, comprising 36 percent of the coastal marshes (excluding salt marsh), accounted for 19 percent of the nutria harvest during this period.

The market for furs has drastically declined in recent years and the resulting overpopulation of some species have had a detrimental effect in some marsh areas.

Linscombe and Kinler (1985) examined the fur harvest in the eastern and western zones of Louisiana coastal marshes. They looked at each of the furbearing species within these zones and determined the amount of acreage necessary for the various marsh types to produce a single individual of these species. These rates according to species and marsh type within the Chenier Plain are depicted in Table 5.

Table 5. Fur Harvest Rates (acres yielding one animal) for Teche/VermilionRiver Basin by Vegetative Type
Type[1].

Species	Fresh	Intermediate	Brackish
Nutria	3.4	5.6	7.3
Muskrat	36.0	99.0	8.5
Raccoon	86.0	73.0	68.0
Mink	23.0	329.0	466.0
Otter	2,036.0	1,258.0	752.0

[1]Data from Linscombe and Kinler 1985, Fur Harvest and Distribution in Coastal Louisiana.

Linscombe and Kinler using fur harvest data placed a dollar value obtainable for each species by acre according to marsh type. Table 6 examines these figures according to species and marsh type within the Chenier Plain.

Table 6. Fur Harvest Value (dollars per acre) for River Basin by Vegetative Type1.

Species	Fresh	Intermediate	Brackish
Nutria	$1.94	$1.18	$0.90
Muskrat	$0.15	$0.05	$0.63
Raccoon	$0.02	$0.02	$0.02
Mink	$0.02	$0.01	$0.01
Otter	$0.01	$0.01	$0.02
TOTAL	$2.14	$1.27	$1.58

Using the value figures developed by Linscombe and Kinler and the acreages of these marsh types (54,040 acres of fresh marsh; 40,677 acres of intermediate; and 137,880 acres of brackish marsh) within the project area, an annual value estimate of $385,153 was obtained for the basin. Table 7 shows this estimate of annual value according to species and marsh type within the project area.

[1]Data from Linscombe and Kinler 1985, Fur Harvest and Distribution in Coastal Louisiana.

Table 7. Annual Value Estimates of Fur Harvest by Marsh Type for Teche/Vermilion River Basin

Species	Fresh	Intermediate	Brackish	Total
Nutria	104,838	47,999	124,092	276,929
Muskrat	8,106	2,034	86,864	97,004
Raccoon	1,081	814	2,756	4,651
Mink	1,081	407	1,378	2,866
Otter	$540	407	2,756	3,703
TOTAL	$115,646	$51,661	$217,846	$385,153

Muskrat and Nutria

Fresh marshes have the lowest muskrat populations and the highest nutria population. Muskrat numbers generally increase as salinities increase and are most abundant in brackish areas. These two animals can occupy the same area without significant conflict. Their selection of food overlaps on some plant species, but generally nutria feed on coarser vegetation above the ground and the muskrat takes more of its food below the surface in the form of roots, tubers, and rhizomes.

The muskrat is widespread throughout the coastal marshes of south Louisiana. In areas near sea level it builds houses from readily available vegetation. These houses are three to five feet in diameter at the base and two to four feet in height. The main food source for muskrats is vegetation, but small quantities of fish, snails, mussels, insects, crabs and crawfish are also eaten. The preferred vegetation eaten by muskrat include Olney and saltmarsh bulrush, cattail, alligatorweed, roseau shoots, and pickerelweed.

Nutria, a native of South America, was introduced into Louisiana in 1938. By 1943 the species was widespread in the southern parishes, and today the distribution is statewide. In marsh areas nutria feed largely on bulrushes, cattail, alligatorweed, and many other plants. Often a feeding platform of vegetation is erected which is a resting area used during feeding.

Linscombe and Kinler (1985) calculated the differential rates of productivity for nutria and muskrat on fresh, intermediate, and brackish marshes (Table 5). These estimates are in acres of marsh needed to support one furbearer. Nutria were found to be the most productive furbearer with a 3.4 acres to animal unit in the Chenier Plain fresh marsh. Muskrat was found to be most productive in the brackish marshes with 8.5 acres per animal unit. This rate is still less than nutria in the brackish marsh with a 7.3 acre per animal unit productivity rate (Table 5). The value per acre for nutria is $1.94, $1.18, and $.90 per acre for fresh, intermediate, and brackish marshes respectively (Table 6) with a total value to the study area of $192,846 per year.. Muskrat value per acre was $.15, $.05, and $.63 per acre for the respective marsh types with a total value to the basin of $71,725 per year.

Raccoon

Raccoons are found statewide in a wide variety of habitats. They are omnivorous, eating berries, shoots and buds of many different plant species, and consuming crawfish, crabs, snails, clams, frogs, earthworms, and insects. Raccoon was found to be most productive in the brackish marshes (Linscombe and Kinler 1985). This furbearer needs 68 acres of marsh per animal unit (Table 5) for a value of $.02 per acre. The total value of raccoon productivity is estimated at $3,558 per year to the basin (Table 6).

Mink

Mink live in areas adjacent to a water source. The largest populations occur in the coastal marsh. They often live in dens abandoned by other animals, such as nutria and muskrat. These nests are lined with soft materials, such as feathers, fur and grass. The diet of the mink is dependent upon the availability of food items. In the coastal area they feed largely on fish, crabs, crawfish and frogs.

Mink was found to be most productive in the fresh marshes (Linscombe and Kinler 1985). This furbearer needs 223 acres of marsh per animal unit (Table 5) for a value of $.02 per acre (Table 6). The total value of mink productivity is estimated at $1,943 per year to the basin.

Otter

Otter occur throughout the state wherever water is abundant. The largest populations occur in the Atchafalaya Basin and coastal marshes. Although they usually dig their own den on the banks of stream, with the entrance hole under water, they have been known to utilize abandoned nutria or muskrat dens. Their diet consists largely of frogs, snakes, fish, turtles, crawfish and crabs, however they will also eat birds, rats and mice. Otter was found to be most productive in the brackish marshes (Linscombe and Kinler 1985). This furbearer needs 752 acres of marsh per animal unit (Table 4) for a value of $.02 per acre (Table 5). The total value of otter productivity is estimated at $2,834 per year to the basin.

Alligator

The American alligator, which is listed as threatened due to similarity of appearance, is commercially harvested in Louisiana. The alligator, first described in 1718, has survived two centuries of hunting. Even after they were extensively harvested to meet the Civil War demand for shoe leather, the marshes continued to support an immense population(Johnson, 1969). In the late 1800's, 4.5 to 6-meter alligators were so commonplace they did not attract considerable attention and were considered a nuisance. In the late 1800's one hunter could market over 1,000 alligator hides annually. Between 1880 and 1904, the population was reduced by an estimated 80%, but as late as 1890, some 280,000 alligator skins still were being processed in this country annually (Waldo, 1957). Linscombe and Kinler using fur harvest data placed a dollar value obtainable for each species by acre according to marsh type. Table 8 examines these figures according to species and marsh type within the Chenier Plain.

In the late 1800's, one hunter could market more than 1,000 alligator hides annually, ca. 1905: (Louisiana State Library, Louisiana Collection. WPA Photographic Archives).

Figure 16. Historical Picture of a Louisiana Alligator Trapper.

Table 8. Alligator Harvest Tags Issued Per Acres Of Habitat[2].

Parish	Brackish Marsh	Intermediate Marsh	Cypress Swamp
Iberia	1:350	1:200	1:200
St. Mary		1:100	1:200
Vermilion	1:350	1:200	

Table 8 displays the number of tags issued per habitat type for all three parishes in the basin. Tags are issued by the Louisiana Department of Wildlife and Fisheries to regulate the harvest of alligators. The number of tags issued depends on the marsh type and reproductive effort (nest count) in the harvest area. The Teche/Vermilion basin contributes to the State's high alligator harvest.

Table 9 displays the number of licensed alligator meat and part dealers in St. Mary and Iberia Parishes. Because some of those dealers could buy and sell products made from alligators that were not harvested in the Basin, the number of licenses issued should be used only as a

[2] Tags for dewatered marsh and deteriorating brackish marsh are issued at a rate of 1 tag per 700 acres. Source: LDWF, Unpublished data.

general indicator of the alligator industry supported by the Basin, especially that portion within the study area.

Table 9. Commercial Wildlife Licenses Sold By Parish in 1991[3].

	Parish		
Type License	St. Mary	Iberia	Total
Trapping(<15 Traps)	3	2	5
Trapping(>14 Traps)	215	15	230
Fur Buyer	14	6	20
Fur Dealer		3	3
Alligator Meat Dealer	1	33	34
Alligator Parts	7	5	12
Frog Gig	10		10
Total	250	64	314

[3] Source: LDWF, Unpublished data.

Mineral Extraction

The importance of oil and gas production can be seen by the number of production fields and amount of infrastructure for transport of these resources. The basin is innervated with hundreds of miles of oil, gas, and product pipelines. The number of oil and gas fields display the tremendous investment in extractive industries for the river basin. The basin contains the following production fields (East to West) by parish:

Table 10 Oil and Gas Fields - Teche/Vermilion Basin.

St. Mary Parish	Iberia Parish	Vermilion Parish
Baldwin	Avery Island	Banker
Bayou Carlin	Bird Island Bayou	Bayou Hebert
Bayou Sale	East Cote Blanche Bay	Boston Bayou
Charenton	Lake Ferme	Buck Point
Cote Blanche	Lake Sand	East Buck Point
East Lake Sand	Lake Tom	Esther
Franklin	South Tigre Lagoon	Fresh Water Bayou
Garden Island	Southeast Avery Island	Hell Hole Bayou
Jeanerette	Vermilion Bay	Intracoastal City
Onion Bayou	Weeks Island	Live Oak
Patterson	West Lake Ferme	North Buck Point
		North Fresh Water Bayou
		South Erath
		Tigre Lagoon

Non-Commercial

Recreation

The Teche/Vermilion study area offers many recreational opportunities, including fishing for both saltwater and freshwater species. The basin's hunting resources offer an abundance of migratory and freshwater species as well as migratory and non-migratory waterfowl, various small (rabbits, quail, etc.) and large (deer) game. The basin also offers non-consumptive use of recreation for bird watchers and campers who visit and enjoy the abundance and diversity of the basin's coastal marshes.

Fisheries

Fisheries resources, both commercial and recreational, are a vital component of the Teche/Vermilion Basin's economy. The basin's residents and many visitors purchase both saltwater and freshwater fishing licenses to pursue the various species of fish that abound. The businesses in the area benefit from the income generated by related local purchases of fuel, supplies, and equipment for this sport.

The marine and estuarine-dependent species include the species listed in the Commercial Fisheries subsection and: 1) Spanish mackerel, 2) blue fish, and 3) grey snapper. These recreationally important species spend some of their life cycle in the bays and the surrounding marshes.

Low-salinity marshes within the study area support an abundance of freshwater sport fishes such as largemouth bass, yellow bass, bluegill, redear sunfish, crappie, freshwater drum, blue catfish, and channel catfish. The geographic distribution of freshwater fish in tidally-influenced areas is largely dependent upon isohalines (ridges of constant salinity). During high rainfall years, red swamp crawfish are occasionally abundant within the tidally-influenced low-salinity marshes.

Hunting

The Teche/Vermilion basin is blessed with vast and diverse hunting resources. This section will concentrate on waterfowl, and selected small and large game species.

Waterfowl

The study area is part of the Mississippi River Flyway and winters millions of migratory waterfowl every year (Figure 17). The basin also contains the non-migratory, mottled duck, which makes its home in the Louisiana coastal marshes.

Figure 17. Geese use the marshes of River Basin to winter and feed

Geese

Southwestern Louisiana is a primary wintering area for geese, and is of special importance for Snow Geese. All geese that winter in Louisiana are primarily grazers. Favorite food types are rice, rice sprouts, Olney bulrush, saltmarsh bulrush and the new leaves of freshly burned marshhay cordgrass. The brackish marsh is the favorite zone for geese since Olney and saltmarsh bulrushes are common there.
A fair food plant for geese is smooth cordgrass. The burning of brackish areas from September to February favors the production of tender young shoots and clears the ground of heavy roughage so the geese can get to the roots and tubers of marsh plants. Burning encourages the growth of the bulrushes and results in the production of tender leaves of marshhay cordgrass.

A good management practice for geese is to perform a prescribed burn two or three weeks before the arrival of geese into the area. A series of these burns two or three weeks apart can be spread over the winter months to assure the continuing production of young and tender vegetation.

Ducks

Ducks actually favor the fresh and intermediate marsh areas, but if the food supply and water conditions are suitable, the brackish marshes may also be utilized.

Most marsh management for ducks is applicable to puddle ducks rather than diver ducks, which prefer deeper lakes and bays. Water depth is a critical factor to consider in management for ducks. If a marsh is dry, or if the water is too deep, puddle ducks will not utilize the area. Normally fifteen inches of water cover is the maximum feeding depth for puddle ducks.

The earlier successional stages of plant species furnish the greatest abundance of duck food. Saltgrass and tender shoots of marshhay cordgrass are good food items.

Other

The marsh provides food and cover for many important hunting species. These include large game such as whitetail deer, small game such as rabbits and birds such as quail and dove. This section will concentrate on whitetail deer and swamp rabbit.

Whitetail Deer

The whitetail deer is found in all areas of Louisiana where suitable habitat is present. The extent of the home range of the animal varies seasonally. During most of the year, the range varies from 300 to 600 acres. With the advent of the breeding season, males will move further in search of receptive females.

Deer are completely herbaceous in their food habits and the number of plant species they are known to consume is over one hundred. In the marshes, their diet consists of tender marsh vegetation and browse from bushy canal spoil banks and natural levees and bayous.

Deer living in marsh areas are normally found in greater numbers in fresh and intermediate locations. Their numbers diminish in brackish areas and they are seldom found in saline marshes. Like many other species, deer utilize bushy cover found on spoil areas. Deer in these areas usually feed in the marsh and retreat to the bushy cover to escape predators or to find shaded resting places. Care should be taken to avoid the burning of these areas during prescribed burning procedures.

Swamp Rabbit

The swamp rabbit differs from the eastern cottontail in that it is larger and has a darker coat color. The species is found in all parts of Louisiana. It tends to thrive best in coastal marshes and areas that are heavily wooded. In marshes, swamp rabbit populations are concentrated in areas where canal banks and wooded ridges provide good cover, but it will also live in a cover of roseau cane, paille fine, or Olney bulrush. Nests are constructed in shallow depressions on the ground and are made of a mixture of grass and rabbit hair.

Swamp rabbits are herbivorous and will utilize food types such as grasses, sedges, cane and aquatic emergents. They usually feed at night, but at particular times, such as after a rainfall, the rabbit may be seen feeding in the daylight hours.

Visual Utilization (Non-Consumptive Use)

The basin study area has a diverse ecosystem and culture that offers opportunities to see historical land marks and natural habitat. The marsh and waterways in the lower basin area are receiving attention from the standpoint of their potential for unique parks and recreational developments drawing upon the resources peculiar to the area.

Bird watching is a major attraction in the area bringing visitors from many states. During migration periods species congregate in the area prior to crossing the Gulf, and on their return gather reserves to continue northward. The coastal wetlands of Louisiana provide habitat for some of the largest concentrations of nesting egrets, herons and ibises in North America. The Jungle Gardens and Bird Sanctuary at Avery Island was developed by the late Edward Avery McIlhenny. Enormous flocks of egrets and herons, among other species, are protected on the island and may be seen in early spring and summer; ducks and other wild fowl are also present in the winter. A listing of known animals that occur in the basin is in Appendix D.

Christmas Bird Counts (CBCs), one of the first efforts to inventory bird species, were started in the northeastern states in 1901 with 25 counts conducted by 27 participants. In 1916 a 15 mile diameter circle was designated as the standard count area. Since then the counts have increased to include all states within the United States, Canada, Mexico, and Central America. In 1931 (Appendix E) a count was conducted and published in Bird Lore, 1932. Appendix E contains the species found on this count. This one bird count encompasses a 15 mile diameter area located southwest of New Iberia including parts of Avery Island and cypress swamps and bayous on the north shore of Vermilion Bay.

New Iberia, Queen City of the Teche, and Abbeville are examples of the cultural heritage of the region. The town of Delcambre is known as the "Shrimp Capital of Louisiana," hosts the Delcambre Shrimp Festival with the Blessing of the Fleet. There are numerous other fairs and festivals conducted throughout the river basin. In Charenton there is a federally recognized Chitimacha Indian Reservation which has a museum consisting of Indian crafts and works of art. The Chitimachas were known as the best weavers in the nation.

Antebellum homes can be seen in the study area. Among those that are noteworthy because of a particular historical event, a unique architectural feature, or an unusual state of preservation are The Shadows and Bayside in Iberia Parish, Oaklawn Manor (Figure 18) and Darby (Figure 19) in St. Mary Parish. Carefully restored to its original state by the National

Trust for Historic Preservation, The Shadows is an excellent example of a fine south Louisiana home of the 1830's.

In addition to bird watching, abundant cultural resources and activities are available throughout the basin for visitors and natives alike to enjoy.

Threatened and Endangered Species

Federally listed threatened and endangered species occurring in the Basin include the Louisiana black bear, bald eagle, Arctic peregrine falcon, brown pelican, piping plover, and several species of sea turtles. The piping plover and Arctic peregrine falcon are threatened species that winter in coastal areas of Louisiana. Piping plovers are most often found near the Gulf of Mexico, particularly near beaches, and are most numerous on tidal flats along passes. Piping plovers are known to winter on the beaches from Pointe au Fer, west to Freshwater Bayou (Haig and Plissner 1992). Peregrine falcons can be found throughout coastal marshes and along the Gulf shoreline. Endangered brown pelicans are year-round residents that feed in shallow estuarine areas. There are no known brown pelican nesting sites in the Teche/Vermilion Basin.

The Louisiana black bear is a threatened subspecies of the black bear found in the Teche/Vermilion Basin. Although black bears are habitat generalists that use a variety of cover types, they are primarily associated with forested wetlands. Within forested wetlands, black bear habitat requirements include food (i.e., both hard and soft mast), thick vegetation for escape cover/dispersal corridors, large trees for den sites, and areas of isolation for refuge from humans.

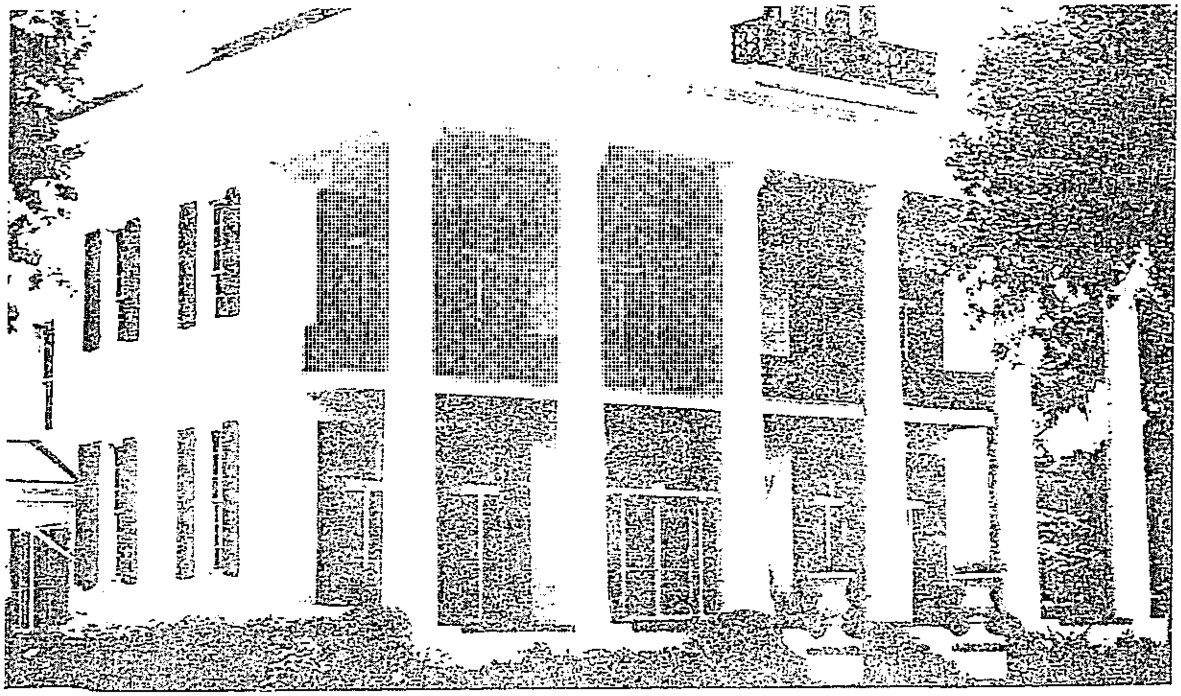


Figure 18. Oaklawn Plantation Home.

Source: Gulf South Research Institute

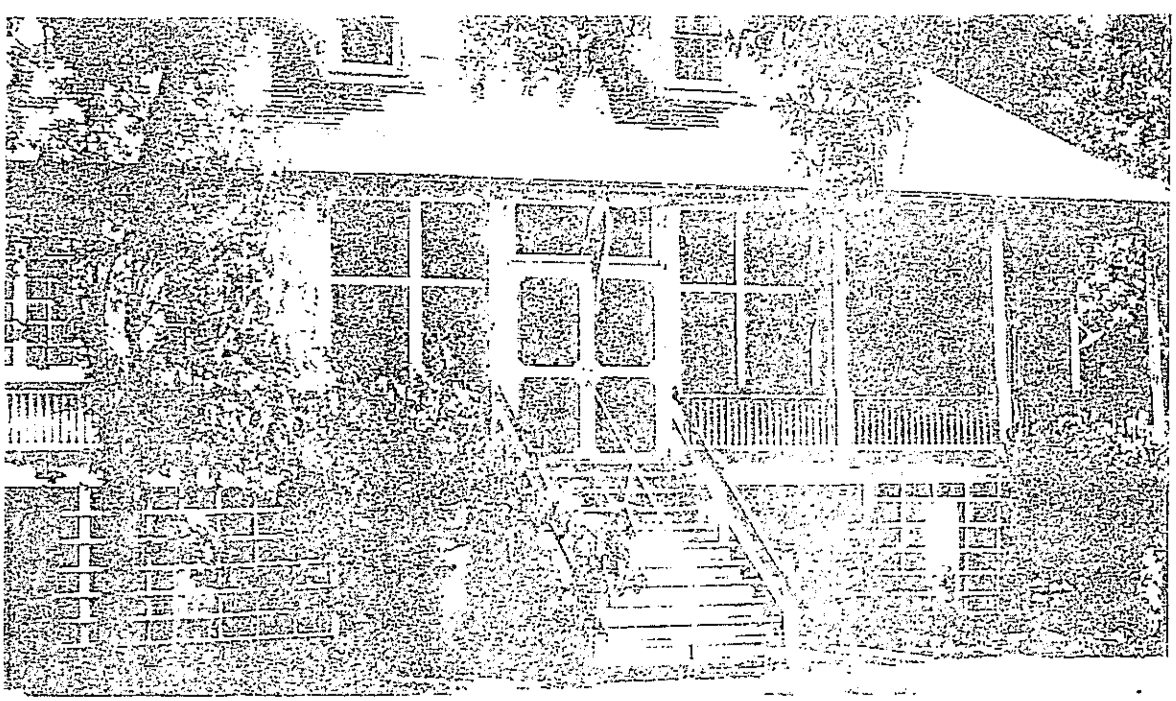


Figure 19. Darby Plantation Home.

Source: Gulf South Research Institute

Forested wetlands south of U.S. Highway 90 in Iberia and St. Mary Parishes are believed to support a population of Louisiana black bears. Louisiana black bears are also known to utilize the marshes in the southern portion of those parishes. Spoil banks and natural ridges are used as black bear travel corridors in the marsh.

The listing for the Louisiana black bear defines potential den trees as baldcypress or tupelo gum, with visible cavities and a minimum diameter of 36 inches at a height of 4.5 feet from the ground (diameter at breast height), which are located along rivers, streams, bayous, sloughs, or other water bodies. Therefore, projects proposed in areas with baldcypress or tupelo gum trees that meet the above criteria should be carefully designed to avoid any impacts to potential den trees. Section 9 of the Endangered Species Act of 1973 (as amended) prescribes criminal charges for unauthorized "take" of endangered species. Destruction of a den tree would be considered a take, as defined in the implementing regulations for the Endangered Species Act of 1973 (as amended).

The process for designating critical habitat for the Louisiana black bear is ongoing. Any designated critical habitat would likely include portions of Iberia and St. Mary Parishes. The US Department of the Interior - Fish and Wildlife Service will provide additional information on the critical habitat designations as it becomes available.

There are 12 known nests of the endangered bald eagle in St. Mary Parish; however not all of those nests are within the Basin. Within the Basin, no other parishes are known to have bald eagle nests. Restrictions on construction time periods and distance of work to nests have been developed by the US Fish and Wildlife Service to help avoid adverse impacts to nesting eagles. These restrictions may be obtained from the aforementioned agency. Expansion of the bald eagle population within the basin is highly possible; therefore, the NRCS should continue to coordinate with the US Fish and Wildlife Service regarding potential impacts resulting from planned project features.

Section 7 of the Endangered Species Act of 1973 (as amended) requires that all Federal agencies prepare a Biological Assessment if threatened or endangered species are present within the area to be impacted by their activities, and to consult with the US Fish and Wildlife Service if their actions are likely to adversely affect any threatened or endangered species.

Socioeconomics

The demographic information contained in this section was from the 1980 and 1990 Census publications. These publications gave 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.

The Teche-Vermilion River Basin is an area that has a combination of urban and rural influences within the three parishes that are portions of the study area. The more urban portions of these parishes are outside of the study area.

Iberia parish had an increase in population of 7.13 percent between 1980 and 1990 from 63,752 people to 68,297. Vermilion Parish's population rose by 3.3 percent from 48,458 in 1980 to 50,055 in 1990. while St. Mary's parish had a 9.6 percent decrease in population from 64,253 to 58,086 in 1990.

The population distribution of the parishes shows similar age distribution, in 1990, except Vermilion Parish had a larger portion of its population in the over-45 age group than the other parishes. The 45-and-over group accounted for 31 percent of the population in this parish while it accounted for 27 percent of the population in Iberia and St. Mary parishes. On average, the parishes had about 27 percent of the population under 15 years of age, 23 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 28 percent in the 45 years or older age group.

During the 1980 to 1990 period unemployment in the state went from six percent to over nine percent. These losses showed up as an increase from 5.5 percent unemployment in 1980 to 10.9 percent unemployment in 1990 for Iberia Parish. This trend also showed up in the percentage of population below poverty level. In 1980, Iberia Parish had 11.8 percent of the population below poverty level while in 1990 the percent of the population below the poverty level was 25.8 percent. The actual number of residents under the poverty level went up 9,906 from 7,523 to 17,429.

St. Mary Parish had a 4.6 percent unemployment rate in 1980 and 11.1 percent rate in 1990. This trend also showed up in the percentage of population below poverty level. 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 $6,472 in Iberia Parish. By 1990 the per capita income increased by $1,988. During the same period inflation drove the average cost of living up 58%[3]. This means that 1990 dollars are worth $5,991 in 1980 terms and that residents actually lost $481 (7.4 percent) of buying power per person.

St. Mary Parish had a per capita income of $6,789 in 1980 and $8,777 in 1990. The per capita income had increased by $1,988. During the same period, inflation drove the average

[3] 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.r

cost of living up 58%. This means that 1990 dollars were worth $5,555 in 1980 terms and that residents actually lost $1,234 (18.2 percent) of buying power per person.

Vermilion Parish had a the per capita income of $6,106 in 1980 and 8,752 in 1990 the per capita income had increased by $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 the basin residents are, on average, less educated than the state. The education level information is based the percent of residents, age 25 or older, that graduated from high-school or college. In 1980, Iberia parish had 49.6 percent of residents with at least a high school education and 9.7 percent of with a college degree. St. Mary parish had 50 percent with a high school degree and 9.2 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, Iberia Parish had 59.3 percent of residents with at least a high school education and 9.0 percent of with a college degree. St. Mary Parish had 58.1 percent with a high school education and 8.3 percent with 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 had a lower rate than the state, but Vermilion parish had the greatest increase in the population with a high school degree. Iberia had a smaller percentage of the parish population with a college degree in 1990 than 1980, but had an increase of about 400 people with college degrees. St. Mary Parish had a shrinking population overall between 1980 and 1990, but an increase in the number of people 25 or older. This represents a loss in the younger population. Also, the percent of people with college education had declined between the two periods representing a loss of people with higher education.

Agriculture

The section on agriculture is based on comparisons and inferences from the 1982, 1987, 1992 Census of Agriculture from US Department of Commerce, Bureau of the Census.

The agricultural statistics show that the basin parishes farm income 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. St. Mary parish had a smaller farm size trend with a stable farm number base. Iberia parish had a decreasing farm size and increasing number farmers (Table 11).

Table 11. Agricultural Demographics between 1982, 1987, and 1992

	Average # of Farms	Average Size	Farmers Tenets	Age	w/other jobs
1982					
Louisiana	31,628	282	3,878	50.5	16,999
Iberia	351	316	61	51.9	148
St. Mary	101	864	45	49.4	36
Vermilion	1,283	267	210	50.8	545
1987					
Louisiana	27,350	293	3,686	52.0	13,854
Iberia	365	289	74	50.7	160
St. Mary	88	809	50	50.6	17
Vermilion	1,189	284	166	53.2	426
1992					
Louisiana	25,652	306	3,883	53.5	12,721
Iberia	289	289	80	53.8	64
St. Mary	809	809	60	51.8	25
Vermilion	284	284	176	54.4	449

The measure of profitability of a business is in the net income. For comparison of farms across the 1982, 1987 and 1992 reporting periods would be to measure net income on a per acre basis. In 1982 the average net income per acre was $54.89 for the state. Iberia, St. Mary, and Vermilion Parishes were more profitable with a $128.59, $139.71, and $68.26 per acre net incomes, respectively.

In 1987 the average net income per acre was $39.59 for the state, which was about $15 less than the 1982 figure. Iberia and St. Mary Parishes had greater incomes than the state average with $95.05 and $92.48, respectively. Vermilion Parish farmers were less profitable on a per acre basis than the state average with $30.21 profitability.

In 1992 the average net income per acre was $38.04 for the state, which was about $1.50 less than the 1987 figure. Iberia and St. Mary were still more profitable than the state average and Vermilion parish less profitable. However, 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. However, Iberia, St. Mary, and Vermilion suffered a 38 percent, 71 percent, and 57 percent loss in per acre profitability, respectively.

Farming has been under a cost-price squeeze on production. In order to understand this one must look at the inflation effects of prices received for farm products and prices paid for farm inputs. Using information from the Economic Research Service one will see 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 of 12.7 percent. This represents a 7.3 percent rate of increase in per unit costs over per unit income.

To see the true buying power of the farm net income one must adjust for the effects of inflation for purchase of ordinary consumer goods. Assuming that rural producers will purchase many of the same goods as non-rural consumers, one will see that the consumer price index on all consumer goods increased 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, Iberia, St. Mary, and Vermilion Parishes were $26.23, $55.27, $27.74, and $20.23 per acre, respectively.

The cost-price squeeze shows up in the 1976 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.

Civil Rights Compliance

A civil rights impacts analysis was performed as required by Departmental Regulations 4300-4. The purpose of this regulation is to assure that no individuals that are socially or economically disadvantaged women, or persons with disabilities are negatively impacted by any policy, program, or action administered by the U.S. Department of Agriculture (USDA). The civil rights policy for USDA and its programs states:

> "No person or group shall be discriminated against on the basis of race, color, sex, national origin, religion, age, disability, or marital or familial status in any employment practice or in any program conducted or assisted by the Department of Agriculture."

Under this policy "major civil rights impacts" are those consequences of proposed policy actions which, if implemented, will negatively and disproportionately affect minorities, women, or persons with disabilities who are employees, program beneficiaries or applicants for employment or program benefits in USDA-conducted or assisted programs by virture of their race, color, sex, national origin, religion, age, disability, or marital or familial status.

The civil rights impact analysis weighed the problems and recommended alternate solutions and concluded the overall impact from implementation to all people within the study area should be of a positive nature. While this Teche/Vermilion River Basin Study does not detail a specific plan of action with a funding mechanism in place, it was coordinated in such a manner that alternate solutions used to solve one problem would not adversely impact another area. For instance, one of the primary problems identified within Vermilion Parish was periodic drought conditions and the lack of available freshwater during the crop growing season. A problem identified by the citizens of St. Mary Parish at a public meeting held in New Iberia dealt with tidal induced flooding of properties within the study area. Alternatives to address these resource problems would not negatively or disproportionately affect minorities, women, or persons with disabilities.

All alternate solutions whether offered through actual construction activities or government incentive programs administered directly to provate landowners shall be offered in an equal and unbiased manner to all people without regards to race, color, national origin, age, disability, marital or familial status. Implementation of recommended alternate solutions should enhance the natural resources within the area, which in turn, will improve and sustain the quality of life of all people with the Teche/Vermilion River Basin.

PROBLEMS

The objective of this section is to list the problems of the study area, then discuss historical events that lead to the present conditions, and describe the impacts of these events. The problems associated with the Teche/Vermilion River Basin are both natural and man-made. The natural occurrences are apparent sea level rise, saltwater intrusion, increased water level fluctuations, and shoreline erosion. The man-made events are saltwater intrusion, increased water level fluctuations, rapid freshwater removal, ponding, and erosion of interior marsh. Some of the man-made problems are the same as natural occurrences because they are aggravated by man-induced changes to hydrology.

Natural Occurrences

Several factors that cause marsh loss occur naturally. These include relative sea level rise, subsidence, wave energy, tides, saltwater intrusion, and shoreline erosion.

Relative sea level rise

This is described as the net sum of subsidence and global sea level rise. Relative sea level rise impacts the design, construction, and operation of water resource projects, and the regulation of natural resources in Louisiana, both in water control operations and permit authority.

In 1929, Mean Sea Level (MSL) at Biloxi, Mississippi, was used to determine the zero elevation for the North American Sea Level Datum (in 1978 this was renamed National Geodetic Vertical Datum (NGVD), of 1929). Thus in 1929, zero NGVD was equal to MSL at Biloxi and was used to establish the vertical control for the North American Continent. In recent years, as a result of subsidence, global sea level rise, and possibly other geologic factors, the mean elevation of local sea level has increased with respect to NGVD.

A report entitled Relative Sea Level and Subsidence in Louisiana and the Gulf of Mexico by the Louisiana Geological Survey (LGS), dated 1989, establishes the disparity between local Mean Sea Level and NGVD in terms of relative sea level rise. Tide data collected by the National Oceanic Service (NOS) and the United States Army Corps of Engineers, New Orleans District, are the basis for the LGS study. The study showed the relative sea level rise in Galveston, Texas (approximately 100 miles from the study area) had a rate of .62 centimeters per year.

Subsidence

This term is defined as the net effect of numerous processes that result in the downward displacement of land relative to a fixed datum. These processes include, but are not limited to, sediment compaction; regional downwarping of the Gulf Coast Geosyncline; and local sources of subsidence which may be associated with environments of deposition, faulting, salt extraction, and man-induced processes related to subsurface fluid withdrawal and drainage. The LGS study, discussed above, showed the subsidence rate for Cameron and Hackberry to be .42 and .32 centimeters per year after correction for the Gulf of Mexico Sea Level Rise.

Tides

Along the coast of Louisiana, the range, timing, and extent of tides vary with the meteorological conditions, plant form of the shoreline, and seasonal freshwater runoff. Astronomical tides are generally semi-diurnal along the Chenier Plain, thus within the study area.

Tides and storm surge result from the wind blowing over the waters of the Gulf, bays, and lakes. Generally the term wind-tide is used to describe set-up of the water surface in a lake or on the open coast of the Gulf or a bay. On the open coast, an onshore wind of 10 miles per hour can increase the tide by one foot. Usually tidal currents are 1/2 foot to one foot per second or less. Figure 20 shows the tidal difference of two hours due to wind-driven tides at Luke's Landing in St. Mary Parish a gauge registered a difference of two feet. Tidal waters overflowing into canals, roads, and into residential areas is a common occurrence.

Figure 20. Wind-driven tides at Luke's Landing in St. Mary Parish.

Wave energy

Shoreline erosion on the large bays is caused primarily by natural wave energy. Wave energy has gradually increased over the centuries because the bays are naturally getting deeper due to the very slight but constant subsidence and global sea-level rise. Wave energy is also believed to have been increased because humans reduced the size of the shell reefs between Marsh Island and Point Au Fer that shielded the basin's large bays from wave and tidal energy in the Gulf of Mexico.

Shoreline erosion

It is the result of several factors which combined to produce erosion along the coastline of waterbodies and waterway boundaries. Much of the erosion can be prevented and/or controlled. Currents and waves can often be prevented from eroding banks and shorelines by using hardened structures such as bulkheads and revetments. In low energy areas, banks, levees and lake rims can be strengthened by levee refurbishment, vegetative plantings, and wave dampening devices.

Reduced Organic Production

This is problem which prevents a marsh from keeping pace with loss of elevation due to subsidence. Organic production is the build-up of marsh biomases via its own vegetative production in fresh and low salinity marshes. As the natural process of soil subsidence occurs, organic material or introduced sediments must be deposited to maintain proper elevation for wetland plant survival. The inability of marsh vegetation to keep up with subsidence can be a factor in the loss of fresh and low salinity marsh.

Herbivores

These plant eating animals, are a cause of marsh denuding and marsh loss to open water in coastal Louisiana. Scientific evidence indicates that, under certain conditions, grazing of marsh and cypress/tupelo swamp by nutria (Myocaster coypus) and muskrat (Ondatra ziberthicus) is having a negative effect on these habitats. Muskrat "eatouts" are easy to identify by large numbers of muskrat dens and denuded areas of marsh. Cases where effects are not as obvious, it appears that high concentrations of nutria cause a long-term stress on marsh by continuously grazing selected species, uprooting other species in search of preferred roots, and grazing the fresh shoots of certain other species.

Nutria are non-native animals introduced into the United States from South America in 1938. Many people believe that nutria are causing much greater damage than muskrats because they are more numerous, they occur in a greater range of habitats, and their eating habits are less specific. Normally high muskrat concentrations are found only in intermediate and brackish marshes containing abundant amounts of three-cornered grass (Scirpus olneyi). Geese have also been known to cause "eatouts" in marshes that have resulted in conversion to open water, however this problem appears to have declined in recent years and is of less serious concern.

The problem of overgrazing by nutria and muskrat is considered a very serious threat to marshes. These furbearing animals were, until the early 1980's, a valuable resource, harvested in great quantities for their pelts. The commercial harvest of these animals helped keep their populations under control. However, due to the worldwide downturn in the fur industry they now have a very reduced economic value and the populations are expanding rapidly.

Hurricanes

The value of wetlands in protecting resources and reducing economic impacts from hurricane damage is often apparent when storm surge energy is blunted by marshes. These storms strike the Louisiana Gulf Coast on the average of once in 4 years, though locations and frequencies at any one location can vary . High winds, waves and water levels (often exceeding 10 feet) are detrimental to beaches.

Major storms can cause direct losses to wetlands, especially to areas that are vulnerable or in the process of deterioration. In addition, hurricanes can force large volumes of saltwater into interior marshes, where they can cause acute stress to fresh and intermediate vegetation (Coleman et al., 1986). However, hurricane-borne sediments are an important resource in some areas, such as the Teche/Vermilion basin. Between 1917 and 1979, about 7 hurricanes made land fall at Cameron Parish. The most severe being Hurricane Audrey which was a category 4 storm carrying wind speeds up to 144 miles per hour when it landed on June 25, 1957.

Facts Related to the Importance of Wetands as a Storm Buffer

- Coastal wetlands act as a buffer between the Gulf of Mexico and inhabited inland areas.
- An estimated 60-75% of Louisiana's residents live within 50 miles of the coast (1993).
- Between 1899 and 1995 over a dozen major hurricanes (class 3-5) hit Louisiana.
- Many coastal communities were abandoned following hurricanes in deteriorating coastlines and marshes (Chenier au Tigre, Manila Village, Balize, Chenier au Caminada and St. Malo).
- Hurricane Betsy flooded or destroyed 27,000 homes in coastal Louisiana in 1965.
- Hurricane Audrey killed 556 people, in southwestern Louisiana in 1957.
- Hurricane winds subside substantially once they reach the wetland buffer.
- Coastal wetlands buffer the tidal increase and wave intensity of hurricanes.
- At risk are millions of people and billions of dollars in infrastructure (e.g. New Orleans).

Lack of Freshwater

During 1996, Vermilion Parish suffered from one of the worst droughts that had occurred in within the last 30 years. Due to a lack of rain, water levels in the Vermilion River and all adjacent canals were low. The impacted area encompassed 195,000 acres of cropland and 180,000 acres of fresh marsh (Figure 21). Although the impacted area is out of the study boundary, NRCS is just briefly mentioning the drought problem in this report. During the extended drought many agriculture and aquaculture producers experienced pockets of saltwater which threaten their freshwater supply. If methods are not found to address water conservation, enhancement, allocation or distribution during exceedingly dry times for the Vermilion River and surrounding area, devastation to the local economy could occur.

Man Induced Problems

Several problems associated with marsh loss are the result of man's activities or natural problems which are magnified due to man's activities. The problems that are exacerbated by man's activities are saltwater intrusion and interior marsh erosion. The problems which are more of a direct result of man's activities are increased water level fluctuations, rapid freshwater removal, hypoxia and ponding.

Saltwater intrusion

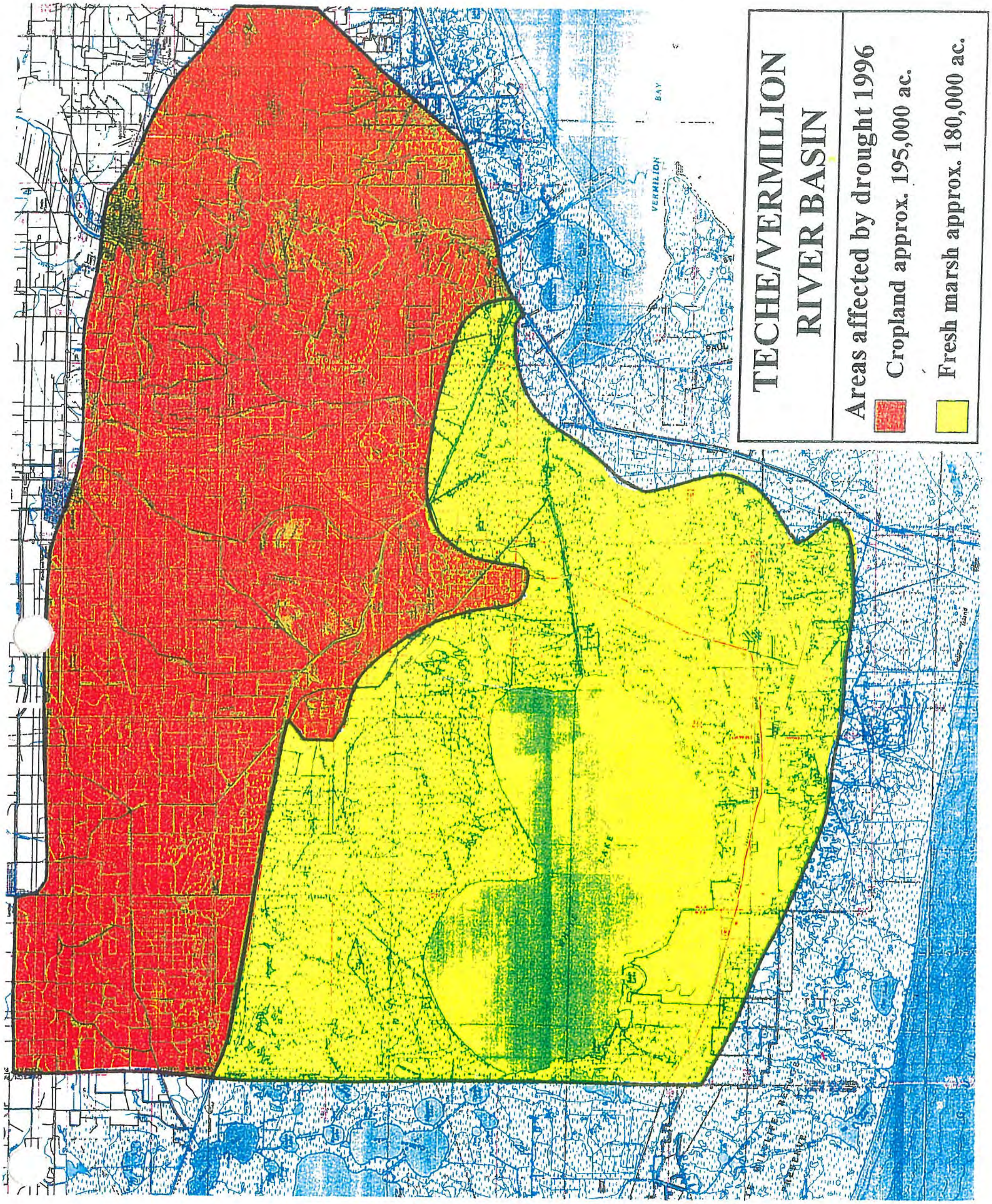
This is the result of an insufficient freshwater hydraulic head to push higher saline waters Gulfward. However, the result of deepening connections to the Gulf of Mexico for navigation and the dredging of access canals for natural resource extraction has exacerbated the problem. The deep channels dredged for navigation allow for entrance of the saline waters throughout the year. This is due to the fact that higher saline waters has greater density than fresher water and thus travel lower in the water column. Therefore, deep draft navigation has provided avenues for saltwater intrusion higher into the basin than would naturally occur.

Dredging of access canals for natural resource extraction purposes has created more connections between the water bodies and waterways that carry more saline water to inland marsh areas. These canals have helped to exacerbate interior marsh erosion by providing direct avenues for saltwater into these interior marshes.

Increased water fluctuation

This is defined as the increased tidal exchange and range within a hydrologic unit than would naturally occur. This is a result of excessive openings, or exchange points, into a marsh area which allow for greater tidal influence than would normally occur. The greater tidal range increases the erosive force of water movements in the marsh area and thus detaches soil particles and washes away vegetation. The problem is most noticeable during frontal passages, when strong winds resuspend/erode soils and outgoing tides flush material out of the marsh.

Basin area affected by 1996 Drought (Outside of Project Boundary)



Rapid Freshwater Removal

The rapid freshwater removal is a reduction of the hydraulic head, or flow, necessary to keep saltwater from entering an area. This is the result of increased openings into a hydrologic unit that does not occur naturally. These excessively large openings allow for an increased rate of discharge of freshwater from a marsh system, thus greater a chance of saltwater intrusion.

Hypoxia

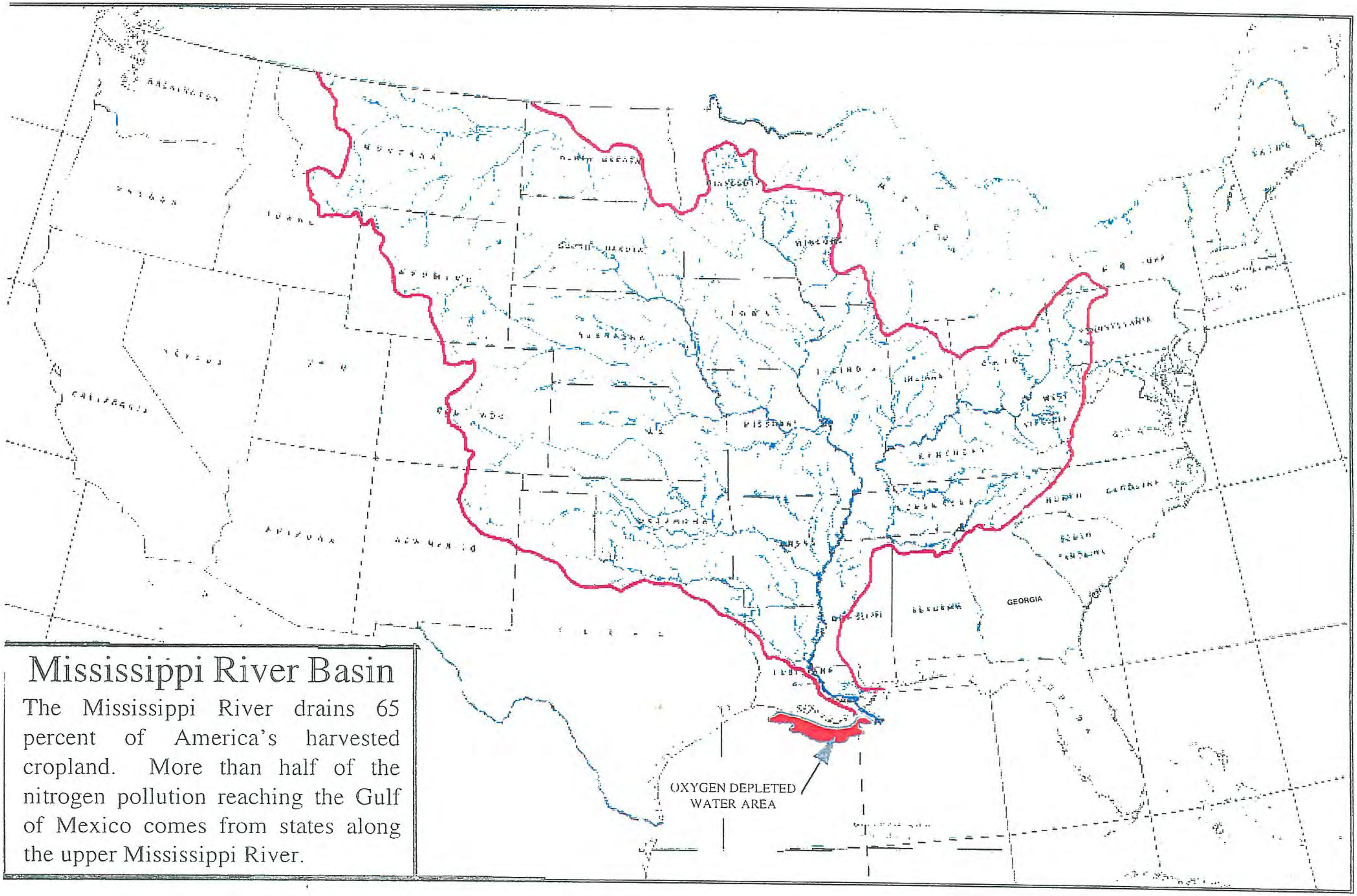
For some time, Louisiana officials have been aware of the occurrence of areas of low dissolved oxygen, or hypoxia, in the Gulf of Mexico near the mouth of the Mississippi River. Given Louisiana's long Mississippi River reach, the large, resource-rich coastal zone and the fact that the hypoxia occurs primarily in the state and federal waters off the Louisiana, it is only natural that Louisiana take an active role in dealing with the issue of hypoxia in the gulf (Louisiana Department of Environmental Quality - Nonpoint News February 1997).

The Mississippi River drains 65 percent of America's harvested cropland (Figure 22). More than half of the nitrogen pollution reaching the Gulf of Mexico comes from states along the Upper Mississippi. Scientist noticed the dwindling oxygen levels 12 years ago. It remained at a fairly constant level until 1993, when a load of nitrogen delivered by the Mississippi River's 100-year flood doubled the Dead Zone's rise (St. Louis Post - Dispatch 1997). During 1993, Illinois corn farmers applied nitrogen fertilizer at a rate of 150 pounds per acre on 98 percent of the 10.5 million acres planted, according to the U.S. Department of Agriculture. That translate to 1.6 billion pounds of nitrogen on corn in one year - plus 26 million pounds on soybeans. In Iowa, the nation's leader in corn production - farmers applied 1.34 billion pounds of nitrogen on cornfields in 1993 and 10.2 million pounds on soybeans.

According to recent studies, 51 percent of the nitrogen comes from commercial fertilizer, 30 percent from animal manure, 5 percent from sewage treatment plants and the rest from other sources (U.S. Geological Survey). Nutrients, mainly nitrogen and phosphorus, spur the growth of algae in the Gulf during the warm spring and summer months. When the algae dies, it falls to the bottom and decomposes. The decomposition uses up oxygen in the water, creating a dead zone. Research scientist taking oxygen readings at 70 feet - near the bottom of the gulf have gotten meter readings of 0.7 parts-per-million (ppm), and other readings of 0.4 ppm. Anything beneath 2.0 ppm is considered hypoxic (Louisiana Universities Marine Consortium, 1997). At last count the dead zone stretched across 6,000 square miles of the Gulf (Figure 22), from the mouth of the Mississippi River to near the Texas border(Nancy Rabalais, 1997).

LDEQ and other agencies have continued to work with the Gulf Program to refine and develop an overall hypoxia management strategy and to fill in data gaps where needed. Joint work is continuing on hypoxia characterization, nutrient loads and concentrations in the Mississippi River, potential gulf fishery impacts, and development and application of nutrient best management practices.

Figure 22. The drainage area of the Mississippi River and the Dead Zone of the Gulf of Mexico.



Mississippi River Basin

The Mississippi River drains 65 percent of America's harvested cropland. More than half of the nitrogen pollution reaching the Gulf of Mexico comes from states along the upper Mississippi River.

Ponding

This term is defined as excessive water levels in an marsh environment. The constantly excessive water levels stress and eventually kill marsh vegetation which increases the opportunity of soil detachment thus erosion.

Erosion of Interior Marsh

This is the result of several factors: saltwater intrusion; increased water level fluctuations; and ponding of marsh. These factors can work independently or in a cumulative fashion. Saltwater intrusion can stress or kill lower salinity tolerant vegetative communities. Increased water level fluctuations can provide greater erosive force due to tides or wave fetch. Ponding can stress or kill vegetative communities and eventually cause conversion of emergent vegetative communities to aquatic communities or open water.

HYDROLOGIC UNITS

The Teche/Vermilion Basin study area is divided into 78 hydrologic units. Forty-five units are located in Vermilion Parish, 17 units are Iberia Parish, and 16 units are in St. Mary Parish. A discussion of the units located in the coastal areas of the basin will be presented with Vermilion Parish. Map 1 contains the component numbers and location within each hydrologic unit.

Vermilion Unit V-1 through V-15

The first 15 units in the Vermilion portion of the basin study are primarily in agriculture and residential uses. The problems associated with these units will be handled by on-going Natural Resources Conservation Service (NRCS) technical assistance and programs from NRCS and Farm Services Agency (FSA). Some of the problems associated with .

Vermilion Unit V-16 (No. V-16)

The hydrologic unit (Figure 23) is a 6,282 acre area located in the Northwest portion of the study area in Vermilion Parish. The soil type in the unit is Lafitte muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by the Gulf Intracoastal Waterway, Vermilion Bay and V-17 and is of one ownership with the exception of Boston Canal which have several owners.

This unit was mapped by O'Neil in 1949 as excessively drained salt marsh; the 1968 and 1978 mapping by Chabreck identified the unit as brackish marsh. In 1988 Chabreck and Linscombe mapped the whole unit as brackish. The 1959 mapping by Yancey is not applicable. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi), and marshhay cordgrass (Spartina patens).

Several marsh ponds and small open water areas (depths 27-28 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of coontail (Ceratophyllum demersum) and duckweed (Limna minor).

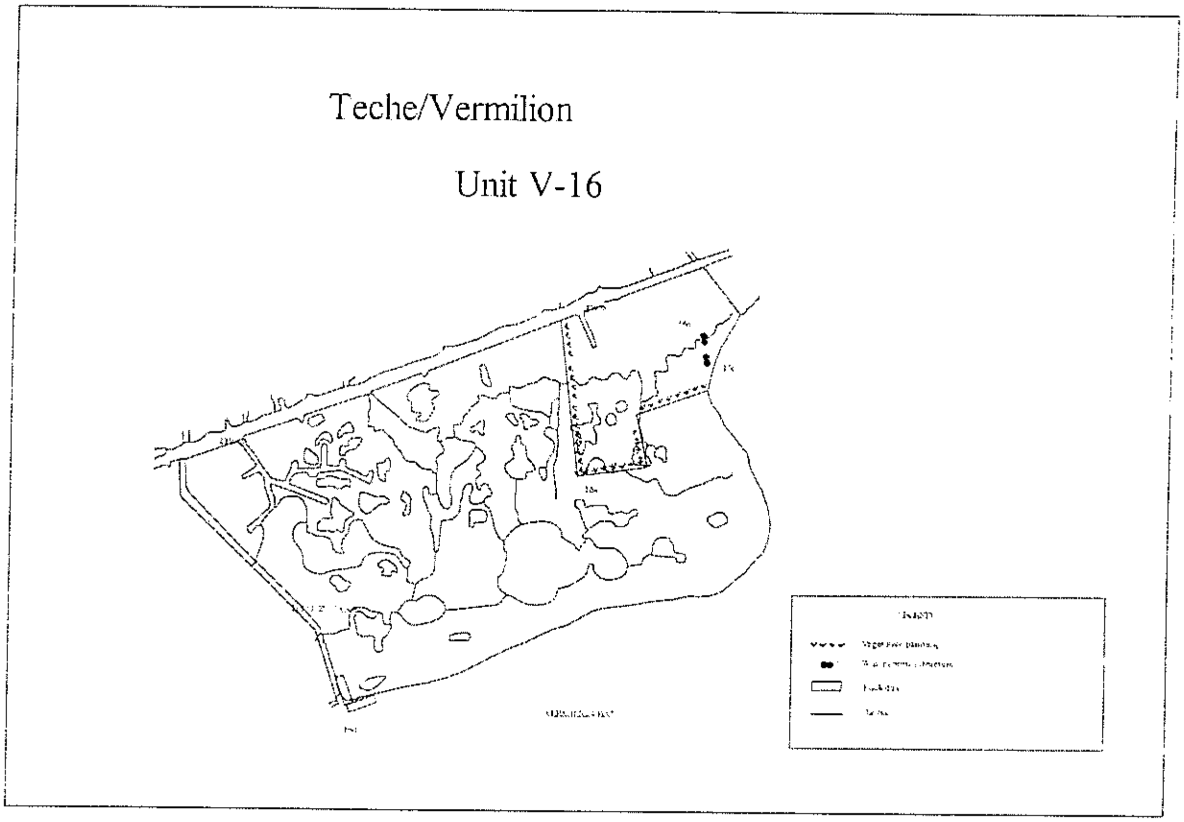


Figure 23. Hydrologic Unit No. V-16

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 16a calls for 5,500 ft. of levee with vegetation.

Element 16b, 16c and 16d are existing structures and will require repair or replacement in the future. Element 16b and 16c are 24" PVC pipes with flapgate. Element 16d is a rock dike - 1000 ft.

Vermilion Unit V-17 (No. V-17)

This hydrologic unit (Figure 24) is a 9,385 acre area located in the northwest portion of the study area in Vermilion Parish. The soil type in the unit is Lafitte muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by the GIWW, Vermilion Bay, Boston Canal, and the Vermilion River Cutoff Channel. This unit was mapped by O'Neil in 1949 as brackish three-cornered grass marsh; the 1968 mapping by Chabreck identified the unit as brackish. The 1978 mapping by

Chabreck and Linscombe identified the northwest portion of the unit as intermediate and the southeast portion as brackish. In 1988 Chabreck and Linscombe mapped the whole unit as brackish. The 1959 mapping by Yancey is not applicable. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi), and marshhay cordgrass (Spartina patens). Several marsh ponds and small open water areas (depths 18-24 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of water hyacinth (Eichhornia crassipes), parrot feather (Myrophyllum brasilieuse) and coontail (Ceratophyllum demersum).

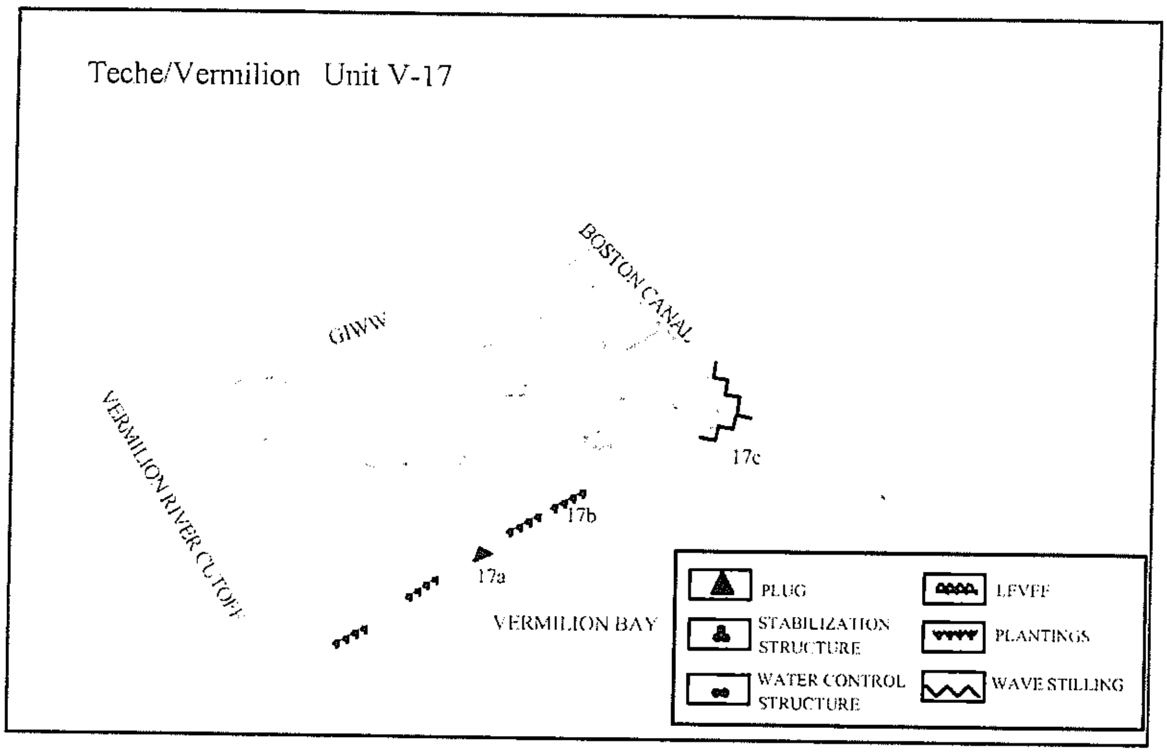


Figure 24. Hydrologic Unit No. V-17

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 17a calls for an earthen plug with rock cover. Element 17b and 17c are existing structures and will require repair or replacement in the future. Element 17b is a vegetative planting of smooth cordgrass (Spartina alterniflora). Element 17c is a rock dike.

Vermilion Unit V-18 (No. V-18)

The hydrologic unit (Figure 25) is a 955 acre area located in the northwest portion of the study area in Vermilion Parish. The soils type in the unit is Lafitte muck with some Delcomb muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by the GIWW, Vermilion Bay, the Vermilion River Cutoff, and the Vermilion River.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered grass marsh; the 1968 mapping by Chabreck identified the unit as brackish. The 1978 mapping by Chabreck and Linscombe identified the unit as intermediate. In 1988 Chabreck and Linscombe mapped the whole unit as intermediate. The 1959 mapping by Yancey is not applicable. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of marshhay cordgrass (Spartina patens) and leafy three-square (Spirpus robustus). In addition, traces of olney bulrush (Scirpus olneyi) were found.

Several marsh ponds and small open water areas (depths 24-28 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of alligatorweed (Alternanthera philoxeroides).

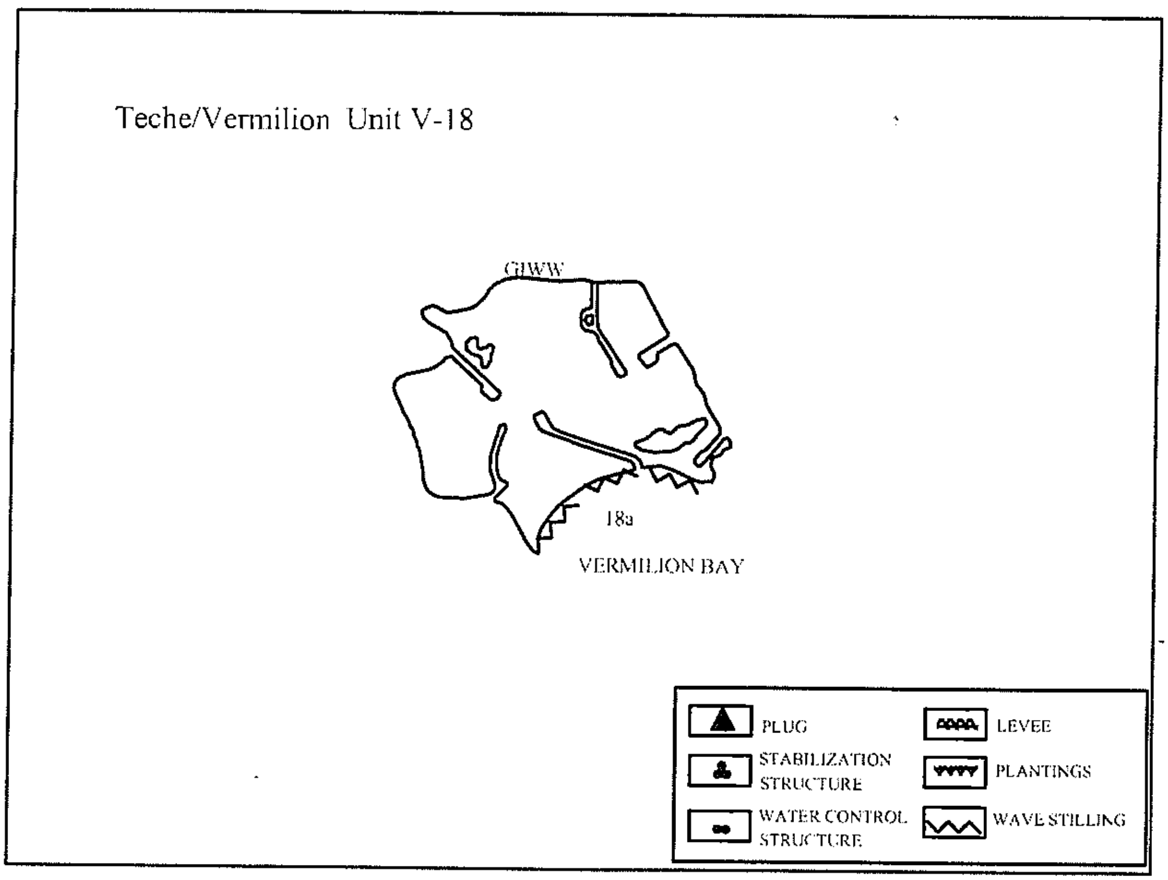


Figure 25. Hydrologic Unit No. V-18

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 18a calls for 7,500 ft. of wave stilling device.

Vermilion Unit V-19 (No. V-19)

This hydrologic unit (Figure 26) is a 1,114 acre area located in the northwest portion of the study area in Vermilion Parish. The soils type in the unit is Lafitte muck with some Delcomb muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by the Vermilion River Cutoff, Little Vermilion Bay and V-17, and V-20.

This unit was mapped by O'Neil in 1949 as 3-cornered grass marsh; the 1968 and 1978 mapping by Chabreck identified the unit as brackish marsh. In 1988 Chabreck and Linscombe mapped the whole unit as brackish. The 1959 mapping by Yancey is not applicable. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi) with traces of leafy three-square (Spirpus robustus) and torpedograss (Panicum repens).

Several marsh ponds and small open water areas (depths 18-24 inches) are scattered throughout the unit. Floating aquatic vegetation consists of alligatorweed (Alternanthera philoxeroides).

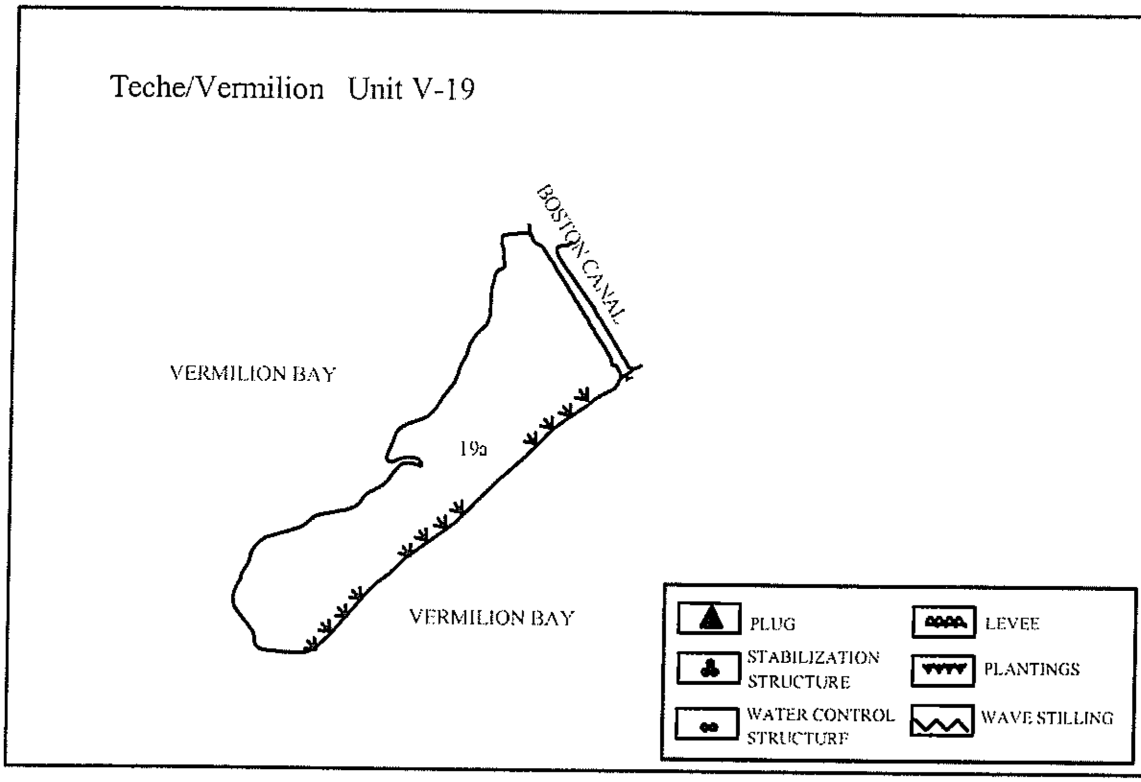


Figure 26. Hydrologic Unit No. V-19

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 19a is an existing planting of smooth cordgrass (Spartina alterniflora).

Vermilion Unit V-20 (No. V-20)

The hydrologic unit (Figure 27) is a 1,874 acre area located in the Northwest portion of the study area in Vermilion Parish. The soil type in the unit is Lafitte muck with some Delcomb muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by Freshwater Bayou, the Gulf Intracoastal Waterway, V-18 and V-21 and is of one ownership.

This unit was mapped by O'Neil in 1949 as excessively drained salt marsh; the 1968 mapping by Chabreck identified the unit as brackish marsh and the 1978 mapping by Chabreck and

Linscombe identified the western portion of the unit as intermediate and the eastern portion as brackish. In 1988 Chabreck and Linscombe mapped the whole unit as intermediate. The 1959 mapping by Yancey is not applicable. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi) and marshhay cordgrass (Spartina patens). In addition, there were traces of leafy three-square (Spirpus robustus) and big cordgrass (Spartina cynosuroides).

Several marsh ponds and small open water areas (depths 10-24 inches) are scattered throughout the unit. Floating aquatic vegetation consists of alligatorweed (Alternanthera philoxeroides).

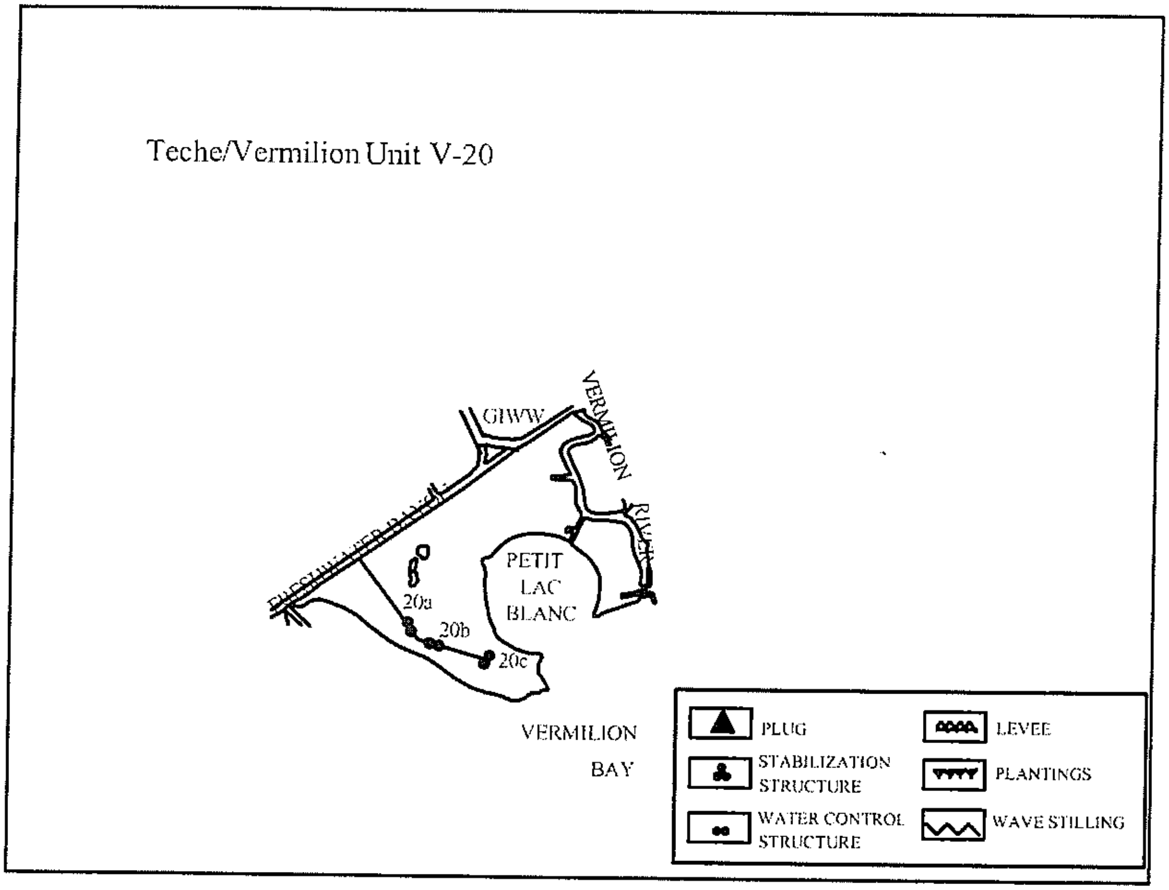


Figure 27. Hydrologic Unit No. V-20

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access. Element 20a, 20b, and 20c are existing structures and will require repair or replacement in the future. Elements 20a, 20b, and 20c are 24" culverts with flapgates.

Vermilion Unit V-21 (No. V-21)

The hydrologic unit (Figure 28) is a 4,316 acre area located in the northwest portion of the study area in Vermilion Parish. The soils in the unit are Clovelly muck. The land is non-forested wetland. The unit has several oil field channels, Coles Bayou and Charles Bayou going through the area. It is bordered by McIlhenny Canal, Freshwater Bayou and Vermilion Bay.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass; the 1968 and 1978 mapping by Chabreck identified the northeast half of the unit as brackish and the southwest half as intermediate. In 1988 Chabreck and Linscombe mapped the whole unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane, roseau and bulltongue. Part of the Buck Point Oil & Gas field is located in this unit. Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi), and roseau (Phragmites communis).

Several marsh ponds and small open water areas (depths 27-28 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of leafy pondweed (Potamogeton foliosus), alligatorweed (Alternanthera philoxeroides), coontail (Ceratophyllum demersum), parrotfeather (Myriophyllum brasiliense) and white waterlily (Nymphaea' odorata).

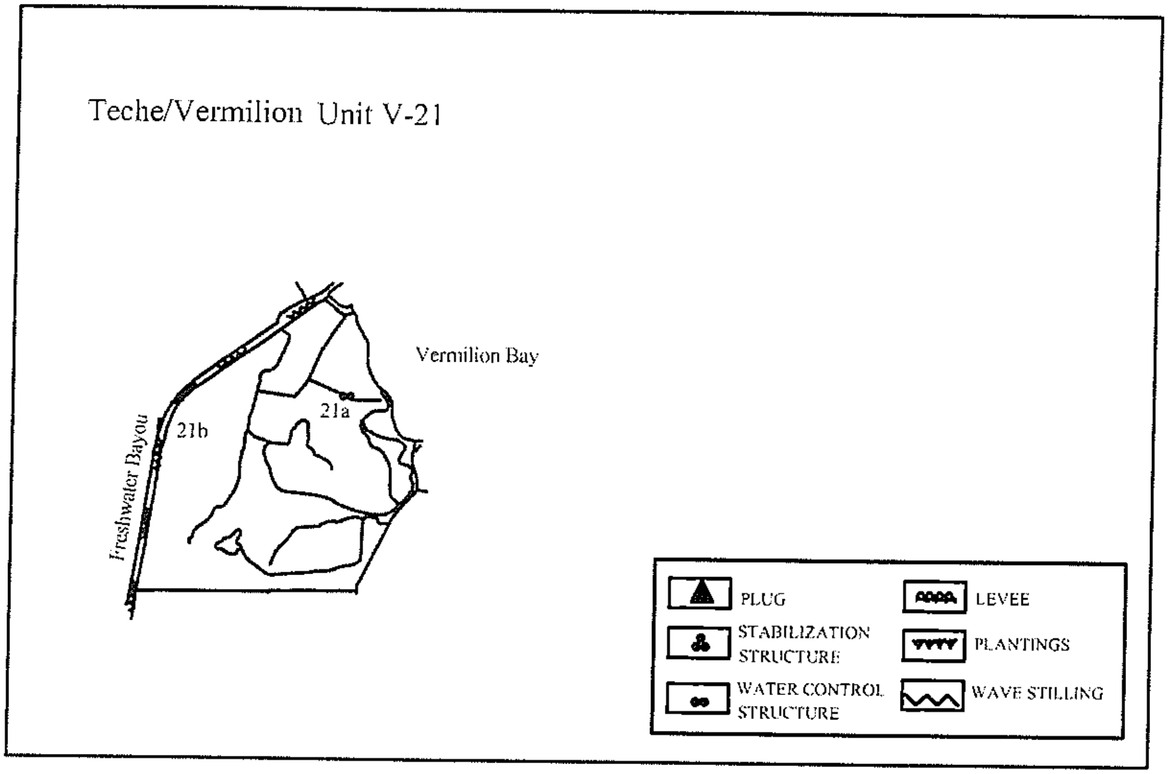


Figure 28. Hydrologic Unit No. V-21

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 21a calls for 25,000 ft. of bank stabilization/wave stilling device along the east shoreline of Freshwater Bayou. Element 21b is an existing structure and will require repair or replacement in the future. Element 21b is a fixed-crest weir with a 5.5 ft. crest and 2 ft. flapgate.

Vermilion Unit V-22 (No. V-22)

The hydrologic unit (Figure 29) is a 2,869 acre area located in the northwest portion of the study area. The soil in the unit is clovelly muck. The land is non-forested wetland. The unit has two oil field channels going through the area. It is bordered by McIlhenny Canal, Freshwater Bayou and Belle Isle Bayou and unit V-23.

This unit was mapped by O'Neil in 1949 as partly sea-rim and partly brackish 3-cornered marsh in the north area and the south area was mapped as sea rim. The 1968, 1978 and 1988 mapping by Chabreck and Linscombe identified the area as intermediate. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane, roseau and bulltongue.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.) and marshhay cordgrass (Spartina patens).

Several marsh ponds and small open water areas (depths 22-31 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of leafy pondweed (Potamogeton foliosus), alligatorweed (Alternanthera philoxeroides), coontail (Ceratophyllum demersum), parrotfeather (Myriophyllum brasiliense) and white waterlily (Nymphaea odorata), big floating heart (Nymphoides aquaticum) and filamentous algae.

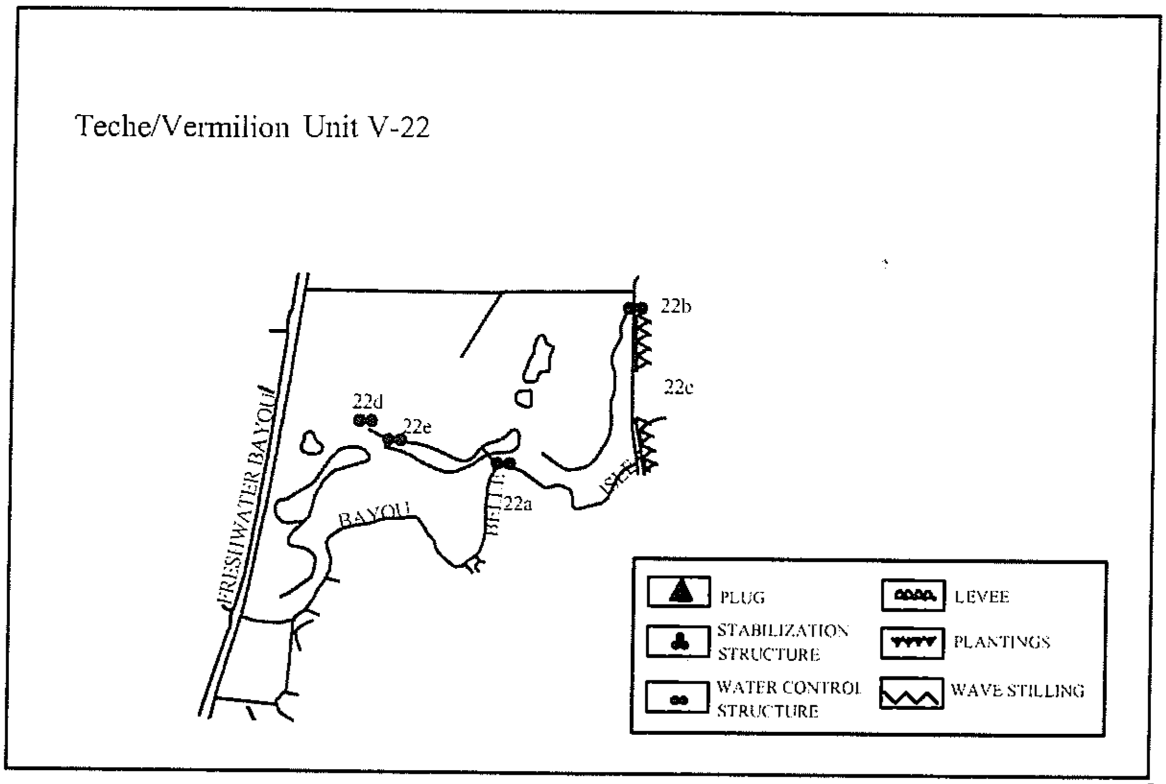


Figure 29. Hydrologic Unit No. V-22

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 22a calls for a variable crest weir with 8 ft. crest set 6 inches below marsh along Bayou Belle Isle. Element 22b calls for a 40" corrugated metal pipe with stoplogs and flapgate. Element 22c calls for 6,500 ft. of levee to be rebuilt. Elements 22d and 22e are existing structures and will require repair or replacement in the future. Elements 22d and 22e are 24" culverts with flapgates.

Vermilion Unit V-23 (No. V-23)

The hydrologic unit (Figure 30) is a 1,749 acre area located in the north central portion of the study area. The soil type in the unit is Clovelly muck. The land is non-forested wetland. The unit has two oil field channels going through the area. It is bordered by Vermilion Bay, McIlhenny Canal, Lakes Fearman, Belle Isle, and unit V-22 and is of one ownership.

This unit was mapped by O'Neil in 1949 as excessively drained salt marsh. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. The 1959 vegetation map by Yancey is not applicable.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of olney bulrush (Scirpus olneyi) and roseau (Phragmites communis). Other common plants are giant cutgrass (Zizaniopsis miliacea) and marsh morningglory (Ipomoea sagittata).

Several marsh ponds and small open water areas are scattered throughout the unit. Floating aquatic vegetation consists of alligatorweed (Alternathera philoxeroides) and salvinia (Salvinia rotundii).

The landowner's objectives for this unit are to maintain and enhance the existing brackish marsh to provide habitat for waterfowl, estuarine organisms, better nutrient and sediment delivery 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.

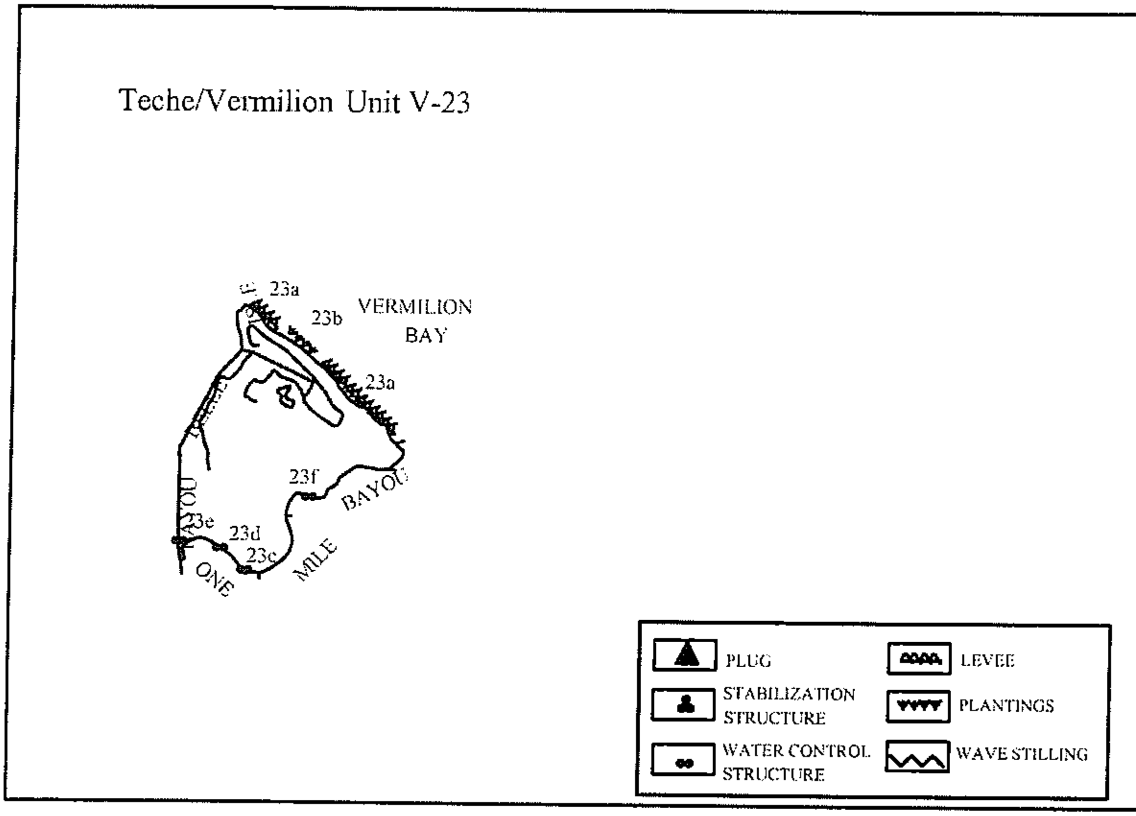


Figure 30. Hydrologic Unit No. V-23

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 23a calls for 9,000 ft. of shoreline stabilization. Element 23b calls for 1000 ft. vegetation plantings of smoothcordgrass. Elements 23c and 23d call for a low level rock weir set 1 foot below marsh level.

Elements 23e and 23f are existing structures and will require repair or replacement in the future. Element 23e is a 40" corrugated metal pipe along Bayou Belle Isle. Element 23f is a steel sheet pile interlocking structure along One Mile Bayou.

Vermilion Unit V-24 (No. V-24)

The hydrologic unit (Figure 31) is a 2,210 acre area located in the north central portion of the study area. The soil type in the unit is Clovelly muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Vermilion Bay and Lake Fearman and is of one ownership. The area has many natural bayous and lakes. It's part of a Wildlife Refuge.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. The 1959 vegetative map by Yancey is not applicable.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists primarily of olney bulrush (Scirpus olneyi), roseau (Phragmites communis) and black needlerush (Juncus roemeranus). Other common plants are leafy three-square (Scirpus robustus), marshhay cordgrass (Spartina patens) and marsh morningglory (Ipomoea sagittata).

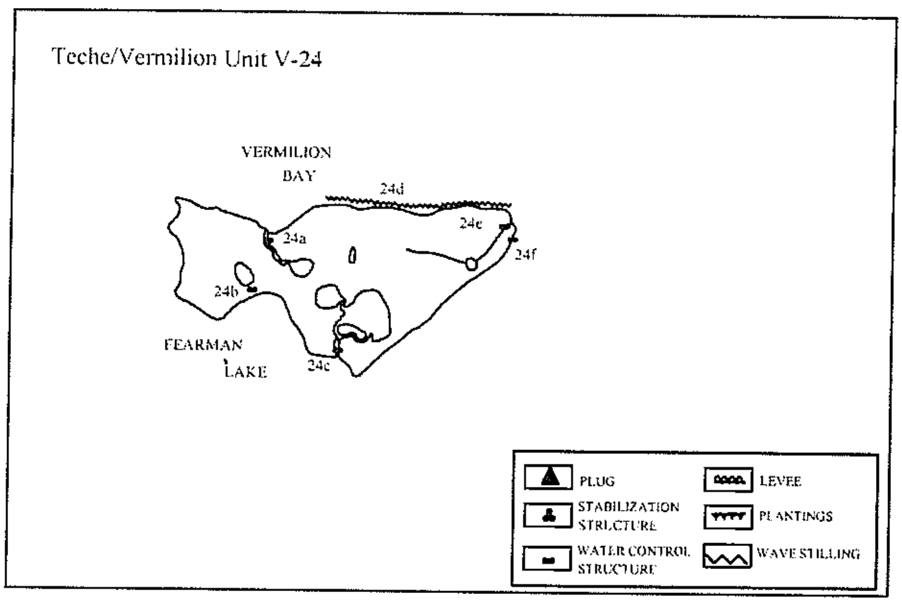


Figure 31. Hydrologic Unit No. V-24

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 24a calls for a low level rock weir on Shallow Bayou. Elements 24b and 24c calls for low level rock weirs set 6" below marsh level. Element 24d calls for 25,000 ft. of wave stilling device.

Elements 24e and 24f are existing fixed-crest weirs that will require repair or replacement in the future.

Vermilion Unit V-25 (No. V-25)

The hydrologic unit (Figure 32) is a 3,947 acre area located in the West Central portion of the study area. The soils in the unit are Clovelly muck, Bancker muck and Mermentau clay. The land is non-forested wetland. The unit has two oil field channels going through the area. It is bordered by McIlhenny Canal, and Belle Isle Bayou and is of one ownership. The area named Belle Isle is in this unit and has a higher elevation than the surrounding marsh.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as intermediate marsh and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass and hogcane.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.), marshhay cordgrass (Spartina patens), soft rush, (Juncus effusus) and paspalum (Paspalum sp.).

Several marsh ponds and small open water areas (depths 17-30 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of leafy pondweed (Potamogeton foliosus), coontail (Ceratophyllum demersum), big floating heart (Nymphoides aquaticum) and filamentous algae.

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

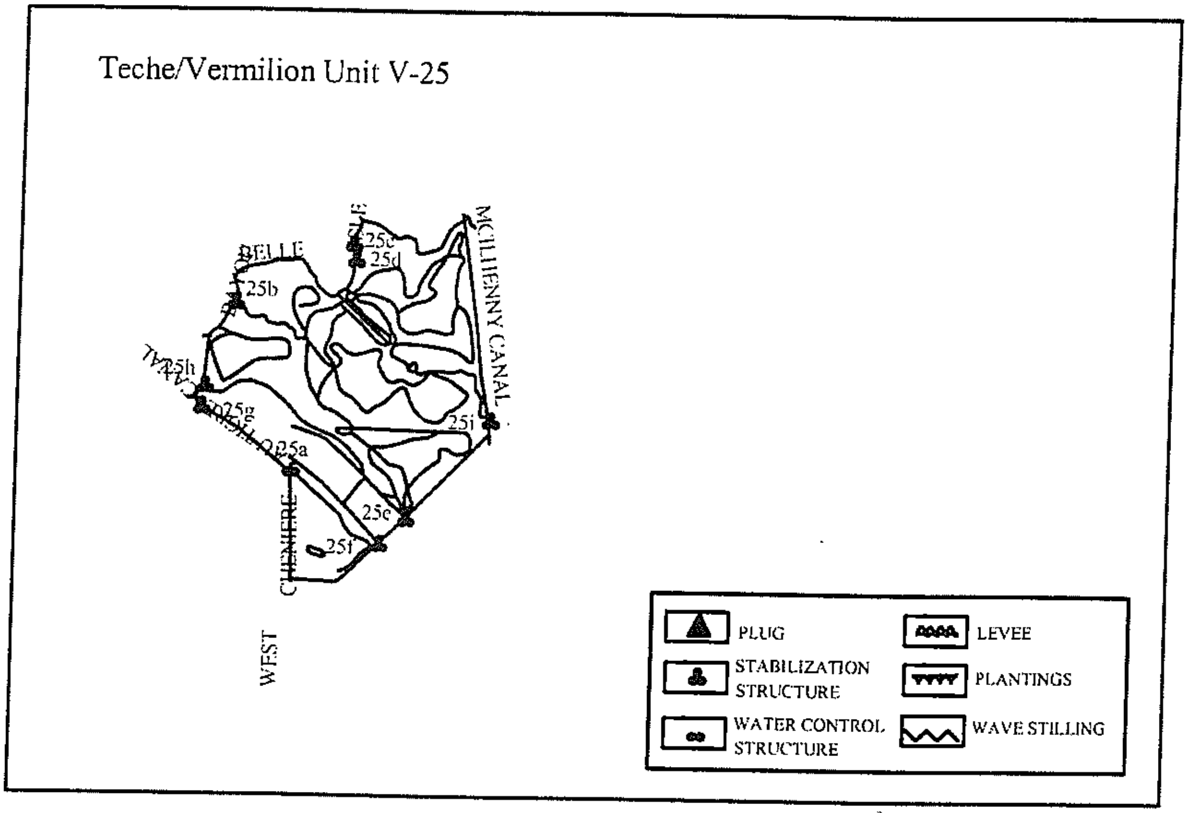


Figure 32. Hydrologic Unit No. V-25

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage production, wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements.

Element 25a calls for 2-36" box structures along Chenier Au Tigre Canal.

Elements 25b, 25c, 25d, 25e, 25f are 24" corrugated metal pipes and are existing structures. They will require repair or replacement in the future. Elements 25g and 25h are 12" corrugated metal pipes and element 25i is a 30 ft. corrugated metal pipe(cmp) . These are also existing and will require replacement or repair in the future.

Vermilion Unit V-26 (No. V-26)

The hydrologic unit (Figure 33) is a 6,131 area located in the central portion of the study area. The soils in the unit are Clovelly and Bancker muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by McIlhenny Canal, Lake Fearman, One Mile Bayou, Toms Bayou and units V-30 and V-31, and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of olney bulrush (Scirpus olneyi). Other common plants are marshhay cordgrass (Spartina patens), alligatorweed (Alternanthera philoxeroides) and cattail (Zizaniopsis miliacea).

Several marsh ponds and small open water areas (depths 1-8 inches) are scattered throughout the unit. Submerged and floating aquatic vegetation consists of frogbit (Limnobium spongia) and filamentous algae.

The landowner's objectives for this unit are to maintain and enhance the existing brackish marsh to provide habitat for waterfowl, estuarine organisms, better nutrient and sediment delivery and to 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.

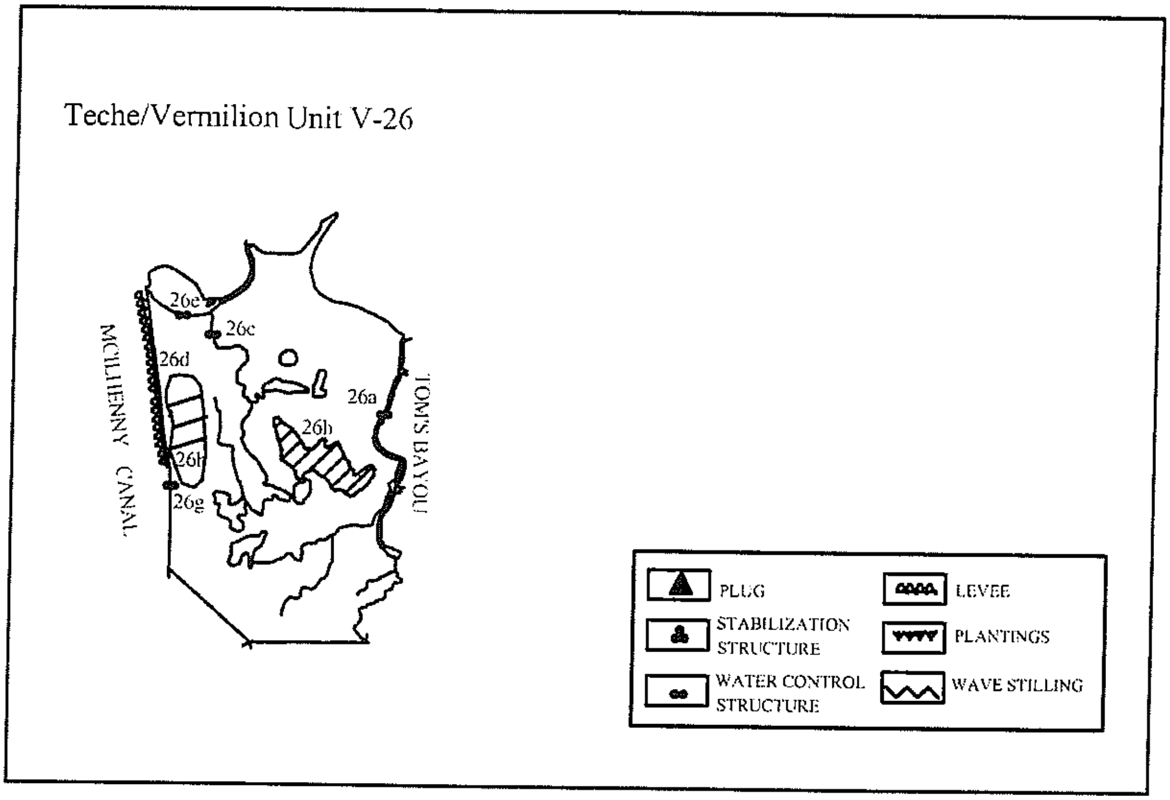


Figure 33. Hydrologic Unit No. V-26

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion.

The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

The most important element according to the landowner is element 26a. Element 26a calls for the construction of a low level rock weir across Tom's Bayou. Element 26b calls for 3000 ft. of terraces with vegetative. plantings. Element 26c calls for a low level rock weir. Element 26d calls for 5,000 ft. of levee repair along McIlhenny Canal. Element 26h calls for 5,500 ft. of terraces with vegetative planting. Element 25e and 26g are existing structures and will require repair or replacement in the future.

Element 26c and 26f are fixed crest weirs with 10 ft. crest on each one.

Vermilion Unit V-27 (No. V-27)

The hydrologic unit (Figure 34) is a 1,734 acre area located in the eastern portion of the study area. The soil type in the unit is Clovelly muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Toms Bayou, Lake Fearman, V-28 and V-29 and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. The 1959 vegetation map by Yancey is not applicable.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of olney bulrush (Scirpus olneyi), black needlerush (Juncus roemeranus) and leafy three-square (Scirpus robustus). Other common plants are marshhay cordgrass (Spartina patens), roseau (Phragmites communis).

Several marsh ponds and small open water areas are scattered throughout the unit. Floating aquatic vegetation consists of alligator weed (Alternanthera philoxeroides).

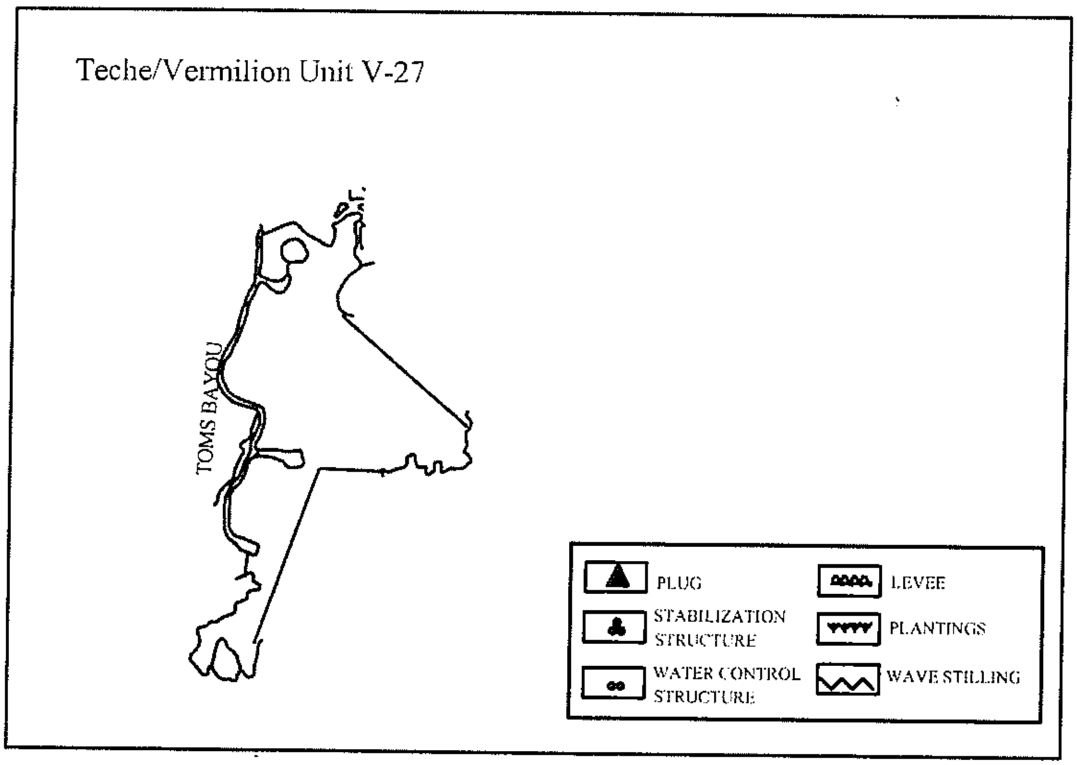


Figure 34. Hydrologic Unit No. V-27

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

This unit is in good condition. No alterations, additions or repairs are needed at this time.

Vermilion Unit V-28 (No. V-28)

The hydrologic unit (Figure 35) is a 487 acre area located in the eastern portion of the study area. The soil type in the unit is Clovelly muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Vermilion Bay, V-27 & V-24 and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish, the 1959 vegetative map by Yancey is not applicable.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of leafy three-square (Scirpus robustus). Other common plants are marsh morningglory (Ipomoea sagittata), marshhay cordgrass (Spartina patens) and roseau (Phragmites communis).

Several marsh ponds and small open water areas are scattered throughout the unit. Water covered the emergent marsh to a depth of three inches. A reading taken in South Lake showed the salinity at 3 ppt.

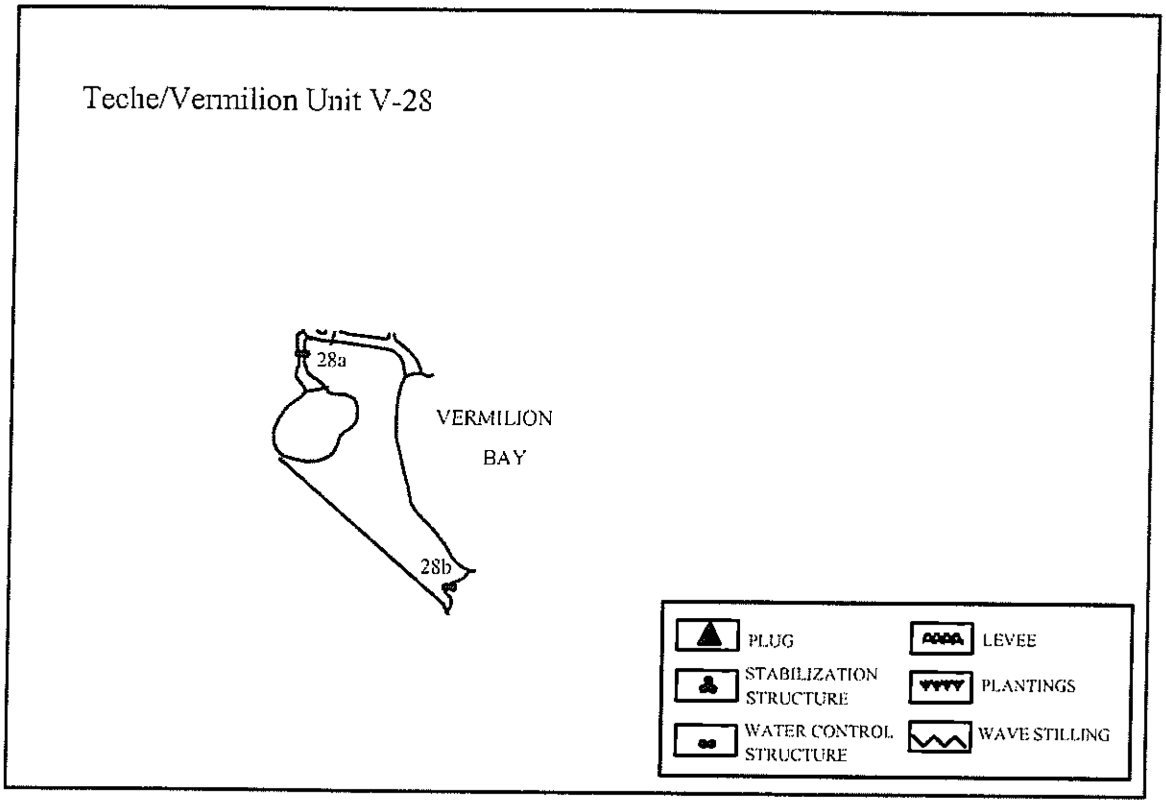


Figure 35. Hydrologic Unit No. V-28

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Elements 28a and 28b are existing structures and will require repair or replacement in the future. Elements 28a and 28b are low level rock weirs.

Vermilion Unit V-29 (No. V-29)

The hydrologic unit (Figure 36) is a 1,960 acre area located in the south central portion of the study area. The soil type in the unit is Clovelly muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Vermilion Bay, Hog Lake Bayou and V-27 and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered marsh grass. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. The 1959 vegetative map by Yancey is not applicable.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of leafy three-square (Scirpus robustus) and marshhay cordgrass (Spartina patens). Other common plants are roseau (Phragmites communis), cattail (Typha sp.) and rattlebox (Daubentonia texana).

Water covering the marsh unit varies in depth from 1 to 5 inches. At Hog Lake the salinity was 3 ppt. Submerged aquatic vegetation such as Eurasion watermifoil and coontail (Ceratophyllum demersum) were found along the edges of the interior ponds.

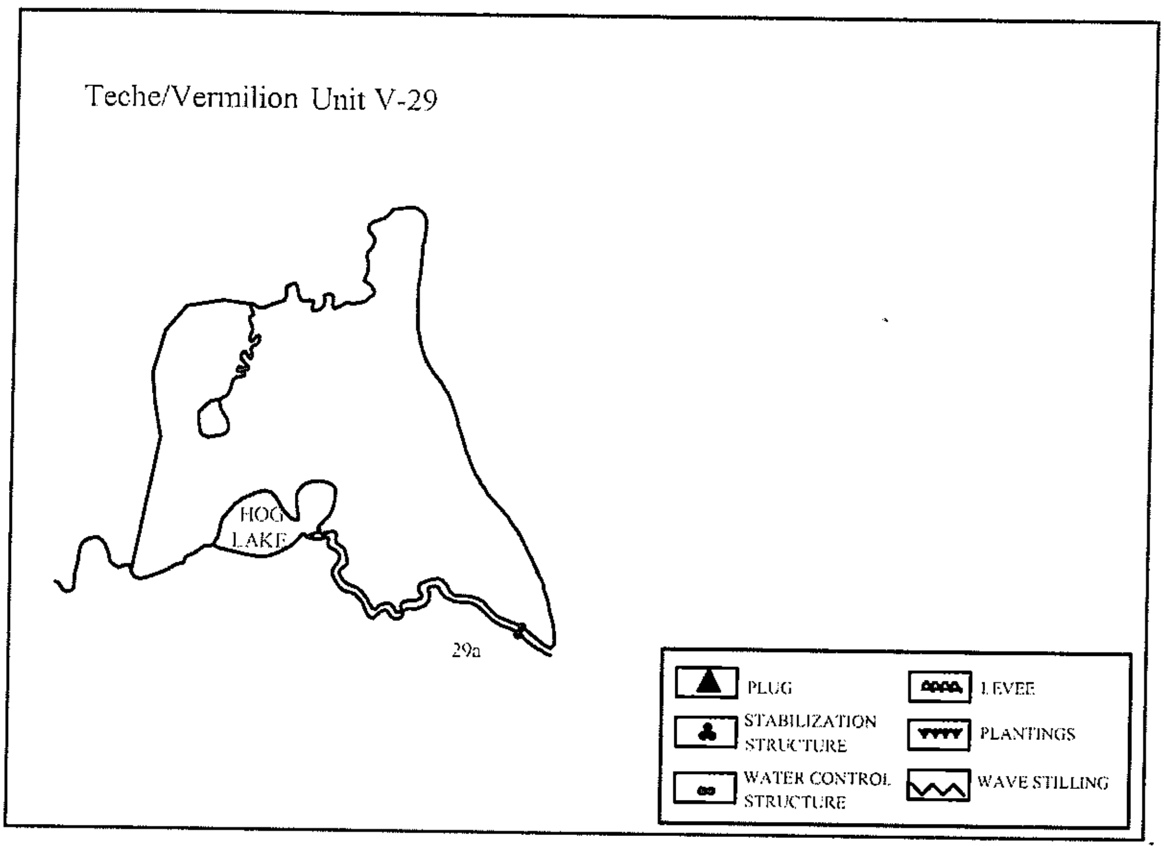


Figure 36. Hydrologic Unit No. V-29

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 29a is an existing structure and will require repair or replacement in the future. Element 29a is a rock weir, 71.5 feet total crest with a total structure length of 134 feet.

Vermilion Unit V-30 (No. V-30)

The hydrologic unit (Figure 37) is a 383 acre area located in the west central portion of the study area. The soil in the unit is Banker muck. The land is non-forested wetland. The unit has no major oil field channels going through the area. It is bordered by the McIlhenny canal, V-26, V-31, and V-36 and is of one ownership.

This unit was mapped by O'Neil in 1949 as part intermediate and part brackish 3-cornered grass marsh. The 1968, 1978 and 1988 mapping by Chabreck & Linscomb, identified this area as brackish marsh. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.) and marshhay cordgrass (Spartina patens). Several marsh ponds and small open water areas are scattered throughout the unit. There is an 18" diameter flapgate structure on the north boundary and an open pipe in the southwest corner of the unit.

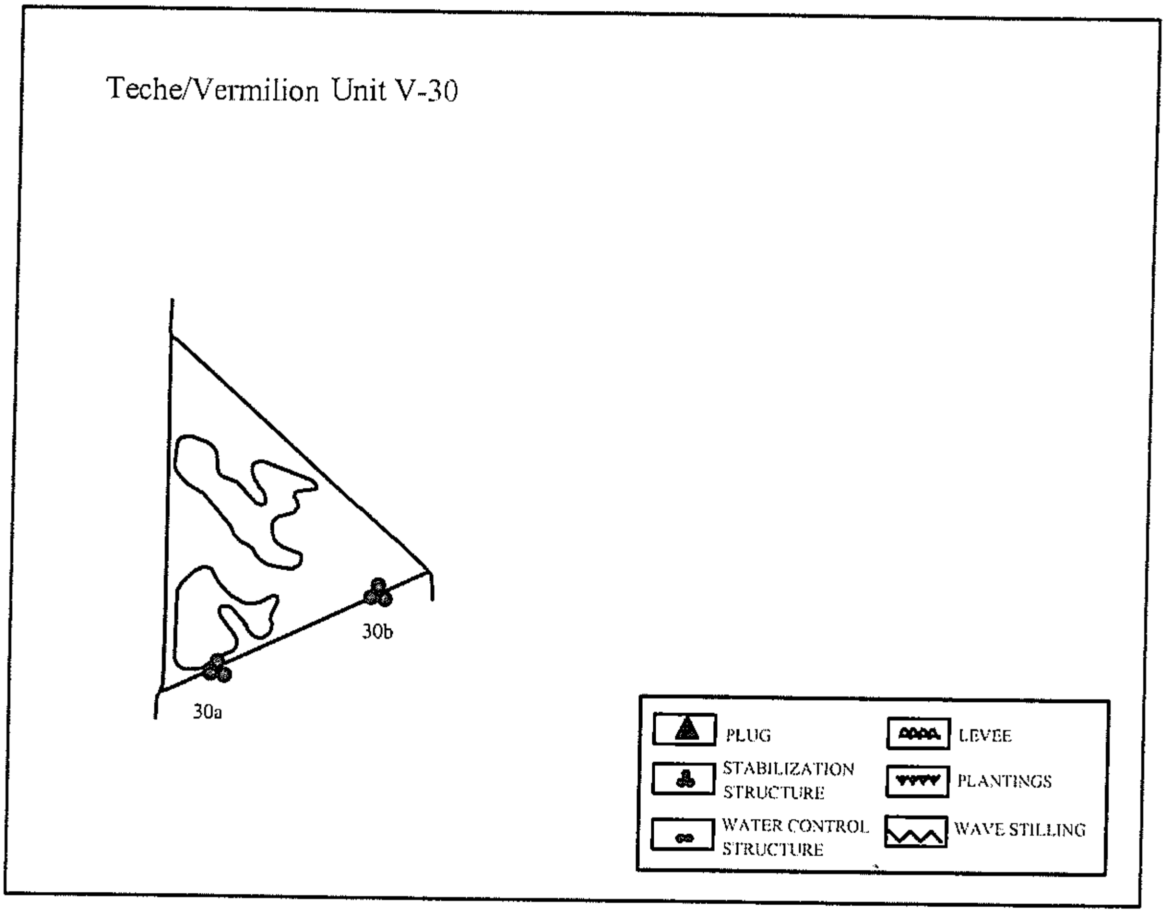


Figure 37. Hydrologic Unit No. V-30

The plan objective for this hydrologic unit, called Goose Pond, is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism.
access.

Elements 30a and 30b are existing structures and will require repair or replacement in the future. Elements 30a and 30b are 18" steel culverts.

Vermilion Unit V-31 (No. V-31)

The hydrologic unit (Figure 38) is a 912 acre area located in the west central portion of the study area. The soils in the unit are Bancker muck and Mermentau clay. The land is non-forested wetland. The unit has no major oil field channels going through the area. It is bordered by McIlhenny Canal, Unit V-25, V-26, V-30, V-33 and V-35 and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as intermediate marsh and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish marsh. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.), marshhay cordgrass (Spartina patens), spikesedge (Eleocharis Sp.) and roseau (Phragmites communis).

Several marsh ponds and small open water areas are scattered throughout the unit. There is an 18" diameter flapgate structure on the north boundary and an open pipe in the southwest corner of the unit.

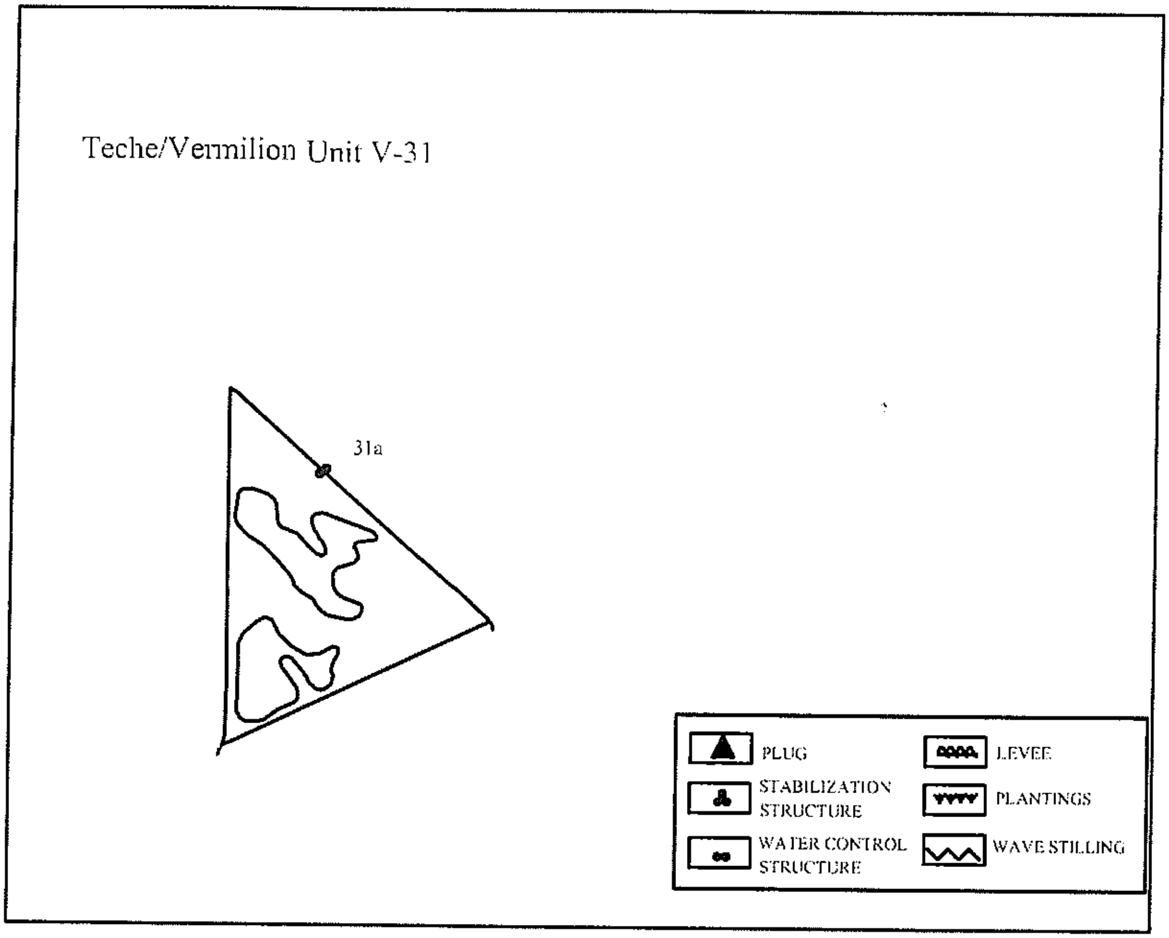


Figure 38. Hydrologic Unit No. V-31

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and installing water control structures with properly sized new ones in the future, if needed. New structures will be fitted with slots for estuarine organism access.

Vermilion Unit V-32 (No. V-32)

The hydrologic unit (Figure 39) is a 391 acre area located in the west central portion of the study area. The soils in the unit is Bancker muck. The land is non-forested wetland. The unit has no major oil field channels going through the area. It is bordered by the West Chenier au Tigre canal, Unit V-25, V-31, and V-35 and is of one ownership.

This unit was mapped by O'Neil in 1949 as brackish 3-cornered grass, with some intermediate marsh in the south area of the unit. The 1968 mapping by Chabreck identified this area as intermediate marsh and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish marsh. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.) and marshhay cordgrass (Spartina patens).

Several marsh ponds and small open water areas are scattered throughout the unit. One representative pond was evaluated, having a depth of 14 inches and traces of duckweed (Lemna minor) present.

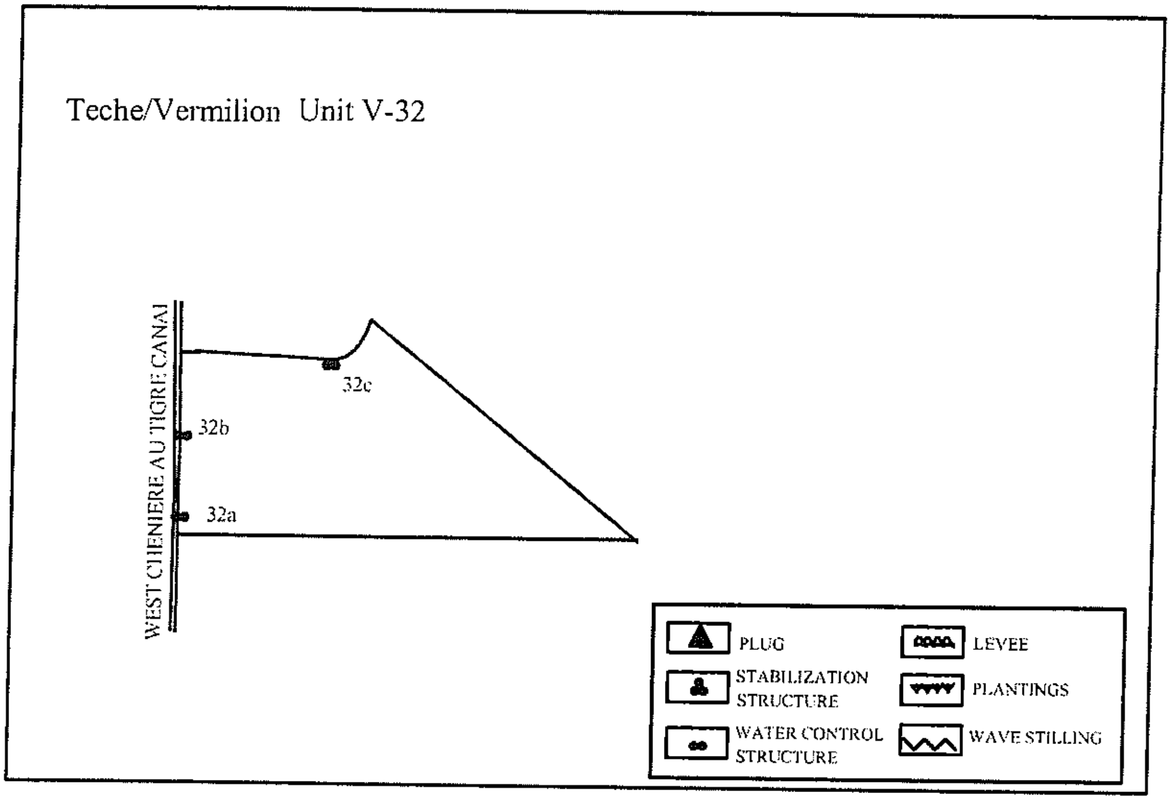


Figure 39. Hydrologic Unit No. V-32

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Elements 32a, 32b and 32c are existing structures along West Chenier Au Tigre Canal and will require repair or replacement in the future. Element 32a is a fixed crest weir with one boat bay, 2 piles, 10 ft. crest and 28 ft., total structure length. Element 32b is a fixed crest weir with one boat bay, 2 piles, 10 ft. crest and 30 ft. total structure length. Element 32c is an 18" automatic flapgate.

Vermilion Unit V-33 (No. V-33)

The hydrologic unit (Figure 40) is a 4,487 acre area located in the east central portion of the study area. The soil type in the unit is Banker muck. The land is non-forested wetland. The unit has four oil field channels going through the area. It is bordered by Freshwater Bayou, West Chenier Au Tigre Canal and oil field canals and is of one ownership.

This unit was mapped by O'Neil in 1949 as intermediate and brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as intermediate and the 1978 mapping by Chabreck and Linscombe identified the unit as brackish. The 1988 mapping by Chabreck and Linscombe identified the unit as intermediate with some brackish marsh. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane & roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of leafy three-square (Scirpus robustus), marshhay cordgrass (Spartina patens) and torpedograss (Panicum repens). Other common plants are olney bulrush (Scirpus olneyi), roseau (Phragmites communis) and cattail (Typha sp.).

Water covering the marsh unit varies in depth from 1-5 inches. Submerged aquatic vegetation such as coontail (Ceratophyllum demersum) was found along the edges of the interior ponds.

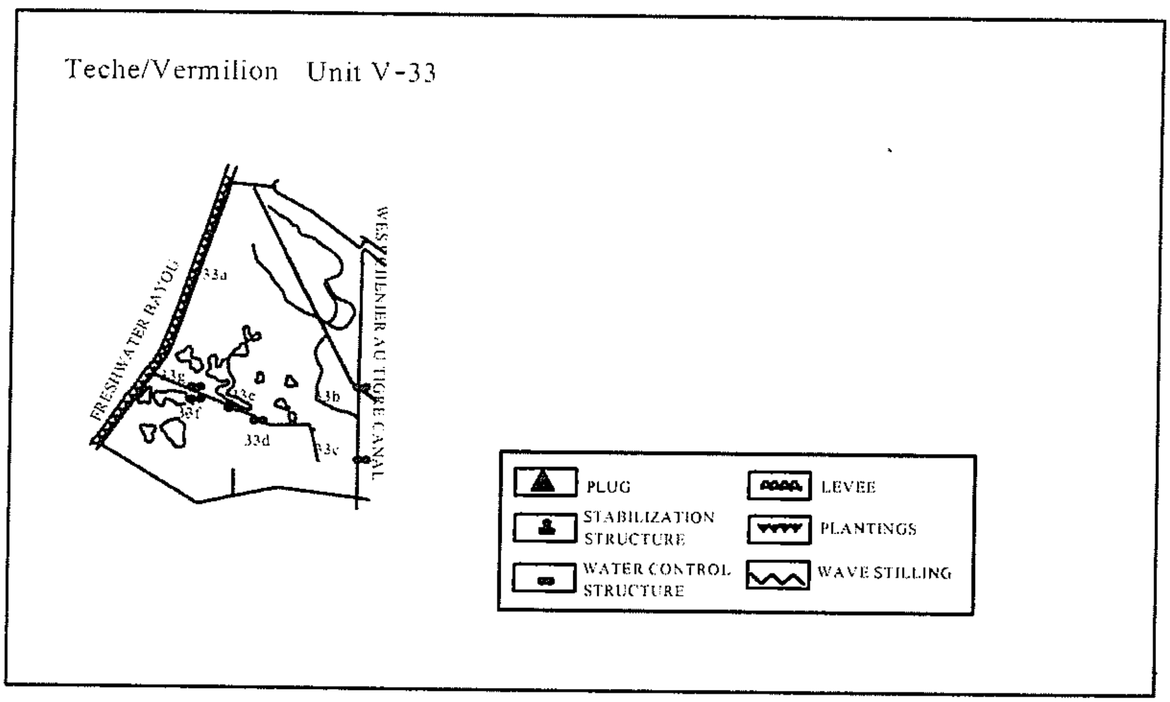


Figure 40. Hydrologic Unit No. V-33

The plan objective for this hydrologic unit is to actively manage for intermediate marsh. This will be accomplished by maintaining and enhancing the existing intermediate marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access.

Element 33a calls for 25,000 of bank stabilization. Elements 33b, 33c, 33e, 33f, 33g are existing structures and will require repair or replacement in the future. Elements 33d, 33e, 33f, 33g are variable crest weirs with 20 ft. crest and flapgates. Elements 33b and 33c are 48 ft. culverts with flapgate and variable crest inside.

Vermilion Unit V-34 (No. V-34)

The hydrologic unit (Figure 41) is a 3,505 acre area located in the south central portion of the study area. The soil type in the unit is Banker muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by Freshwater Bayou, West Chenier Au-Tigre canal, V-44 and an oilfield channel. The unit is of one ownership.

This unit was mapped by O'Neil in 1949 as intermediate marsh with some brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as intermediate while the 1978 mapping by Chabreck and Linscombe identified the unit as brackish. The 1988 mapping by Chabreck and Linscombe identified the unit as intermediate marsh with some brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of marshhay cordgrass (Spartina patens). Other common plants are California bulrush (Scirpus californicus), giant cutgrass (Zizaniopsis miliacea) and alligator weed (Alternanthera philoxeroides).

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

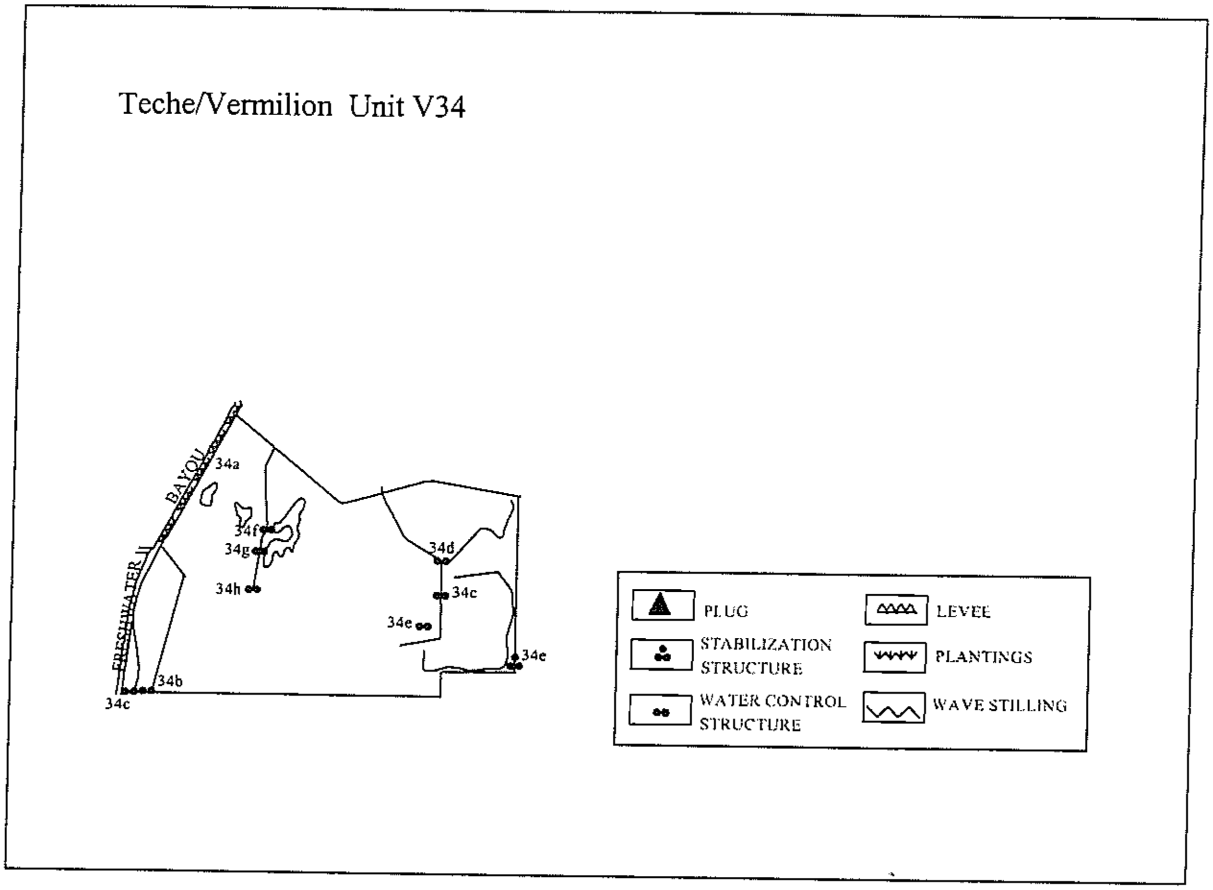


Figure 41. Hydrologic Unit No. V-34

The plan objective for this hydrologic unit is to actively manage for intermediate marsh. This will be accomplished by maintaining and enhancing the existing intermediate marsh to provide habitat for forage, production, wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife requirements.

Element 34a calls for 7,000 ft. bank stabilization along Freshwater Bayou.

Elements 34b, 34c, 34d, 34e, 34f, 34g, 34h, 34i, 34j are existing structures and will require repair or replacement in the future. Elements 34b and 34c are 23" variable crest aluminum culverts with flapgates. Element 34d is a 24" variable crest aluminum culvert with 1 boat bay. Element 34e is 24" culvert. Element 34f is a V.C. weir, 6 ft. crest and 15 ft. total structure length. Element 34g is a V.C. aluminum weir with flapgate and 20 ft. crest. Element 34h is a 36" V.C. weir with 6 ft. crest.

Vermilion Unit V-35 (No. V-35)

The hydrologic unit (Figure 42) is a 1,660 acre area located in the south central portion of the study area. The soil type in the unit is Banker muck. The land is non-forested wetland. The unit has several oil field channels going through the area. It is bordered by McIlhenny Canal, West Chenier Au Tigre Canal, V-32, V-37 and part of Paul J. Rainy Wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 as intermediate marsh. The 1968 mapping by Chabreck identified this area as intermediate and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of roseau (Phragmites communis) and cattail (Typha sp).

Several marsh ponds and small open water areas are scattered throughout the unit. Submerged aquatic vegetation consists of coontail (Ceratophyllum demersum).

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

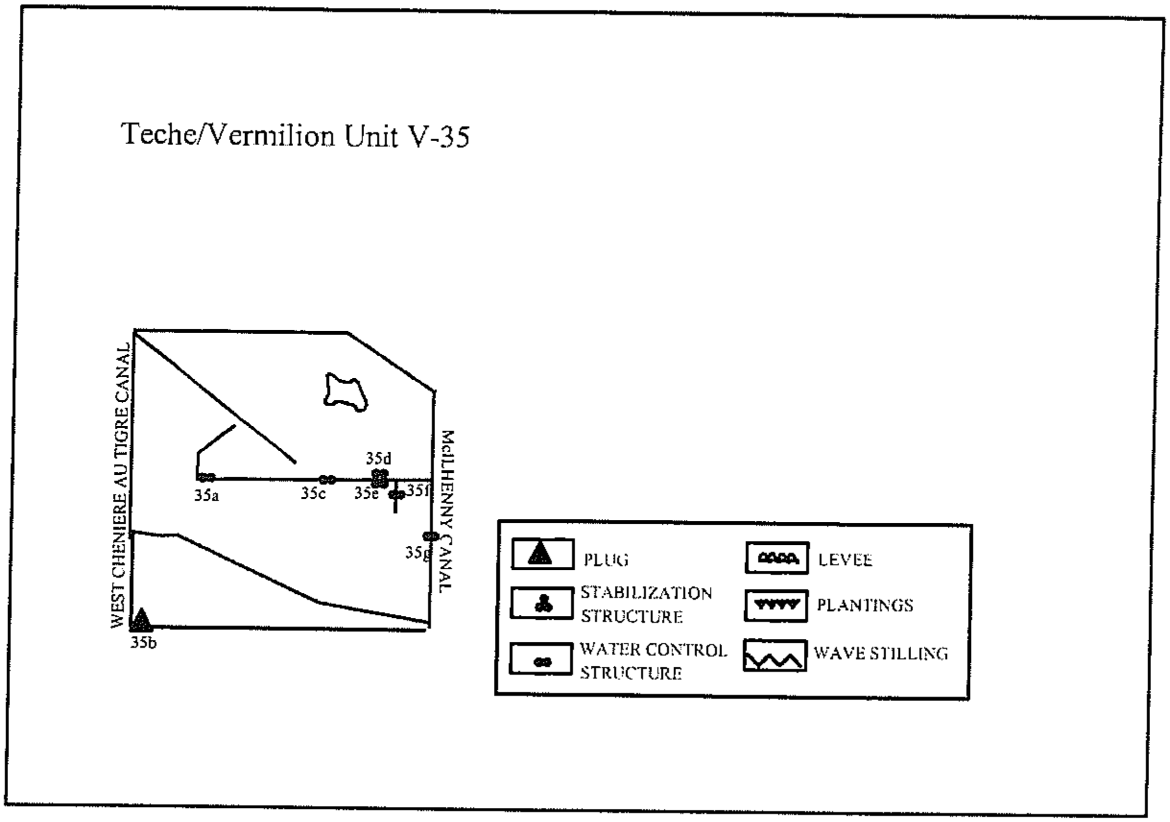


Figure 42. Hydrologic Unit No. V-35

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage, production, wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements. Elements 35a calls for a low level rock weir at the elbow of the work channel. Elements 35b, 35c, 35d, 35e, 35f, 35g are existing structures and will require repair or replacement in the future. Element 35b is an existing plug. Element 35c is a weir with 1 boat bay, 2 piles, 10 ft. crest and 38 ft. overall length. Element 35d is a weir with 1 boat bay, 10 ft. crest and 50 ft. overall length. Element 35e is a rock weir with 22 ft. crest. Element 35f is a rock weir with 28 ft. crest. Element 35g is a rock weir on McIlhenny Canal, 10 ft. crest and 35 ft. overall length.

Vermilion Unit V-36 (No. V-36)

The hydrologic unit (Figure 43) is a 1,116 acre area located in the south central portion of the study area. The soil type in the unit is Banker muck. The land is non-forested wetland. The unit has two oil field channels going through the area. It is bordered by McIlhenny Canal, Last Point Canal, V-30, V-38, and part of Paul J. Rainy Wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 as intermediate marsh and brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as intermediate and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane & roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of roseau (Phragmites communis) and cattail (Typha sp.) Other common plants are California bulrush (Scirpus californicus).

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

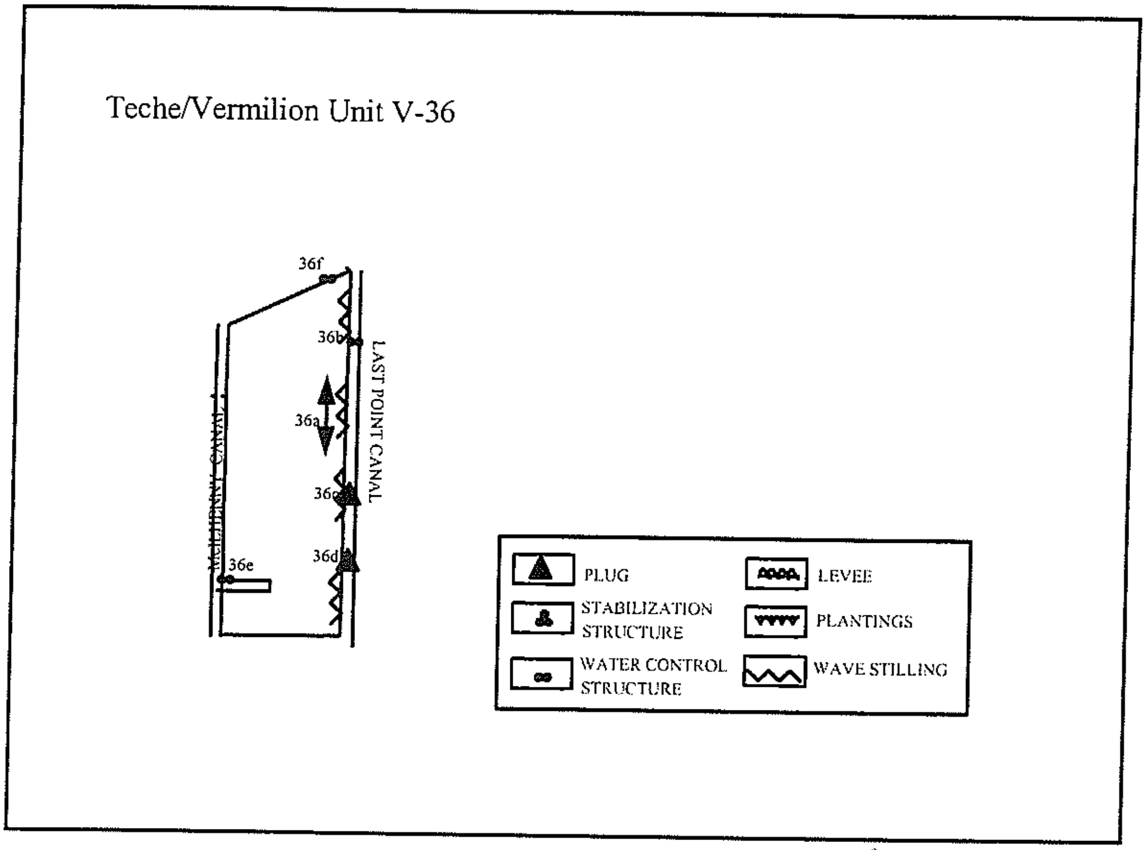


Figure 43. Hydrologic Unit No. V-36

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage, production,
wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements.

Element 36a calls for 9,500 bank stabilization along Last Point Canal. Element 36b calls for a low level rock weir set 1 ft. below marsh level. Elements 36c and 36d call for earthen plugs along Last Point Canal.

Elements 36e and 36f are existing structures and will require repair or replacement in the future. Element 36e is a fixed crest weir located at the Conoco location with 10 piles, 4 boat bays, 38 ft. crest and 110 ft. overall length. Element 36f is an 18" steel pipe.

Vermilion Unit V-37 (No. V-37)

The hydrologic unit (Figure 44) is a 1,648 acre area located in the southern portion of the study area. The soils in the unit are mostly Banker muck and some Creole muck. The land is non-forested wetland. The unit has three oil field channels going through the area. It is bordered by West Chenier Au Tigre Canal, McIlhenny Canal, V-35, V-42 and part of Paul J. Rainy Wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 as 3-cornered grass brackish marsh and some intermediate. The 1968 mapping by Chabreck identified this area as intermediate and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.), marshhay cordgrass (Spartina patens), spikesodge (Eleocharis sp.) and roseaux (Phragmites communis).

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

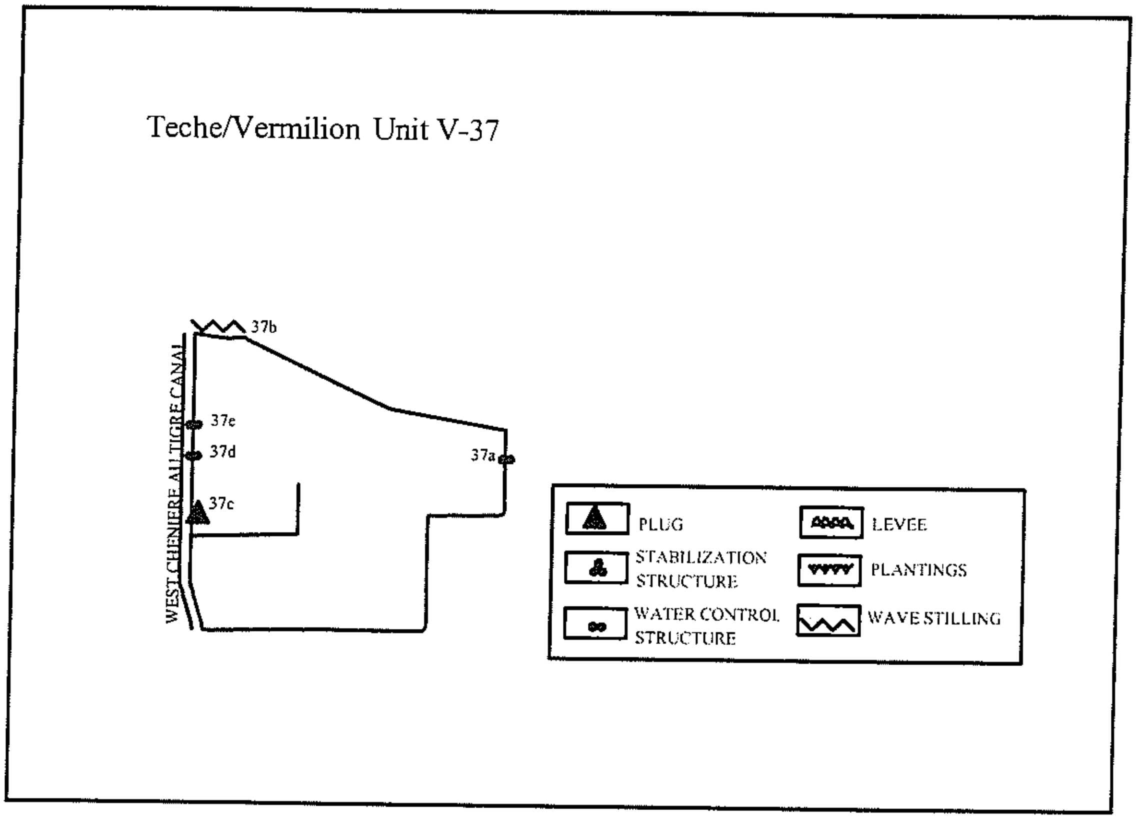


Figure 44. Hydrologic Unit No. V-37

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage, production, wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements. Element 37a calls for a low level rock weir. Element 37b calls for the repairing of 2,100 ft. of wave stilling device. Elements 37c, 37d, 37e are existing structures and will require repair or replacement in the future. Element 37e is a variable crest weir with 1 boat bay, 10 ft. Crest and 38 ft. Overall length. Element 37c is an existing earthen plug and element 37d is a variable crest weir with 1 boat bay, 4 piles, 9.6 ft. And 42.6 ft. overall length.

Vermilion Unit V-38 (No. V-38)

The hydrologic unit (Figure 45) is a 640 acre area located in the southern portion of the study area. The soils in the unit are Banker and Creole muck and Mermentau clay. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by McIlhenney Canal, Brunner Canal, Last Point Canal, V-42, V-36 and part of Paul J. Rainey Wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 as sea rim with some brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of olney bulrush (Scirpus olneyi). Other common plants are cattail (Typha sp.) and marshhay cordgrass (Spartina patens).

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

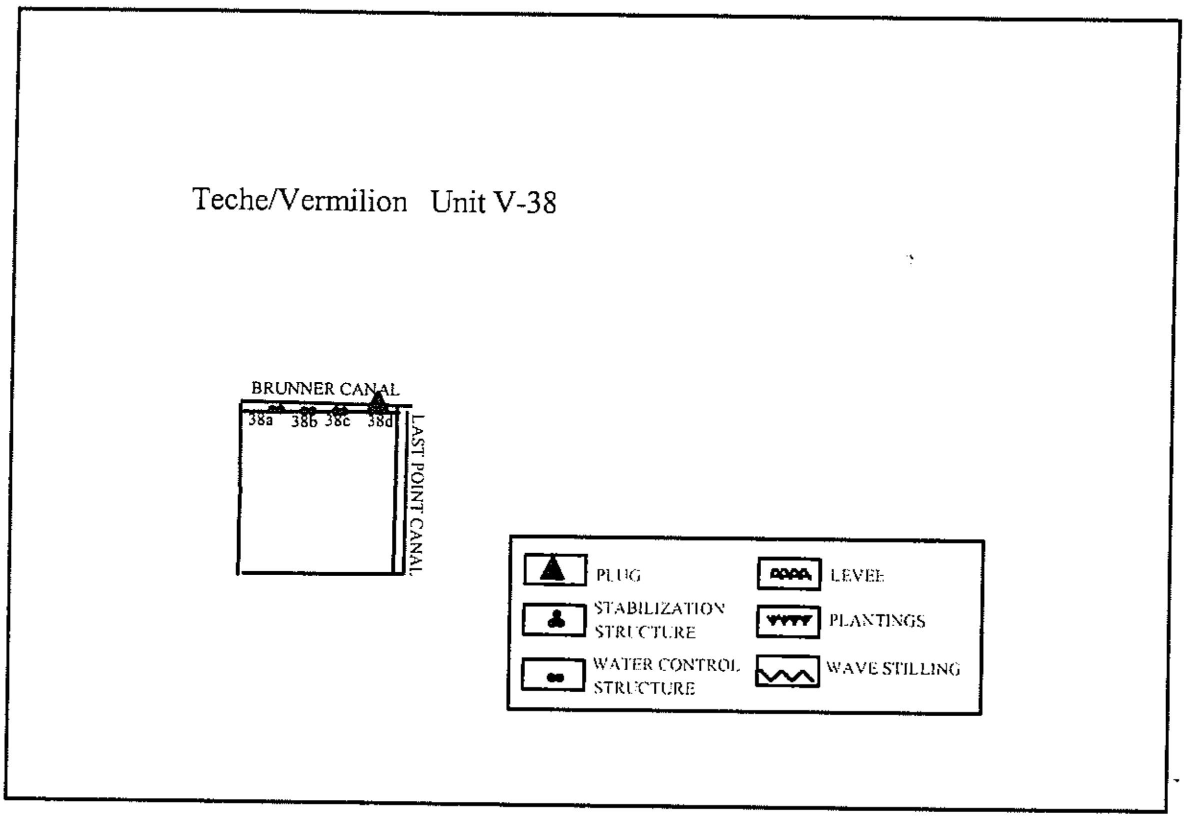


Figure 45. Hydrologic Unit No. V-38

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage, production, and wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements.

Elements 38a, 38b and 38c call for 3 low level rock weirs along Brunner Canal. Element 37d calls for an earthen plug along Brunner Canal.

Vermilion Unit V-39 (No. V-39)

The hydrologic unit (Figure 46) is a 6,965 acre area located in the Southern portion of the study area. The soils in the unit are Banker and Clovelly muck. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Last Point Canal, State Wildlife Refuge, V-26 and part of Paul J. Rainey wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 mainly as brackish 3-cornered grass marsh with a small amount of intermediate and a small amount of sea rim. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of olney bulrush (Scirpus olneyi), leafy three-square (Scirpus robustus). Other common plants are marshhay cordgrass (Spartina patens), California bulrush (Scirpus californicus) and cattail (Typha sp).

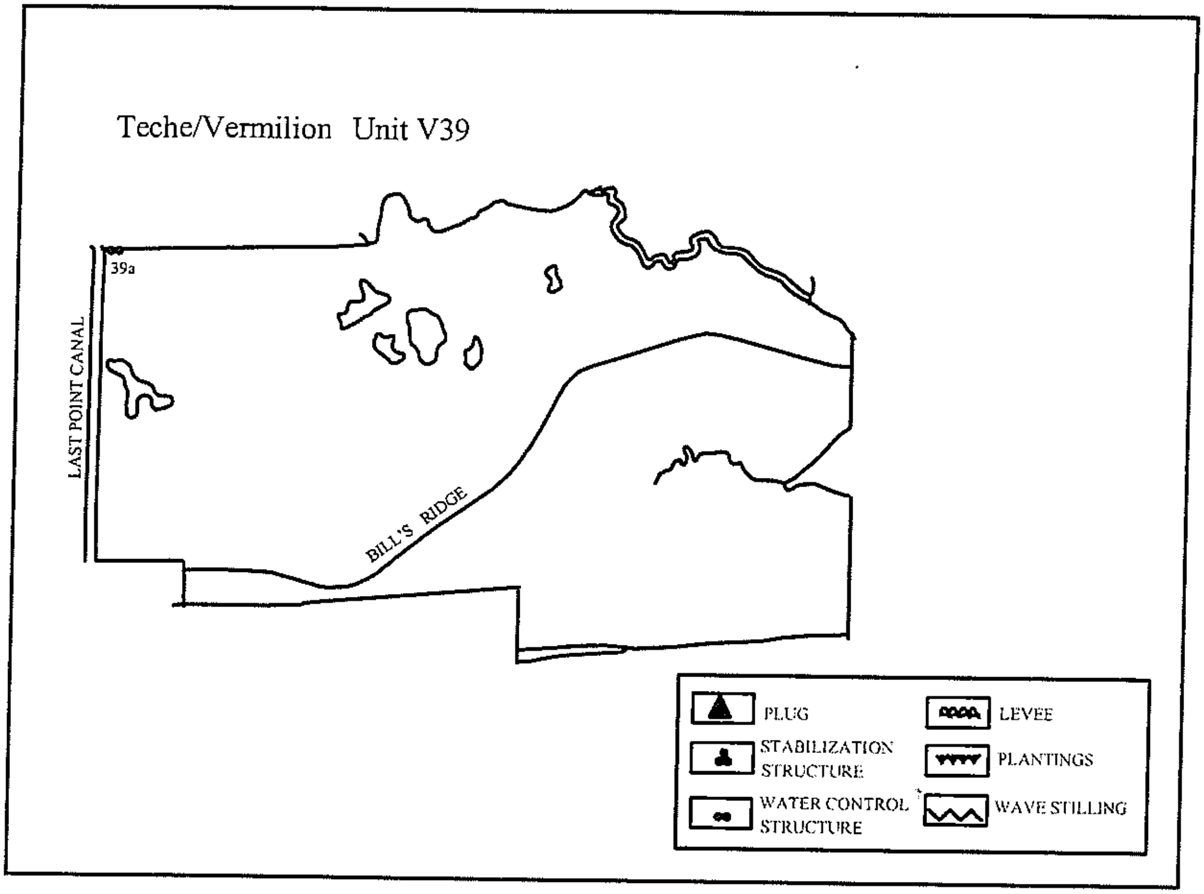


Figure 46. Hydrologic Unit No. V-39

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing marsh to provide habitat for forage production and wildlife habitat and to reduce saltwater intrusion. The plan objective also calls for repairing the existing systems of levees, if needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be sized according to forage and wildlife habitat requirements and allow for slots for esturing organism access.

Elements 39a is an existing structure and will require repair or replacement in the future. Element 39a is a 40" corrugated metal pipe with flapgates on Last Point Canal.

Vermilion Unit V-40 (No. V-40)

The hydrologic unit (Figure 47) is a 4,946 acre area located in the south eastern portion of the study area. The soils in the unit are Scatlake mucky clay with Beach and Coastal along the Gulf. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by the Gulf of Mexico, Vermilion Bay and Paul J. Rainey Wildlife Refuge and is of one ownership.

This unit was mapped by O'Neil in 1949 as excessively drained salt marsh. The 1968 mapping by Chabreck identified this area as brackish. The 1978 by Chabreck and Linscombe identified the unit as brackish with some saline marshes at the northeast tip of the unit. The 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of marshhay cordgrass (Spartina patens) olney bulrush (Scirpus olneyi). Other common plants are leafy three-square (Scirpus robustus), roseau (Phragmites communis) and black needle rush (Juncus roemeranus).

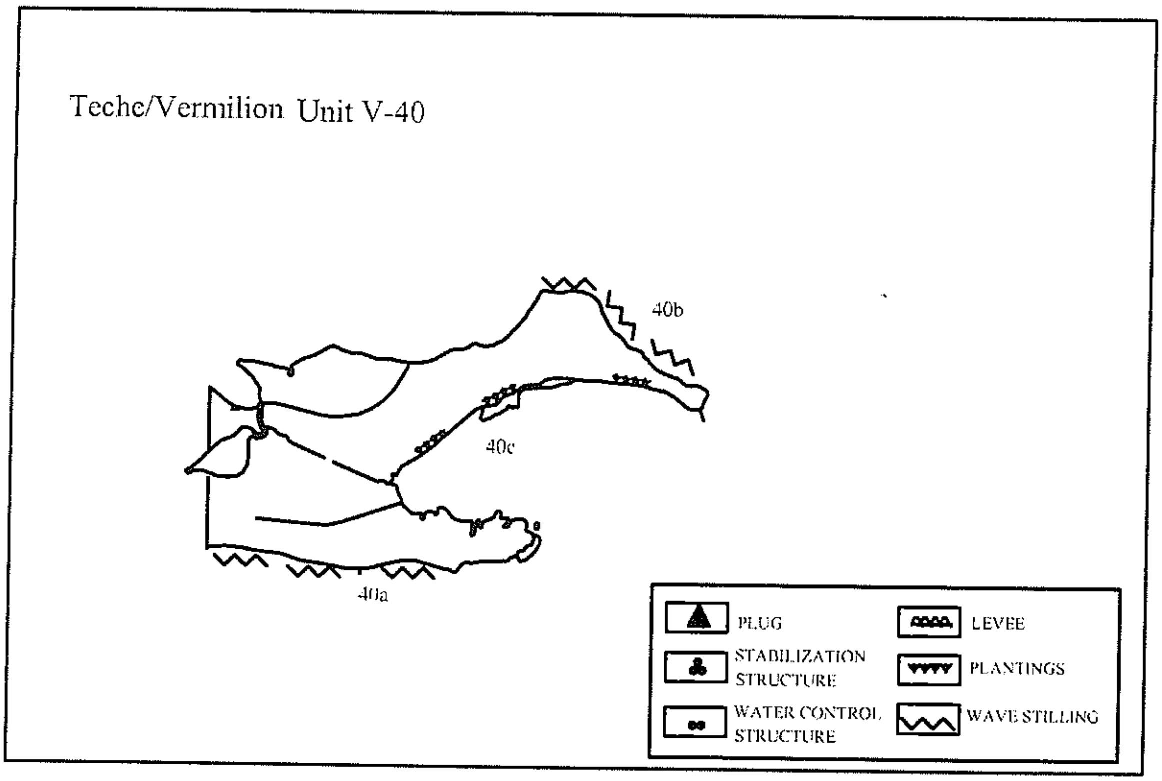


Figure 47. Hydrologic Unit No. V-40

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing marsh to provide habitat for forage production and wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be sized according to forage and wildlife habitat requirements and allow for slots for estuarine organism access.

Element 40a calls for 10,000 ft. of wave stilling rock protection on Vermilion Bay. Element 40b calls for 30,000 ft. of bank stabilization along Vermilion Bay. Element 40c is an existing vegetative planting site of smooth cordgrass.

Vermilion Unit V-41 (No. V-41)

The hydrologic unit (Figure 48) is a 606 acre area located in the south central portion of the study area. The soils in the unit are Creole muck and Mermentau clay. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by the Gulf of Mexico and V-38 and V-39 and is of one ownership.

This unit was mapped by O'Neil in 1949 as sea rim. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of torpedograss (*Panicum repens*) and dwarf spikesedge (Eleocharis parvula). Other common plants are olney bulrush (Scirpus olneyi), common rush (Juncus effusus) and marshhay cordgrass (Spartina patens). Pockets of saltmarsh bulrush (Scirpus patens). Pockets of saltmarsh bulrush (Scirpus robustus) were scattered throughout the unit as well.

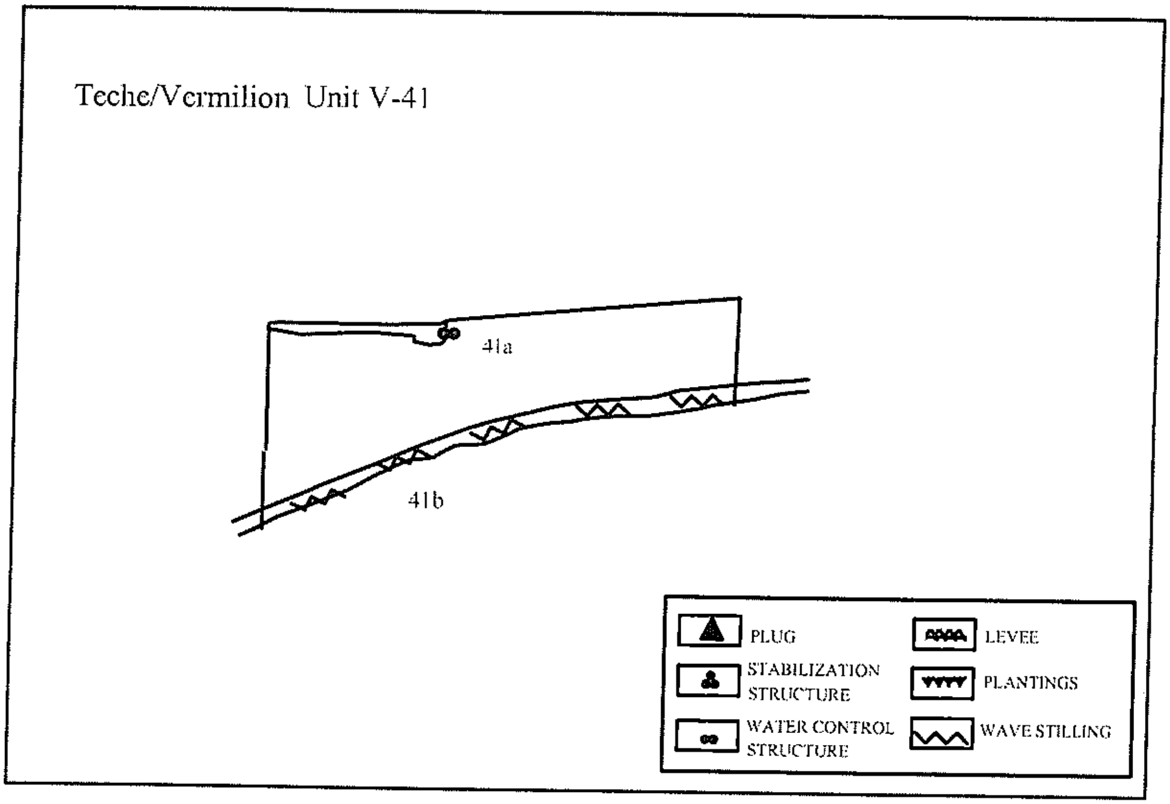


Figure 48. Hydrologic Unit No. V-41

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing marsh to provide habitat for forage production and wildlife habitat and to reduce saltwater intrusion. The plan objective calls for
repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be sized according to forage and wildlife habitat requirements and allow for slots for estuarine organism access.

Element 41a calls for low level rock weir at the end of a work canal. Element 41b calls for 11,000 ft. of coastline stabilization along the Gulf of Mexico.

Vermilion Unit V-42 (No. V-42)

The hydrologic unit (Figure 49) is a 1,450 acre area located in the south central portion of the study area. The soils in the unit are Creole muck, Mermentau clay and Hackberry-Mermentau complex. The land is non-forested wetland. The unit has no oil field channels going through the area. It is bordered by Chenier Au Tigre, V-37, V-38, V-41, V-43 and the Gulf of Mexico and is of one ownership.

This unit was mapped by O'Neil in 1949 as sea rim with some brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of olney bulrush (Scirpus olneyi), marshhay cordgrass (Spartina patens), dwarf spikesedge (Eleocharis parvula) and other sedges. A large chenier (Chenier Au Tigre) is located in this unit. Vegetation supported by this silty clay loam was low paspalum (Paspalum sp.), dwarf spikesedge (Eleocharis parvula) and torpedoegrass (Panicum repens).

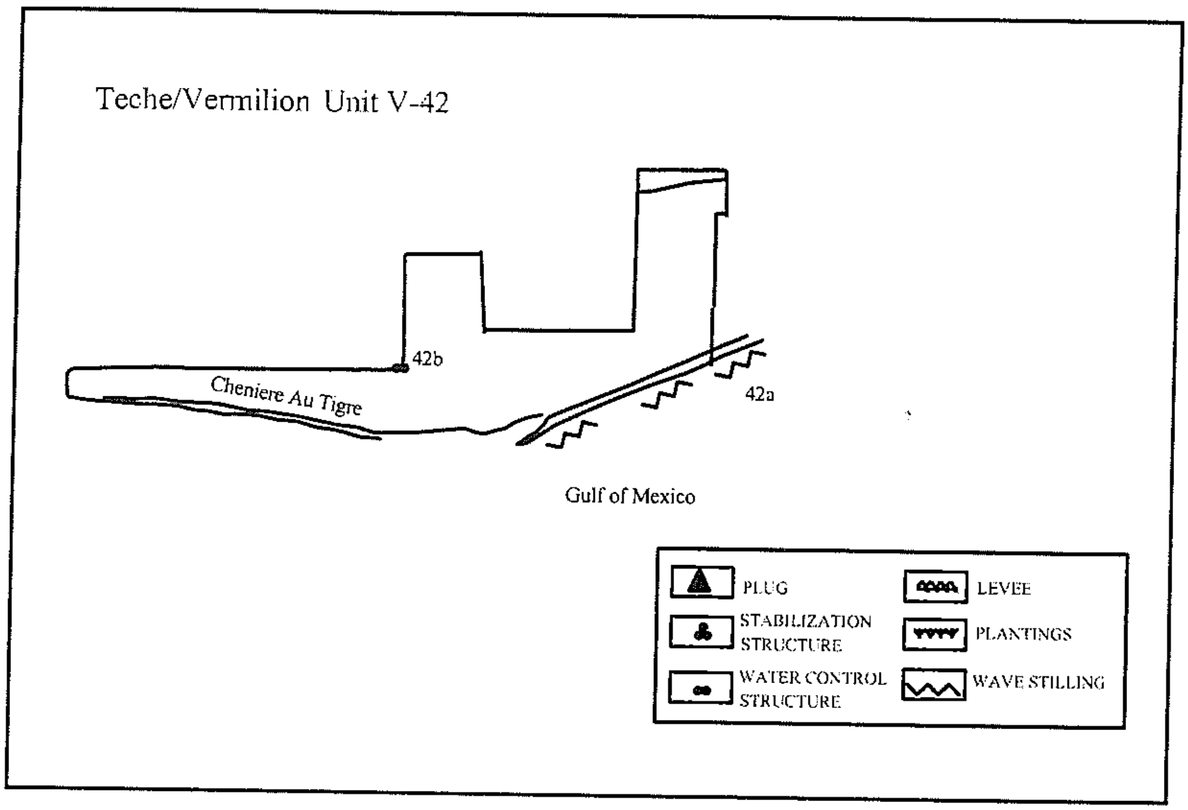


Figure 49. Hydrologic Unit No. V-42

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage production and wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be sized according to forage and wildlife habitat requirements and allow for slots for estuarine organism access.

Element 42a calls for 8,500 ft. of coastline stabilization on the Gulf of Mexico. Element 42b is an existing structure and will require repair or replacement in the future. Element 42b is a 15" PVC pipe with flapgate.

Vermilion Unit V-43 (No. V-43)

The hydrologic unit (Figure 50) is a 4,820 acre area located in the south western portion of the study area. The soils in the unit are Creole muck, Mermentau clay and Hackberry-Mermentau complex. The land is non-forested wetland. The unit has several oil field channels going through the area. It also has several cattle walkways. It is bordered by the Gulf of Mexico, V-42 and V-44 and is of one ownership.

This unit was mapped by O'Neil in 1949 as leafy three-corner grass or coco marsh, some sea rim and some brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as brackish and the 1978 and 1988 mapping by Chabreck and Linscombe identified the unit as brackish. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane, roseau and widgeon grass.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of marshhay cordgrass (Spartina patens) with olney bulrush (Scirpus olneyi) as a co-dominant species. Other common plants are seashore dropseed (Sporobolus virginicus), seashore saltgrass (Distichlis spicata) and seashore paspalum (Paspalum vaginatum). Hackberry (Oeltis virginiana), live oak (Quercus virginiana) and yaupon (Ilex vomitoria) occupy the ridge areas. Areas within the center of the unit have been burned and are composed of almost pure stands of olney bulrush.

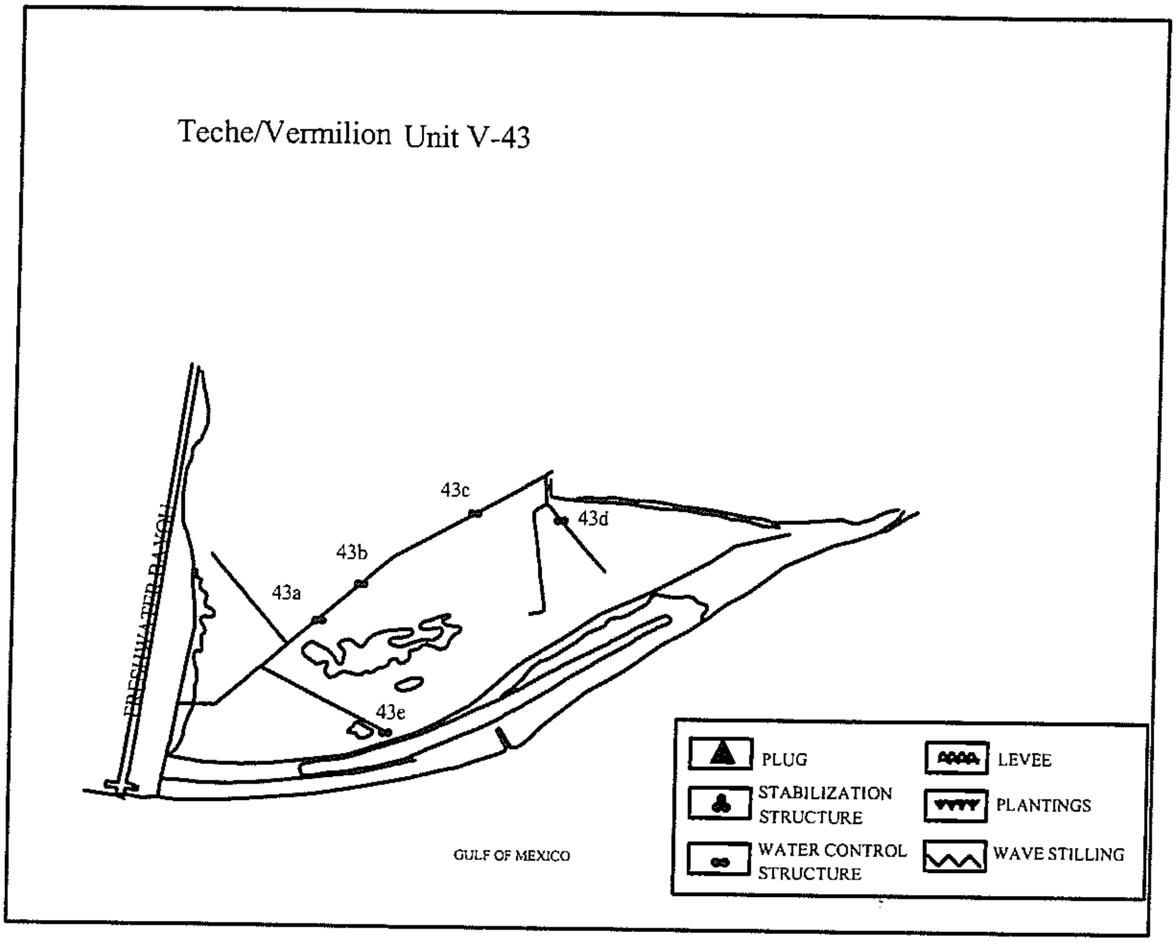


Figure 50. Hydrologic Unit No. V-43

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage production wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements.

Elements 43a, 43b, 43c, 43d and 43e are existing structures and will require repair or replacement in the future. Element 43a is PVC pipe with a flapgate. Elements 43b, 43c, and 43d are 24" PVC water control structures. Element 43e is a PVC pipe with flapgate.

Vermilion Unit V-44 (No. V-44)

The hydrologic unit (Figure 51) is a 2,251 acre area located in the south western portion of the study area. The soils in the unit are mostly Creole muck with some Banker muck. The land is non-forested wetland. The unit has several oil field channels and pipelines going through the area. It is bordered by Freshwater Bayou, V-34 and V-43 and is of one ownership.

This unit was mapped by O'Neil in 1949 as sea rim and brackish 3-cornered grass marsh. The 1968 mapping by Chabreck identified this area as brackish. The 1978 mapping by Chabreck and Linscombe identified the unit as brackish and the 1988 mapping by Chabreck and Linscombe identified the unit as brackish with some intermediate marsh. Vegetation was mapped in 1959 by Yancey as widgeon grass.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of marshhay cordgrass (Spartina patens), onley bulrush (Scirpus olneyi) and seashore dropseed (Sporobolus virginicus). Salmarsh bulrush (Scirpus robustus), bigleaf sumpweed (Iva frutescens), switchgrass (Panicum virgatum), cattail (Typha sp.), groundsel (Senecio sp.) and California bulrush (Scirpus californicus) occur in small pockets throughout the unit.

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

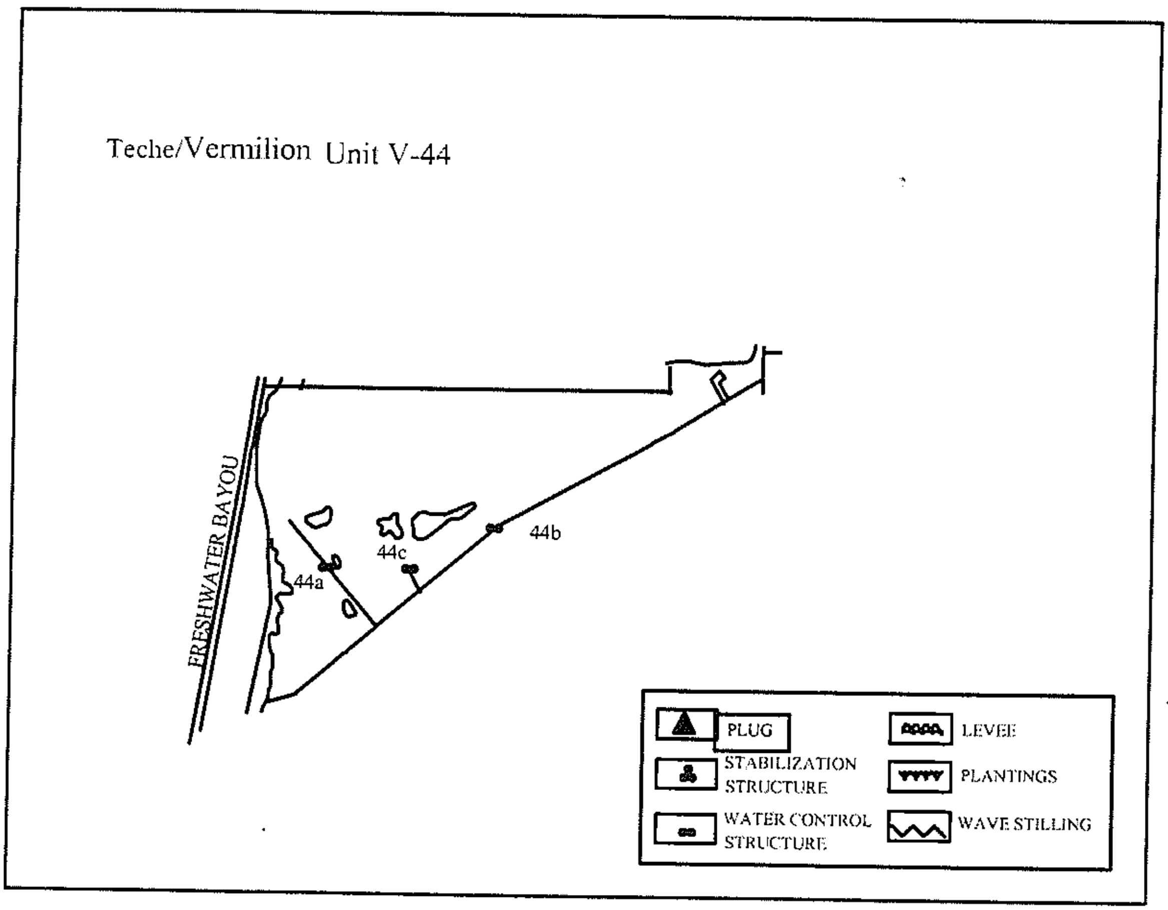


Figure 51. Hydrologic Unit No. V-44

The plan objective for this hydrologic unit is to actively manage for brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for forage, production, wildlife habitat and to reduce saltwater intrusion. The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organism access and sized according to forage and wildlife habitat requirements.

Element 44a calls for rock weir with size elevation to be determined by an NRCS engineer.

Element 44b calls for replacement of old water control structure. Element 44c is an existing structure and will require repair or replacement in the future. Element 44c is a 24" PVC water control structure.

Vermilion Unit V-45 (No. V-45)

The hydrologic unit (Figure 52) is a 260 acre area located in the eastern portion of the study area. The soil type in the unit is Banker muck. The land is non-forested wetland. The unit is dedicated to spoil deposit with a levee around it. It is bordered by Freshwater Bayou, V-34, and V-44 and is of one ownership.

This unit was mapped by O'Neil in 1949 as excessively drained salt marsh. The 1968 mapping by Chabreck identified this area as intermediate. The 1978 mapping by Chabreck and Linscombe identified the unit as brackish and the 1988 mapping by Chabreck and Linscombe identified the unit as intermediate. Vegetation was mapped in 1959 by Yancey as wiregrass, hogcane and roseau.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of marshhay cordgrass (Spartina patens). Other common plants are California bulrush (Scirpus californicus), giant cutgrass (Zizaniopsis miliacea) and alligator weed (Alternanthera philoxeroides).

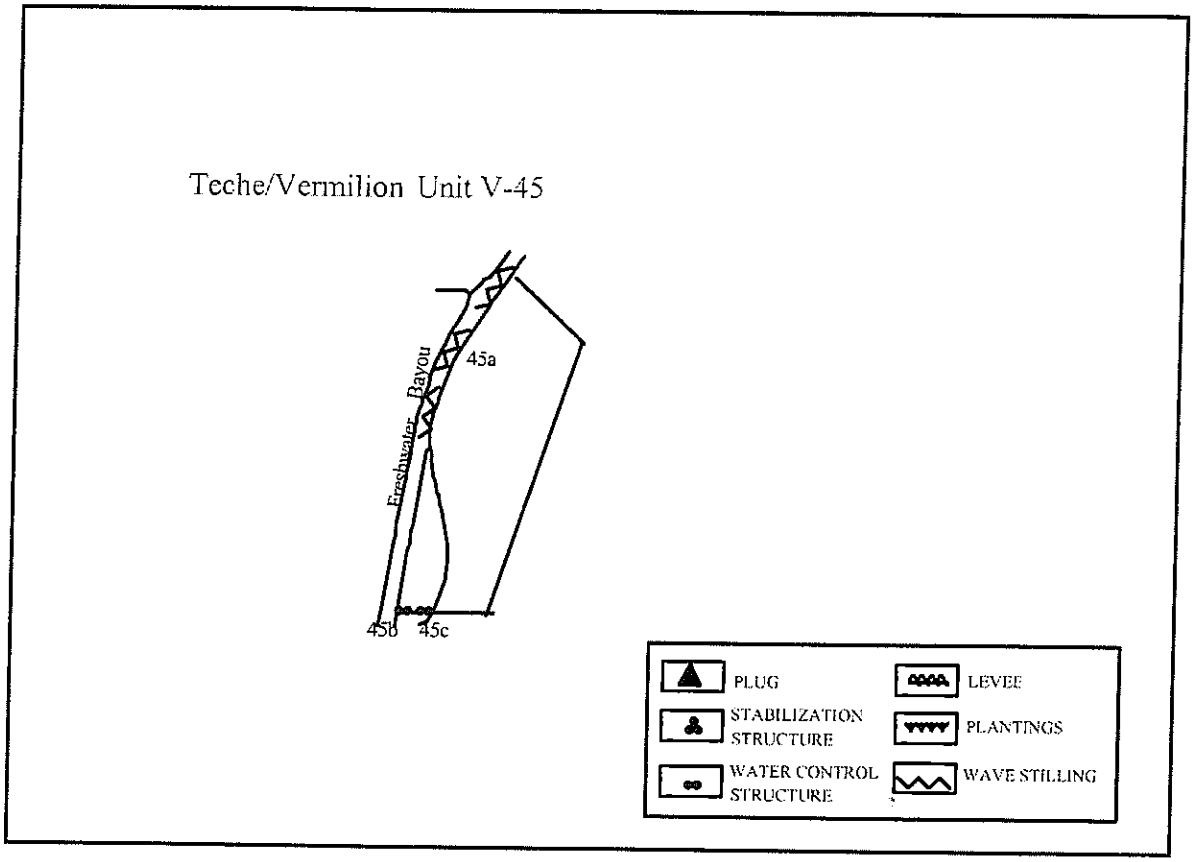


Figure 52. Hydrologic Unit No. V-45

The plan objective calls for repairing the existing systems of levees, where needed, and replacing dysfunctional water control structures with properly sized new ones. New structures will be fitted with slots for estuarine organisms access.

Element 45a calls for 3,000 ft. Of bank stabilization along the Freshwater Bayou. Elements 45b and 45c are existing structures and will require repair or replacement in the future. Elements 45b and 45c are 24" culverts, variable crest with weirs.

Iberia Parish

There were seventeen hydrologic units inventoried for this study in Iberia Parish. A discussion of each of the units along with individual hydrologic unit maps can be found below:

Iberia Unit I-1 (No. I-1)

Unit I-1 is located in Iberia Parish's northwestern coastal wetlands. It is bordered by Bayou Carlin on the southwest, Bayou Petite Anse on the south and southeast, LA Hwy. 329 on the east, and cropland on the north.

Unit I-1 is composed of Delcomb and Andry Association soils, with a small amount of Maurepas association soils in the southeast corner of the CTU. The soils are mapped as brackish marsh soils, however, the vegetation is more indicative of an intermediate marsh. The Atchafalaya provided a freshening effect to the marshes in this area, and is responsible for the transitional influence from brackish to intermediate marsh vegetation.

At present, there are no structures that exist in this hydrologic unit. There is some spoil that exist along the north bank of Bayou Carlin, however, not on the total length. Most of the area is dissected by natural streams.

In a series of reports dated early 1937 from the War Department, Office of the Division Engineer, the Bayou Petite Anse, Bayou Tigre, and Bayou Carlin area was described as follows. These streams are small interconnecting tidal streams in Iberia and Vermilion Parish. Normal tidal variations is about 1 foot, but the water surface may be depressed as much as 2 feet by protracting northerly winds or elevating similarly by strong southerly winds. This description of the areas hydrology indicates that the area was influenced less by tidal activity than it is presently. The hydrology of the unit has been altered by man to improve drainage to upland areas, and provide access for marine transportation, oil exploration and production. Historically, Bayou Petite Anse was the only natural outlet for the entire unit as it meandered its way through the marshes on its way to Tigre Lagoon. Man made channels in the area which have altered hydrology significantly are:

1) Jefferson Canal
2) Poufette Canal
3) Bayou Carlin (Delcambre Canal) (1935)
4) GIWW

The Jefferson Canal and Poufette Canal are man made drainage channels while Bayou Petite Anse was altered to provide transportation for salt and oil. Bayou Carlin was constructed to provide marine transportation for the Jefferson Island Salt Mine, Delcambre Shrimp industry and it also serves as an outlet to Lake Peigneur which is north of this unit. Today all of these channels provide drainage to upland areas of the Parish which is composed mostly of cropland. These channels transport into the unit freshwater and sediments. The GIWW, although not in the unit, also transports freshwater into the area from the Wax Lake Outlet during high Atchafalaya River stages. These channels have altered the hydrology by increasing the energy to the interior marshes in the unit. These channelized flows do not benefit the unit fully since most of the silt and sediment are carried into Bayou Carlin. The field evaluations in April of 1995 have documented that the original spoil banks of Bayou Carlin which functioned as levees to protect the interior marshes have eroded to marsh level due to heavy boat traffic and extreme tidal fluctuations exposing the unit to extremely erosive tidal fluctuation which are present in the area. These tidal fluctuations have also caused salt water intrusion problems during drought conditions. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments and prevent saltwater intrusion to upland areas. These goals will be accomplished by maintaining the existing levees along Bayou Carlin and Bayou Petite Anse and reconstructing those which have eroded. Vegetative shoreline planting will also be used to protect the levees where boat traffic and wave energy are high (1L). It is also the plans objective to make better use of the available fresh water and sediments by installing low crested rock weirs and plugs along the perimeter of the unit (1D, E, F, G, H, I, J & K). As mentioned earlier, it is an objective of this plan to limit saltwater intrusion to the upland areas to the north of the unit during times of drought. It has been documented that all of the major channels in the unit carry high salinity water into the upland areas which does not allow the use of surface water for irrigation of cropland. During the droughts of 1996 and 1998, salinity reading at LA-14 on all of the channels were in excess of 1.5 ppt with the highest reading in Delcambre at 3.0 ppt. Structural measures should be implemented to prevent this from occurring (1A, B, C & M).

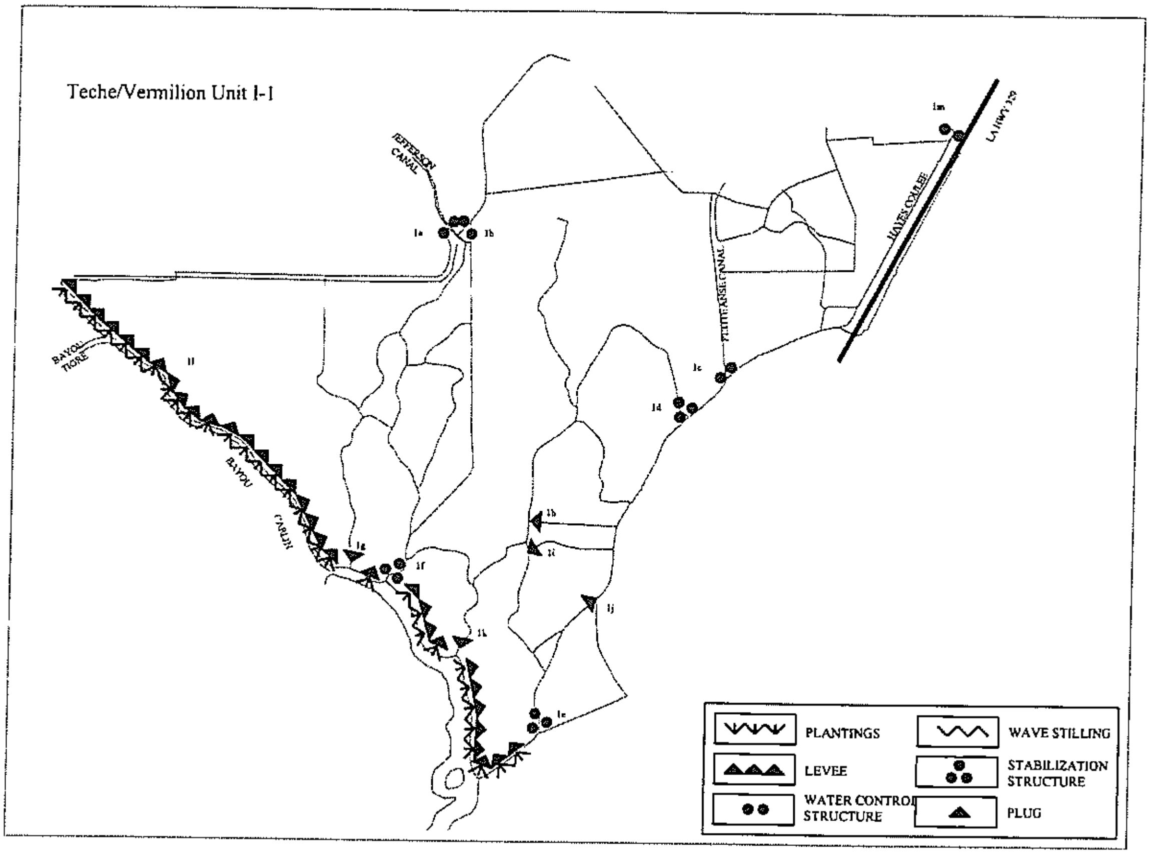


Figure 53. Hydrologic Unit No. I-1

The predominant plants occurring in this CTU are big Cordgrass and a variety of carex species. Both of these plant species prefer conditions that are subject to occasional drying. Their occurrences on almost every sampling location suggests that alternate wet and somewhat dry conditions occur in this unit. Dwarf spikesedge and other Eleocharis sp. are scattered throughout the entire unit, making up to 35 % of the ground cover on transition areas between spoilbanks and the interior marsh. Marshhay Cordgrass and Olney bullrush made up approximately 11% on the E.S. sites that were inventoried. The low percentages of these plants also indicate intermediate marsh conditions. Eastern baccharis was consistently found throughout the unit. Switchgrass was found growing in isolated areas, usually on slightly elevated sites associated with bends in small bayous or where dredged spoil was deposited. Softstem bulrush, cattail, bulltongue, and roseau cane were found in small amounts. Traces of marsh morning-glory, alligatorweed groundsel, deer pea, canarygrass, wax myrtle, pennywort, bushy bluestem, iris, California bulrush, and spider lily were encountered throughout the marsh.

Iberia Unit I-2 (No. I-2)

This unit (I-2) is located in the western most of the Iberia Parish coastal wetlands. It is obounded on the north by Bayou Tigre, on the northeast, and east and Bayou Carlin, on the south and southwest by the Union Oil Canal.

The soils of I-2 are mapped as a brackish marsh composed of primarily Andry association soils with some marsh in Lafitte association soils in the southern part of the unit.

The only structural measures present in this unit is the existing levee found in the upper portion of the management unit.

In a series of reports dated early 1937 from the War Department, Office of the Division Engineer, the Bayou Petite Anse, Bayou Tigre, and Bayou Carlin area was described as follows. These streams are small interconnecting tidal streams in Iberia and Vermilion Parish. Normal tidal variation is about 1 foot, but the water surface may be depressed as much as 2 feet by protracting northerly winds or elevating similarly by strong southerly winds. This description indicates that the hydrology of the area was influenced less by tidal fluctuation than it is presently. The hydrology of the unit has been altered by man to improve drainage to upland areas and provide marine access for oil exploration and production. These changes in hydrology have increased the tidal influence in the area. There are three features associated with this unit that are a result of man altering the hydrology of the unit. These features are:

1) The building of a levee along a property line on the northern portion of the unit. This was done to better manage the area for forage production for livestock and wildlife.

2) The dredging and straightening of the old natural Bayou that is in the western boundary of the unit. This dredging was done to improve access to the area for trapping and oil exploration.

3) The dredging and straightening of Bayou Carlin.

Feature No. 2 above has altered the hydrology by capturing the majority of flow from Bayou Tigre which drains uplands in both Iberia and Vermilion Parish. This channel now carries huge amounts of freshwater and sediments into the unit. Bayou Carlin is also a source of freshwater and sediments for the unit. The 1995 field evaluation indicates that the unit was once protected by levees which were constructed by utilizing the spoil from the dredging operations on both the east and western boundary. However, erosion from boat traffic and tidal fluctuations have caused some of these levees to erode to marsh level exposing the marsh to high tidal influences. The objective of this unit is to actively manage the unit as a brackish marsh. This will be accomplished by maintaining and enhancing the existing brackish marsh to provide habitat for waterfowl, esturine organisms and to reduce saltwater intrusion. The plan objectives call for maintaining the existing levees along the perimeter and reconstructing those which have eroded and protect those with vegetative shoreline planting especially along Bayou Carlin (2L & K). It is also the objective to make use of the available sediments by installing fixed crested rock weirs at exchange points along both of the channels in question (2A, B, C, D, E, F, G & H). It should also be noted that salt water intrusion makes its way into the uplands during drought conditions making surface water unavailable for irrigation of cropland. During the drought of 1996, documented salinity reading taken in Bayou Tigre at Erath reached levels of 3.5 ppt. Structural measures to prevent this salt water intrusion into the upland should be considered at the junction of Bayou Tigre and No Name Bayou this is located in V-14 (2M). This structure should be sized to protect the upland area from tidal flooding.

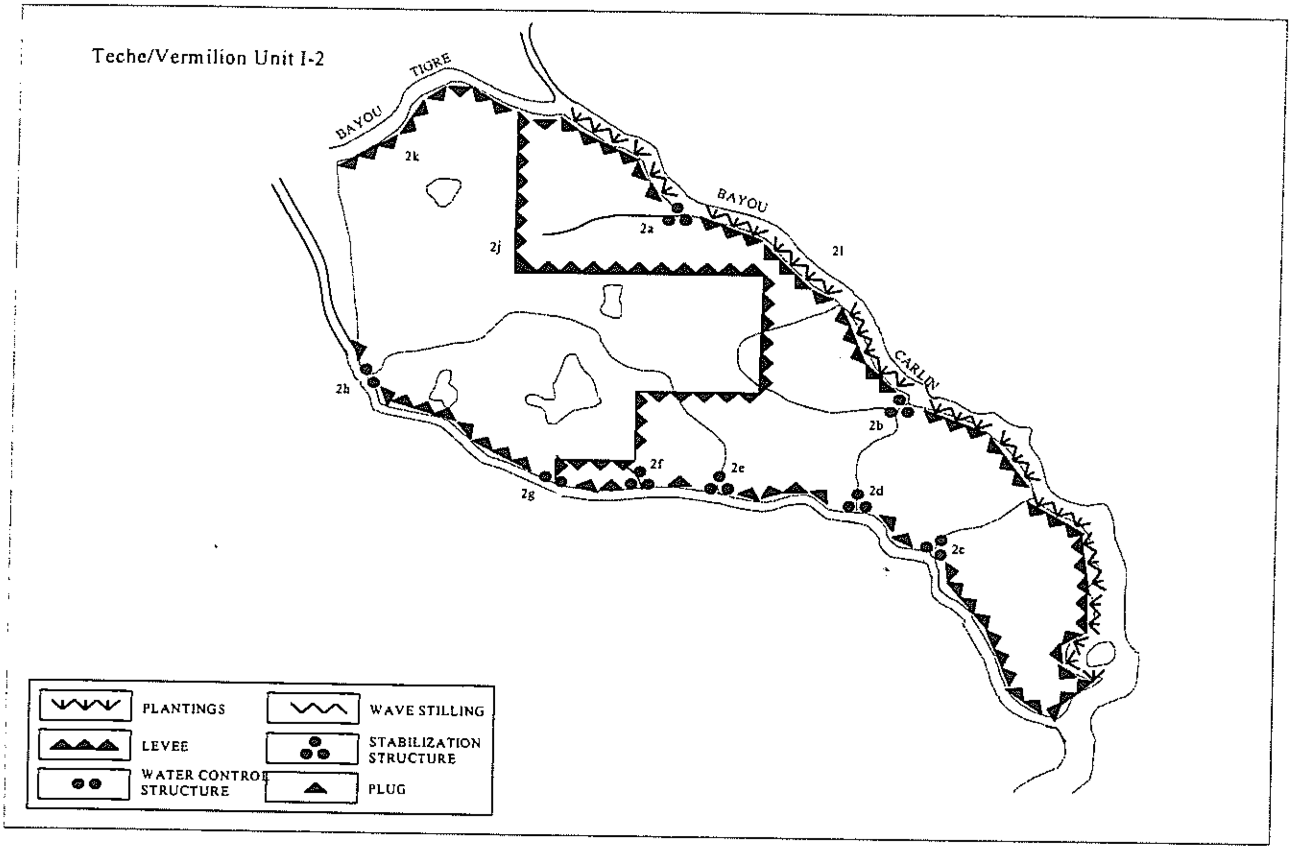


Figure 54. Hydrologic Unit No. I-2

This unit has more marshhay cordgrass and Olney bulrush than unit I-1. These two species are the two most encountered plants in the unit. However, this unit still has areas that have a considerable amount of Carex sp. and the diversity of the vegetation is more than most brackish marshes. Therefore, this unit should be characterized as an intermediate marsh, although some E. S. sites indicate brackish marsh vegetative conditions. Big cordgrass was found to dominate one area of the unit on the central part of the eastern side of the unit. Cattail and dwarf spikesedge are scattered throughout the unit. Roseau cane was found in pockets throughout the unit and there are several large cane breaks in the unit. Giant cutgrass, smartweed, Bulltongue, marsh morningglory, alligatorweed, groundsel, canarygrass, iris softrush, and spider lily were found in minute amounts.

Iberia Unit I-3 (No. I-3)

Unit I-3 is also located in the western coastal wetlands of Iberia Parish. It is bounded on the south by the Trunkline Gas Pipeline, the north by No Name Bayou, and east by Bayou Carlin (Delcambre Canal),and the west by the Union Oil Canal.

The soil of this unit is mapped entirely in the Lafitte Association. This unit is made up of brackish to intermediate marsh.

The Trunkline Gas pipeline has existing plugs at the intersection of the Union Oil Canal and Bayou Carlin (Delcambre Canal).

In a series of reports dated early 1937 from the War Department, Office of the Division Engineer, the Bayou Petite Anse, Bayou Tigre, and Bayou Carlin area was described as follows. These are small interconnecting tidal streams in Iberia and Vermilion Parish. Normal tidal variations is about 1 ft, but the water surface may be depressed as much as 2 ft by protracting northerly winds or elevating similarly by strong winds. This description of the areas hydrology indicates that the area was influenced less by tidal activity than it is presently. The hydrology of the unit has been altered by man to improve drainage to the uplands, and provide access for marine transportation, oil exploration and production. Historically, the northern boundary No Name Bayou flowed west to Bayou Petite Anse. Two small tidal tributaries Bayou Portage that flowed south and another no name tributary, which flowed east toward Bayou Petite Anse, both provided drainage to the unit. Ultimately, all of the drainage of the unit flowed into Tigre Lagoon before it entered into Vermilion Bay.

The man made alterations to the unit are as follows:

1) Trunkline Gas Pipeline
2) Union Oil Canal
3) The dredging and of No Name Bayou to the North.
4) GIWW
5) Dredging and straightening of Bayou Petite Anse.

All of these alterations have affected the unit's hydrology by increasing tidal fluctuations. The Dredging of No Name Bayou was done to improve drainage to the uplands areas and it no longer serves as it once did since the construction of the Union Oil canal. The Union Oil Canal has captured most of the traditional flows as it now empties directly into the GIWW. The Trunkline Gas Pipeline has cut the traditional drainage pattern since the spoil from the channel was placed on both sides. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by maintaining the existing spoil banks No Name Bayou, Bayou Carlin, Trunkline Gas Pipeline and the Union Oil canal and reconstructing those which have eroded. It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings especially along Bayou Carlin (3A, B & C). To better utilize the available freshwater and sediments, low crested rock weirs will be installed on small streams which now provide drainage to the unit

(3D, E, F, G, H & I). It is also very important that the existing plugs on the Trunkline Gas Pipeline channel be maintained.

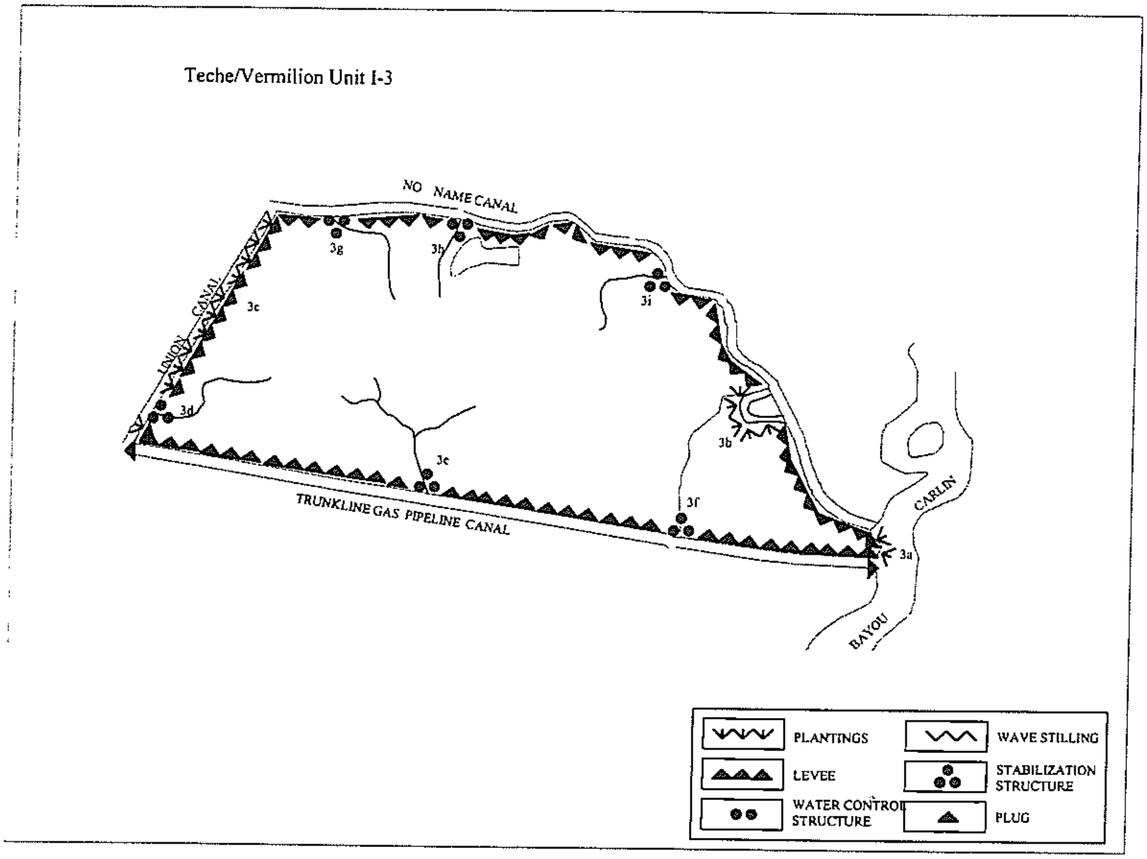


Figure 55. Hydrologic Unit No. I-3

Carex species and Roseau cane represent the dominant vegetation. Marshhay cordgrass and Olney bulrush combined make up approximately 23% of the ground cover. Soft rush and spikesedge were found in approximately the same amounts as minor constituents of the marsh vegetation. California bulrush, bulltongue alligatorweed. marsh morningglory and iris were found in trace amounts. Eastern baccharis was found in better drained sites, while switchgrass was found on one E.S. site along a bayou bank.

Iberia Unit I-4 (No. I-4)

This unit is located in the southwestern part of Iberia Parish. It is bordered on the north by the Trunkline Gas Pipeline, south by the Gulf Intracoastal Waterway, east by Bayou Petite Anse, and west by Union Oil Canal and several oilfield location canals which closely parallel the Iberia-Vermilion Parish line.
The soil of this unit is completely in the Lafitte Association. The soil is organic, very poorly drained and rapidly permeable. The unit was classified as a brackish to saline marsh by O'Neil in 1949, and as brackish marsh in 1988 by Chabreck and Linscombe.

At present there are no hard structures in the unit. Spoil banks exist along all of the oil field channels, Bayou Petite Anse and the GIWW. However the spoil banks are not continuous because of erosion. There are several location canals which were plugged at the ends and the plugs need maintenance.

In a series of reports dated early 1937 from the War Department, Office of the Division Engineer, the Bayou Petite Anse, Bayou Tigre, and Bayou Carlin area was described as follows. These are small interconnecting tidal streams in Iberia and Vermilion Parish. Normal tidal variations is about 1 foot, but the water surface may be depressed as much as 2 feet by protracting northerly winds or elevating similarly by strong winds. This description of the areas hydrology indicates that the area was influenced less by tidal activity back then than it is presently. The hydrology of the unit has been altered by man to improve drainage to the uplands, and provide access into the area for marine transportation, oil exploration and production. Historically the entire drainage area of the unit drained through Bayou Portage which flowed Southward into Tigre Lagoon before it entered Vermilion Bay.

The man made alterations to the unit are as follows:

1) Trunkline Gas Pipeline
2) The dredging and construction of the Union Oil Canal
3) GIWW
4) Dredging and straightening of Bayou Petite Anse.

All of these alterations have affected the unit's hydrology by increasing tidal fluctuations in the unit. The Union Oil Canal has captured most of the traditional flows from the north as it now empties directly into the GIWW. The Trunkline Gas Pipeline has cut the traditional drainage pattern since the spoil from the channel was placed on both sides. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by maintaining the existing spoil banks along Bayou Carlin, Trunkline Gas Pipeline, Union Oil Canal and the GIWW and reconstructing those which have eroded (4S, T, U & V). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings especially along Bayou Carlin. To better utilize the available freshwater and sediments, low crested rock weirs will be installed on small streams which now provide drainage to the unit (4A, B, C, D, E, F, G, I, J, K, L & M). A water control structure with a boat bay is planned in the Union Oil Canal to reduce tidal influence (4H). Plans also include plugs in abandoned oilfield channels and pipeline canals (4N, M, O, P, Q & R).

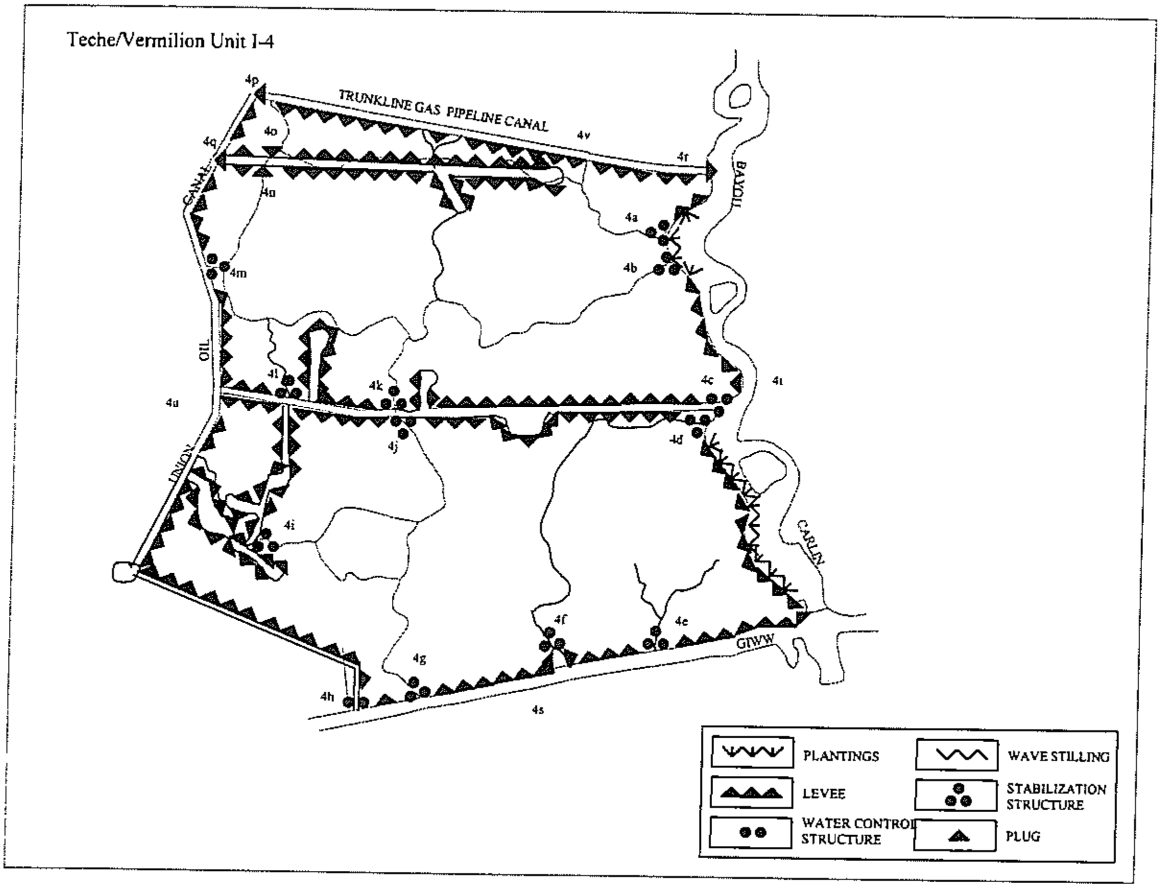


Figure 56. Hydrologic Unit I-4

Currently, Olney bulrush (Scirpus olneyi) is the dominant species in the CTU, comprising 58% of the plant community. All other species consistently occurred in amounts of less than ten percent: barnyardgrass (Echinochloa crus-galli) 9%, marshhay cordgrass (Spartina patens) 8%, leafy threesquare (Scirpus robustus) 8%, and alligatorweed (Alternanthera philoxeroides) 7%. Other species noted to occur in trace amounts were bulltongue (Sagittaria lancifolia), spikesedge (Eleocharis sp.) , and yellow bristlegrass (Setaria glauca). The presence of the barnyardgrass, alligatorweed, and bulltongue indicates intermediate type marsh conditions. The incidence of Olney bulrush occurring in such a high percentage of the plant community suggests that a controlled burning program is being used. The interior marsh appears quite healthy, and no evidence of marsh break-up was noted. In fact, the area adjacent to the GIWW is currently being grazed.

Iberia Unit I-5 (No. I-5)

This unit is located in the southwestern most of Iberia Parish. It is bounded on the northwest by the Gulf Intracoastal Waterway (GIWW), The northeast by the Avery Canal, and south by Vermilion Bay.

A large body of water, Tigre Lagoon, is located in the central portion of the west half of the unit. Tigre Lagoon is connected to both the GIWW and Vermilion Bay by the remains of old Bayou Petite Anse. This lagoon is subject to tidal fluctuation and becomes an exposed mudflat during low tides. Smooth Cordgrass (Spartina alternaflora) is beginning to invade the area naturally. Attempts are being made to accelerate the vegetative process by establishing small plots and allowing the seeds to revegetate the area naturally.

Most of the unit is owned by larger land owners of greater than 500 acres. Camps sites are located on the northwest corner of the lagoon. Oil fields channels are located in the south central portion of the unit. Historically, the unit drained into Tigre Lagoon before entering Vermilion Bay.

The unit is covered by soils of the Lafitte association. These soils are very poorly drained organic soft marshes. They are nearly level. Elevations are less than 2 feet above sea level. Most of the area is flooded much of the time by about 6 inches of water. They are subject to occasional deep flooding by storm tides when hurricane and tropical storms pass over or near the area. Lafitte soils have a surface layer of dark-brown organic material that is underlain by 116 inches of very dark grayish-brown, dark reddish-brown, very dark grayish-brown almost completely decomposed, semifluid organic material. Soils are saline. The vegetation is chiefly the Brackish Marsh type. Flooding, organic matter content, wetness and low strength are limiting factors.

The northwestern boundary GIWW is covered by spoil exposed by the dredging of the GIWW. The GIWW was originally dredged to a width of 150 feet; at this time, the present width varies from 500 to 700 feet. This spoilbank is eroding at a rapid rate due to wave action from boat traffic in the GIWW. Cattle graze the section of the unit south of the GIWW and north of Tigre Lagoon. Due to spoil deposition over the area, soils will support cattle grazing.

The field investigations in 1995 did not document any structural measures in the unit.

Man made channels in the area which have altered the units hydrology are as follows.

1) GIWW
2) The Dredging of the Avery Canal
3) The Dredging of oil location channel south of Tigre Lagoon

All of these channels have altered the hydrology and increased the tidal energy and fluctuations in the unit. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by reestablishing and maintaining continuous spoil banks along the GIWW and Avery Canal. It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings and wave stilling along the shoreline of Vermilion Bay, Avery Canal and the GIWW (5A, D, F & K). High tidal energy is to be managed by installing rock weirs at the mouth of the Avery Canal and the Oaks Canal and a similar structure on an oilfield canal. These structures will be designed to also stabilize the channel bottoms and widths (5C, E & I). To better utilize the available freshwater and sediments low crested rock weirs will be installed on small streams which now provides drainage to the unit (5G, H & J). Sediment fencing with vegetative plantings in Tigre Lagoon are planned to maintain channel banks after the installation of the structure at Avery canal which we help to reestablish historic drainage patterns (5B). A water control structure is planned in the outlet of the oilfield channel the flows through Tigre Lagoon into Vermilion Bay from Bayou Petite Anse (5L).

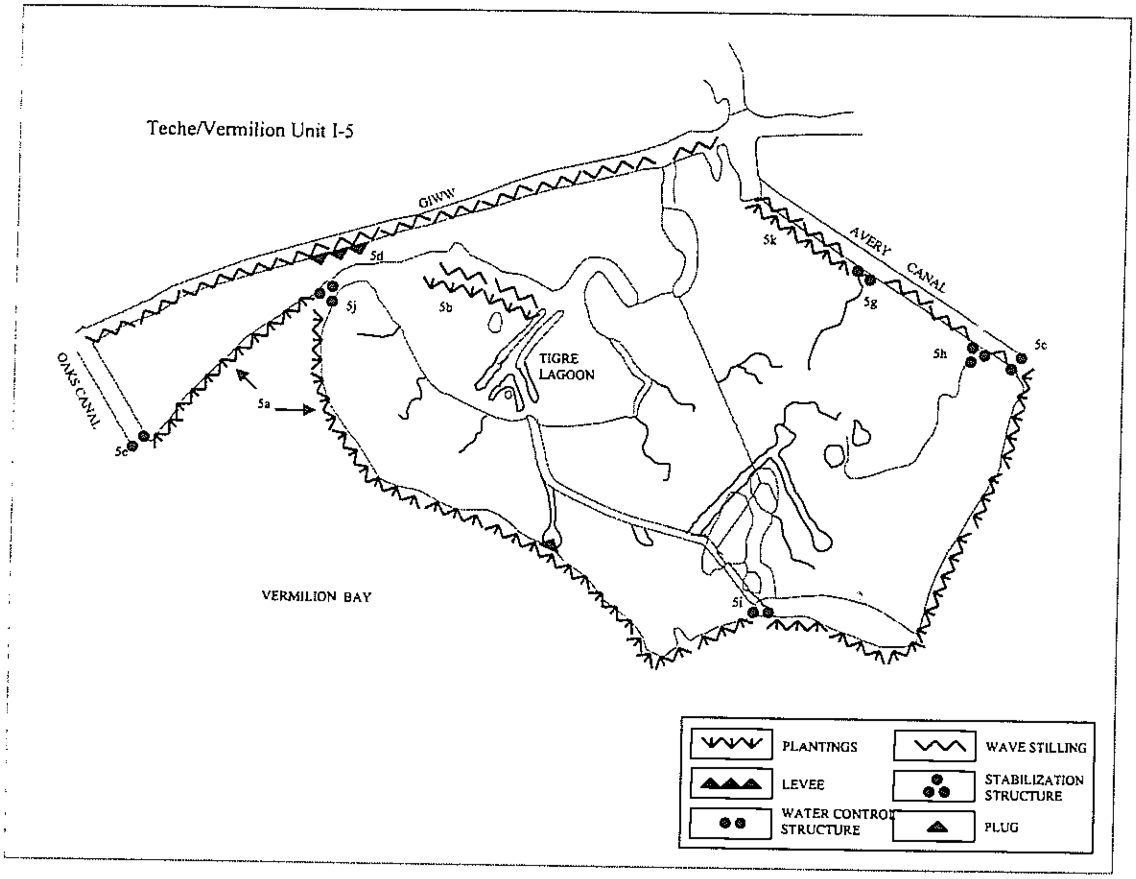


Figure 57. Hydrologic Unit I-5

Vegetatively, this unit is a very homogeneous brackish marsh. Although Three-corner grass (<u>Scirpus olneyi</u>), is the dominant species in the northeastern and central areas of the unit (95% of the community), it is present throughout. Marshhay cordgrass is the dominant species in the southwestern half (55% to 60%), with three-corner grass as the secondary species (30%). In the interior marshes of this unit, Eastern baccharis and Marsh morningglory appears at rates of 5% to 10%. Other species occurring in this unit in trace amounts are cattail, bulltongue, goldenrod, deer pea, and rushes.

Iberia Unit I-6 (No. I-6)

This unit encompasses a small area and is bordered on the north, east and west by Avery Island Salt Mine Channels, and south by the Trunkline Gas Pipeline.

The soils on the western one-third of this unit is of the Lafitte Association. The soils on the eastern two-thirds soils of this mapping unit are Maurepas association. These soils in soft marshes. The Lafitte contains a thick organic layer and is saline to brackish. The Maurepas also has a thick organic layer, however, its mostly woody. This small unit was classified as a brackish to saline marsh by O'Neil in 1949, and as brackish marsh in 1988 by Chabreck and Linscombe.

A riprap plug on the pipeline canal that forms the southern boundary prevents rapid fluctuations in water levels from occurring within this area (6B). An existing earthen plug on the Oil field location site near the intersection of the Avery canal and Bayou Carlin is maintained to reduce tidal influence to the unit (6C). The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by reestablishing and maintaining continuous spoil banks along the Avery Island Oil field canal, Bayou Petite Anse, Bayou Carlin and the Trunkline Pipeline Canal. It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings along the shoreline of the Avery Canal and Bayou Carlin (6A). To better utilize the available freshwater and sediments Low Crested Rock Weirs will be installed on small streams which now provide drainage to the unit (6D, E & F).

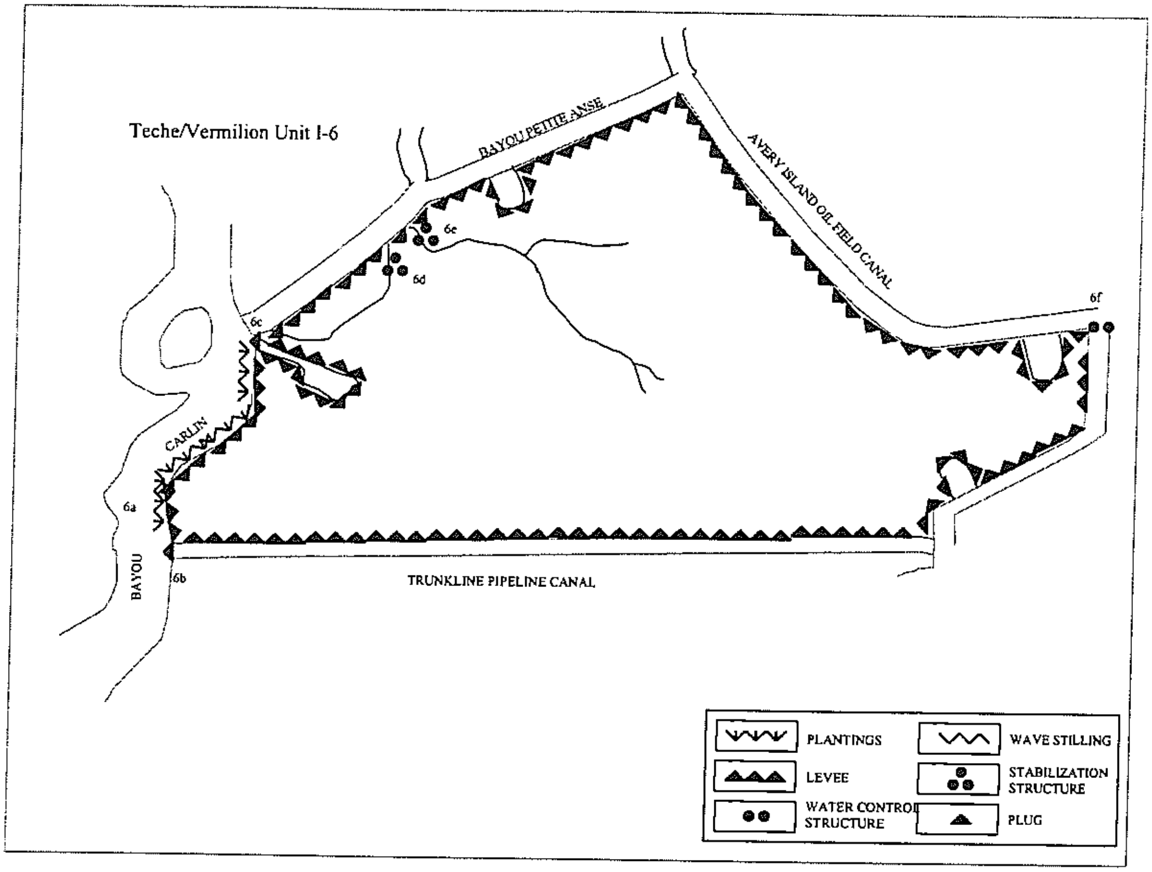


Figure 58. Hydrologic Unit I-6

Composing 28% of the vegetative community, Marshhay cordgrass is now the primary species dominating this CTU, followed closely by Olney bulrush which composes 23% of the community. Alligatorweed and bulltongue were found to make up 15 and 10% respectively of the emergent vegetation. Spikesedge, soft rush (Juncus effusus), and giant cutgrass (Zizaniopsis miliacea) each composed 8% of the community.

Iberia Unit I-7 (No. I-7)

This unit is located south of Avery Island LA. I-07 is bounded on the north by the Trunkline Gas Pipeline, south by Three Bayou and Gulf Intra Coastal Waterway (GIWW), east by the Iberia Port Channel, and west by Bayou Petite Anse.

The primary soil in this unit is the Lafitte Association. There are two areas of Maurepas association. One is located in the northwest corner and the other is a larger area in the northeast corner. This unit was primarily classified as a brackish to saline marsh by O'Neil in 1949, and mainly brackish by Chabreck and Linscombe in 1988 with an intermediate area on the eastern end.

Three water control structures are located along the southern boundary of this CTU which is adjacent to the GIWW. The incidence of healthy intermediate/brackish type vegetation transitioning to fresh/intermediate type species in the east end indicates the structures are providing proper control and protecting interior marshes from the salinity spikes known to occur in the waterway.

Man made channel in the area which have altered the units hydrology are as follows.

1) GIWW
2) The Dredging of the Trunkline Gas Pipeline
3) The Dredging of the Iberia Southern Drainage Canal
4) The Straightening and dredging of Bayou Carlin

All of these channels except for the Trunkline Gas Pipeline channel have increased the tidal energy and fluctuations in the unit. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the GIWW, Bayou Carlin and Iberia Southern Drainage Canal (7J). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings along Bayou Carlin and GIWW. High tidal energy is to be managed by maintaining the existing weirs these structures are designed to stabilize the channel bottoms and widths (7A, B & C). To better utilize the available freshwater and sediments Low Crested Rock Weirs will be installed on small streams which now provide drainage to the unit (7 D, E, H & I). Plugs along oilfield slips that cross small drains will be plugged to prevent excess tidal fluctuation in the unit (7G).

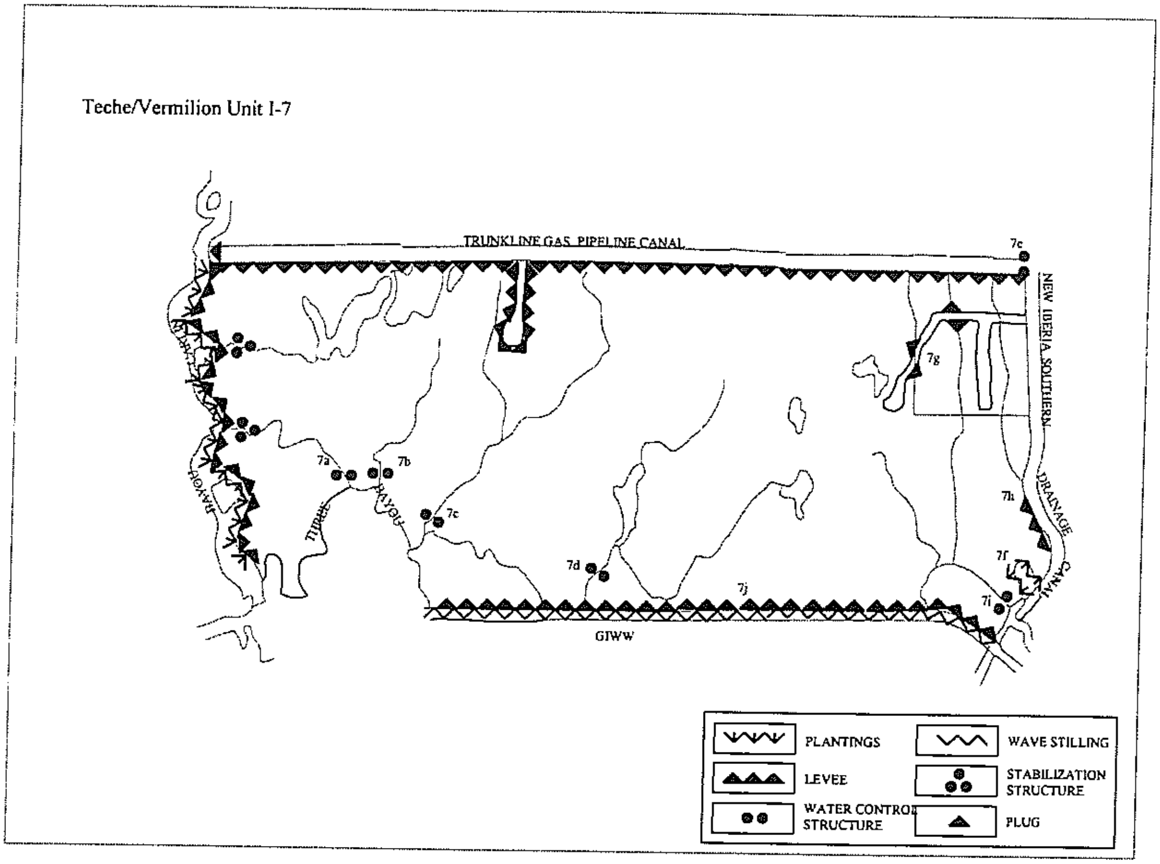


Figure 59. Hydrologic Unit I-7

This large CTU is composed of a very diverse plant community with an interior marsh that appears quite healthy. Marshhay cordgrass is the primary species, and composes 21% of the plant community. Several secondary species are present and occur in the following percentages: Olney bulrush 17%, bulltongue 15%, alligatorweed 11%, and cattail (Typha sp.) 10%. Other species noted to occur in amounts of 5% or less are spikesedge, leafy threesquare 5%, roseau (Phragmites communis) 4%, barnyardgrass 3%, black needlerush (Juncus roemerianus) 2%, and seashore paspalum (Paspalum vaginatum) 2%.

Iberia Unit I-8 (No. I-8)

This unit is located south of Avery Island, LA. It is bounded by Three Bayou on the north, east, and west. The south boundary is the Gulf Intra Coastal Waterway (GIWW). The boundaries of this triangular shaped unit are formed on one side by the GIWW and on two sides by Three Bayou.

The soil in the unit is of the Lafitte Association. These soils have a thick organic layer in the soft marshes of Louisiana. This unit was classified as a brackish to saline marsh by O'Neil in 1949, and considered brackish in 1988 by Chabreck and Linscombe.

Field investigations made during the spring of 1995 documented that no structural measures exist within the unit.

The dredging of the GIWW which is the southern boundary of the unit has altered the hydrology of the unit by increasing the tidal energy and fluctuations in the unit. The plan objective of this unit is to actively manage the unit for brackish to intermediate marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the GIWW, Bayou Carlin (8A & C). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings along Bayou Carlin and GIWW. It is anticipated that wave stilling will be required along the GIWW because of the heavy boat traffic. This will be accomplished by constructing a rock levee along the existing banks to prevent the channel from getting wider. Vegetative plantings will be used behind the levee as siltation builds. High tidal energy in the interior of the unit will be managed by installing a rock weir with a boat bay at Three Mouth Bayou. This structure will be designed to stabilize the channel bottoms and widths. These structures will better utilize the available freshwater and sediments (8B).

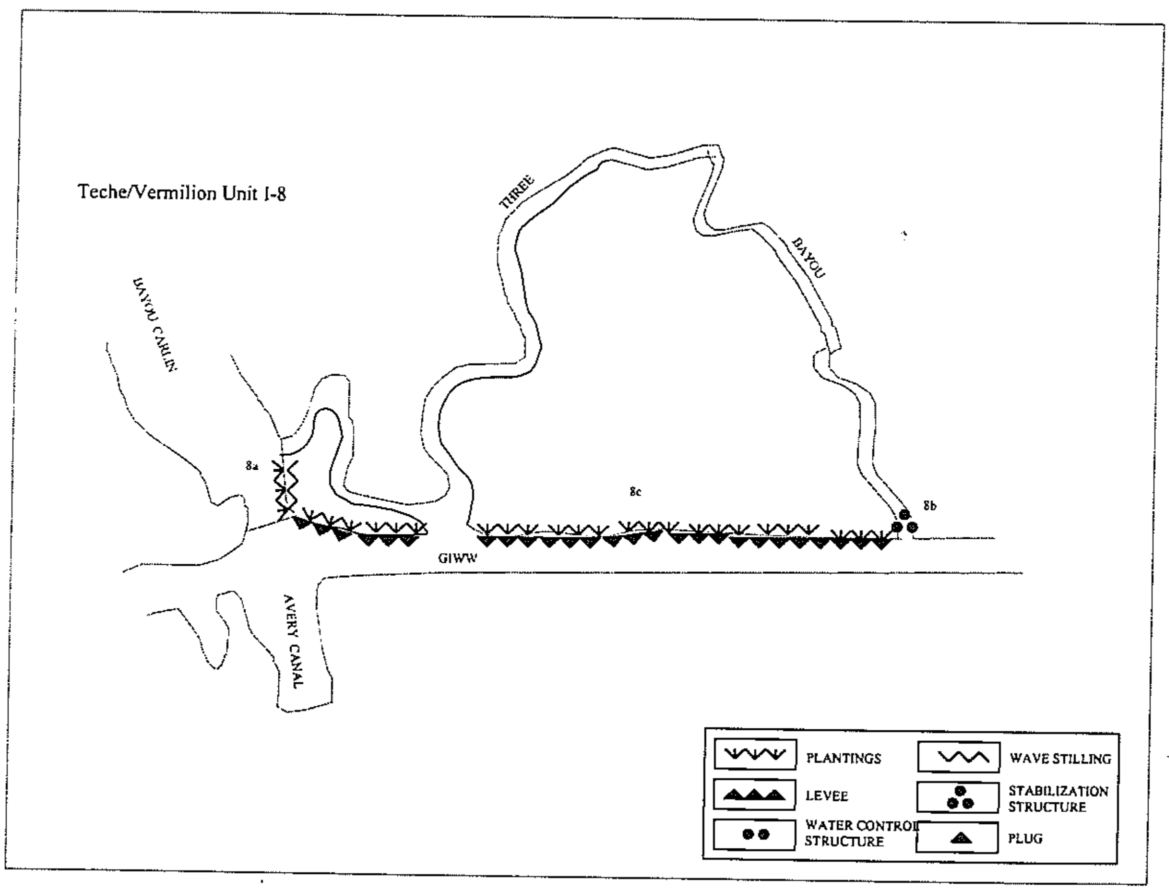


Figure 60. Hydrologic Unit I-8

The species composition of the vegetative community is currently indicative of a brackish marsh. Olney bulrush is the dominant species, composing 30% of the community. Other species occurring throughout the unit in secondary percentages are as follows: barnyardgrass 18%, marshhay cordgrass 15%, and leafy threesquare 13%. Bulltongue and spikesedge both occur in amounts of 5%.

Iberia Unit I-9 (No. I-9)

This area is located South of the GIWW, East of the Avery Canal , West of the Port Canal, and North of Vermilion Bay. A small meandering natural channel traverses the unit connecting the GIWW with the Avery Canal. There are 2 other small streams that provide direct connection between Vermilion Bay and interior marshes. Historically this unit was connected with units I-05, I-07 and I-08 before the dredging of the GIWW and the Avery Canal. Historically, the drainage of the unit was north through meandering natural channels which drained into Three Mouth Bayou and then drained into Bayou Petite Anse and then flowed southwest through Tiger Lagoon before entering Vermilion Bay.

The soils of this unit is of the Lafitte Association. Lafitte soils are in soft marshes of Iberia Parish. They are level, saline and have a thick layer of organic material.

There are no existing structures documented in the unit during field investigations performed in the spring of 1995.

The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Avery Canal (Dredged in 1927 70 ft Wide and 8 ft depth)
3) Commercial Canal

All of these channels have altered the hydrology of the unit by increasing the tidal energy in the unit. The plan objective of this unit is to actively manage the unit for brackish to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. Water control structures are planned at Avery Canal and the Commercial Canal to reduce tidal fluctuation and to stabilize the side slopes and bottom width of channels (9A & B). These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the GIWW, Avery Canal and Commercial Canal (9D & I). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings along Bayou Carlin and GIWW. It is anticipated that wave stilling will be required along the GIWW, Avery Canal and Port Canal because of the heavy boat traffic. This will be accomplished by constructing a rock levee along the existing banks to prevent the channel from getting wider. Vegetative plantings will be used behind the levee as siltation builds. High tidal energy is to be managed by installing two rock weirs with barge bays in the mouths of Commercial Canal and Avery Canal. These structures will be designed to stabilize the bottom and width of the channels. High tidal energy in the interior of the unit will be managed by installing small Rock Weirs at the mouths of small natural channels, which provide drainage to the unit (9 E, F, G & H). These structures will be designed to better utilize the available freshwater and sediments. Shoreline plantings and wave stilling is planned along the shore of Vermilion Bay to protect from shoreline erosion (9C).

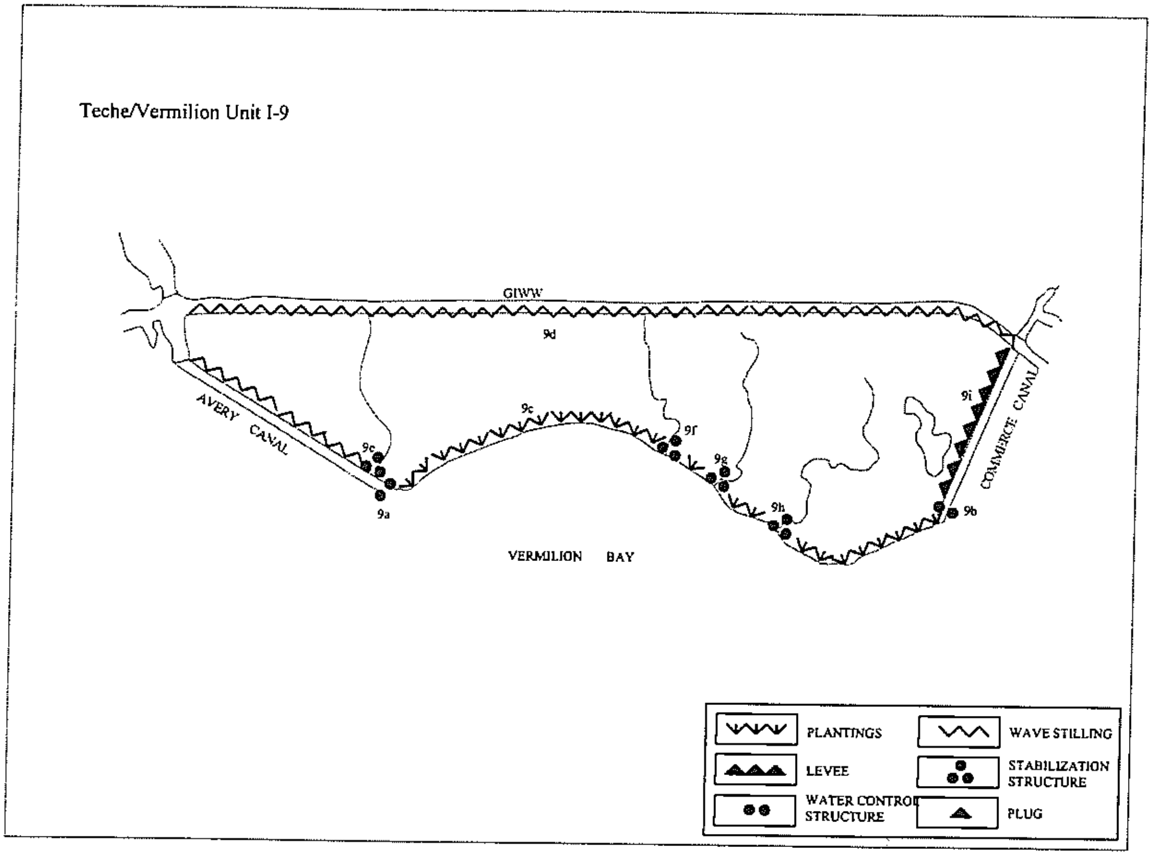


Figure 61. Hydrologic Unit I-9

Overall, three-corner grass is the dominant species, composing approximately 50% of the unit's total vegetative community. Leafy three-square is the dominant species in the eastern portion of this unit, but overall, composes only 23% of the unit's total community. Switchgrass was the dominant species (60%) only at one evaluation site located on the western side of a bayou that connects Avery Canal and the GIWW.

A large variety of other fresh and intermediate species occur throughout the unit in trace amounts up to 5%. Some of these species are bulltongue, cattail, (Typha sp., goldenrod, hogcane, saltmarsh loosestrife (Lythrum lineare), marshhay cordgrass, roseau, smartweed, and Walter's millet (Echinochloa walteri).

Iberia Unit I-10 (No. I-10)

This unit is located west of Avery Island, LA in Iberia Parish. It is bounded on the south by the Trunkline Gas Pipeline, west by Avery Island and LA Hwy. 329, east by the Iberia Port Channel, and north by cropland.

The soils of this unit are Lafitte and Maurepas Association. These soils are soft soils with a thick layer of organic material. The Maurepas soils are located in the swamp areas, which causes the woody organic material in the upper surface layer. The Lafitte is soft marsh soils, which are typically brackish to intermediate. O'Neil classified this unit as a sawgrass marsh in 1949, and Chabreck and Linscombe later recorded it as intermediate type marsh in 1988.

At present there is one structure that exists in Logging Bayou. It is a wooden low level weir that has been in existence since the late 1970's. It is functioning well and should be maintained. Its purpose was to prevent salt water intrusion in the delicate ecosystem of fresh marshes and swamps that surround Avery Island. The pipeline canal also has riprap plugs at either ends of it to maintain ecosystem integrity.

Historically, the drainage of the unit was south through natural bayous which entered the bay complex either through Tigre Lagoon or Weeks Bayou. The dredging of the following channels has drastically changed the drainage of the unit.

1) GIWW
2) Commercial Canal
3) The Trunkline Pipeline Canal
4) Hayes Coulee

Hayes Coulee now serves as the major drain for the unit because of the continuous spoil banks on the Commercial Canal and the Trunkline Gas Pipeline. These channels have also increased the tidal energy in the unit. The plan objective of this unit is to actively manage the unit for fresh to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the Commercial Canal (10E). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings along the Commercial Canal. High tidal energy is to be managed by installing a water control structure at La-329. This structure will be designed to better utilize the available freshwater and sediments and prevent saltwater intrusion into the adjacent upland areas. It has been documented that saltwater enters the unit through the opening under La-329. It was documented during the drought periods of 1996 and 1998 that salinity at La-329 reached 4 ppt. These conditions do not allow the use of surface water for irrigation of crops (10A). Existing plugs will be maintained to maintain stability of the interior of the unit (10 B, C, D & F).

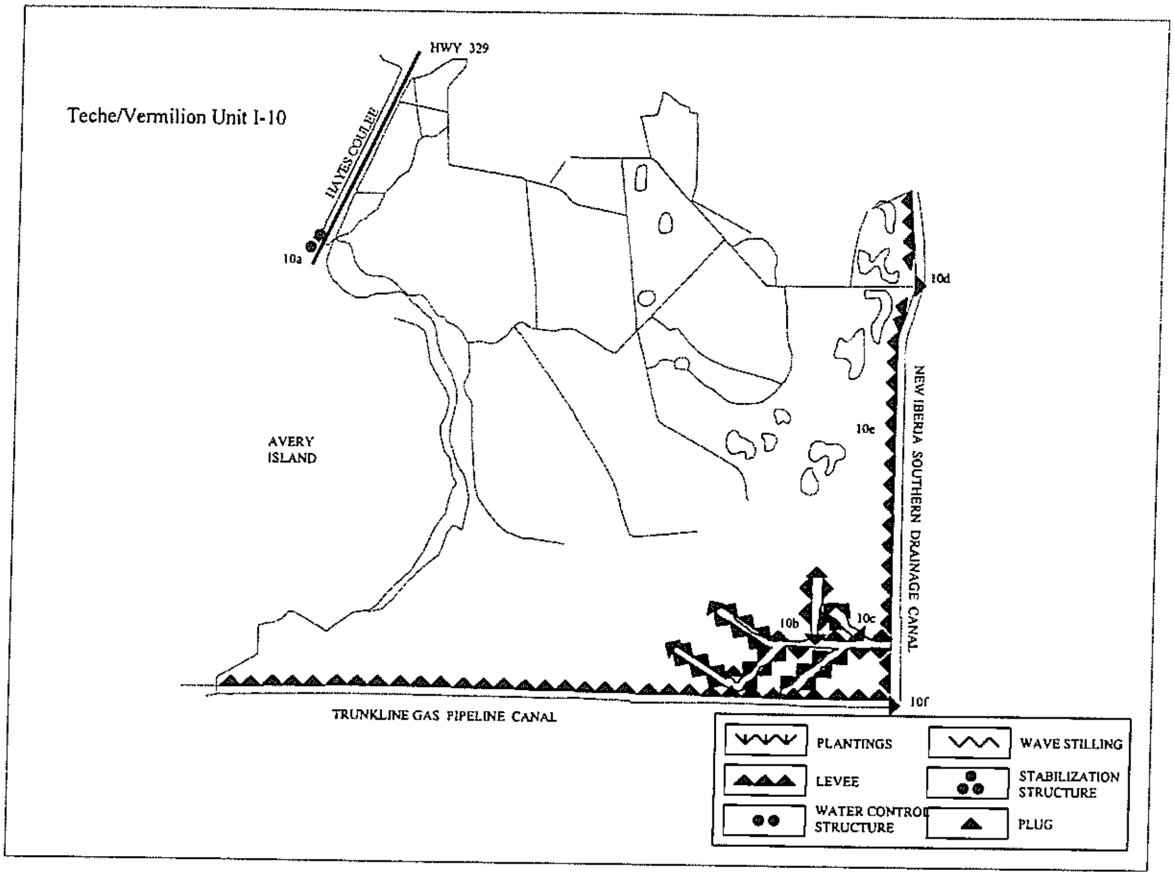


Figure 62. Hydrologic Unit I-10

The current vegetative community continues to be typical of a fresh/intermediate marsh area with greater species diversity. The dominant species are Olney bulrush, bulltongue, and alligatorweed, which each composes approximately 18% of the community. Other species noted to occur in amounts between 5 and 8% are marshhay cordgrass, Jamaican sawgrass (Cladium jamaicense), and cattail. Species occurring in lesser amounts of tract to 5% were barnyardgrass, southern waxmyrtle (Myrica cerifera), spikesedge, big-leaf sumpweed (Iva frutescens), and soft rush.

The marsh type has remained fresher than the unit to the south because this unit is further away from sources of saltwater intrusion and a riprap plug on a pipeline canal at the southern boundary protects the area from rapid water level fluctuations.

Iberia Unit I-11 (No. I-11)

This unit is located in the wetlands south of Lydia and Duboin, Louisiana, east of Port Canal, west of Stumpy Bayou and Weeks Canal, and north of Trunkline Gas pipeline. The Wilkins Canal traverses this unit in the near center.

The soils of this unit are Lafitte, Maurepas, and Delcomb Associations. Each soil has a soft soil with a moderate to thick layer of organic material. The Maurepas soil's organic layer is made up of woody material and is normally found in the Parish's swamps. The Lafitte soils are normally saline to intermediate in salinity. The Delcomb association is underlain by a loamy material. This is a fresh to intermediate system consisting of wooded or shrub/scrub acreage in the southern portion of the unit and marsh acreage in the northern portion.

Structures are presently located at the end of the Trunkline pipeline canal (11B). The purpose for this structure is to prevent the total draining of the wetlands and provide some type of water control for the unit. However these structures have been circumvented due to erosion near the toe walls and would need repairs or improvements in the near future.

Historically the drainage for the entire area was through numerous natural Bayous. These natural tributaries are as follows.

1) Stumpy Bayou
2) Warehouse Bayou
3) Bayou Pete
4) Long Ride Barge Bayou
5) Bayou Patout
6) Bayou Carlin
7) Weeks Bayou

All of these channels flowed south and entered Weeks Bay at a point north and west of Weeks Island. This point was where Bayou Carlin and Weeks Bayou converged before entering Weeks Bay. Since this was the only outlet to the Bay, the tidal influence to the area was limited to the size of this outlet. Although the remnants of these Bayous are still evident today, the hydrology of the area has drastically been altered by man to improve drainage to the uplands and provide access for oil exploration. The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Commercial Canal
3) Trunkline Gas Pipeline Canal
4) Wilkins Canal
5) Little Valley Canal (Bayou Blue)

These channels have altered the hydrology of the unit by increasing the tidal energy in the unit. The plan objective of this unit is to actively manage for fresh to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the Commercial canal. Tidal energy in the interior of the unit will be managed by installing water control structures at the mouths of small natural channels which provide drainage to the unit and the adjacent cropland. These structures will be designed to better utilize the available freshwater and sediments and prevent salinity intrusion into cropland areas north of the unit (11A, C, D, E & F). It has been documented that all of the channels of the area carry high salinity water into the upland area, which does not allow for its use for irrigation. During the drought of 1996 and 1998, salinity readings at Hwy. 90 were in excess of 1.5 ppt.

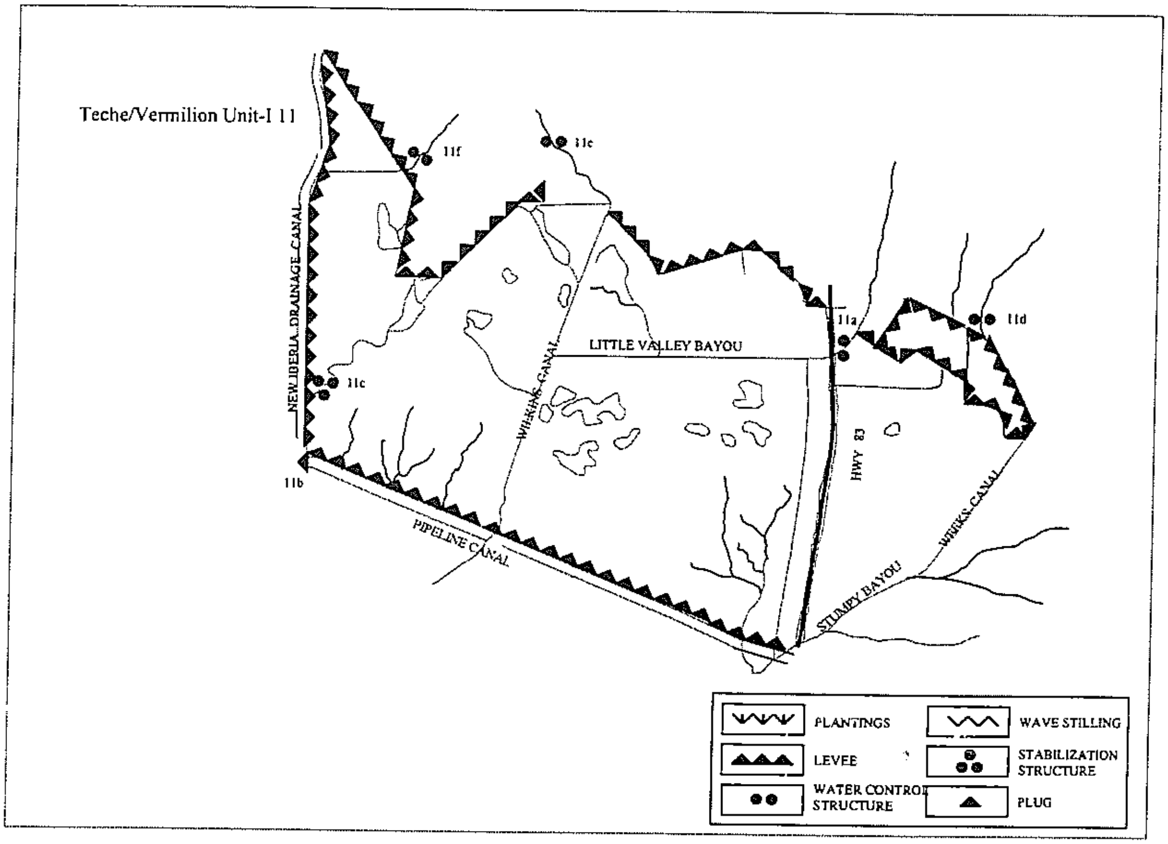


Figure 63. Hydrologic Unit I-11

In the open marsh area, the dominant species is cattail (Typha latifolia), followed by almost equal amounts of bulltongue (Sagittaria lancifolia), and softstem bulrush (Scirpus validus). Marshelder (Iva frutescens), switchgrass (Panicum virgatum), sedge (Carex sp.), alligatorweed (Alternanthera philoxeroides), and eastern baccharis (Baccharis halimifolia) were also noted, each composing approximately 10% to 15% of the total plant community. Bagscale (Sacciolepis striata), iris (Iris spp.), marshmallow (Hibiscus sp.), marshhay cordgrass (Spartina patens), giant cutgrass (Zizaniopsis mileacea) and soft rush (Juncus effusus) were recorded as present in trace amounts.

In the wooded and shrub/scrub area, the most prevalent species are marshelder, eastern baccharis, palmetto (Sabal palmetto), wax myrtle (Myrica cerifera) and bald cypress (Taxodium distichum). Of several species appearing in trace amounts, some are iris, red bay (Persea borbonia), red maple (Acer rubrum), live oak (Quercus virginiana), thistle (Cirsium muticum), sedge, yaupon (Ilex vomitoria), pepper vine (Ampelopsis arborea), marsh morning-glory (Ipomoea sagittata), and spider lily (Hymenocallis caroliniana).

It was noted that some of the areas in the southern and western portions of the unit appeared to contain particularly healthy, diverse plant communities. Plants in general were robust, and the leaves of bulltongue were very large. In the southeastern corner of this unit, however, several dead cypress and live oak trees were observed. It was obvious, from the size and condition of the skeletal trunks remaining, that these trees were mature at the time they died and have been dead for some time. The area where these trees are located is generally in good condition and less mature trees of the same species appear healthy. It is believed that this "kill" was caused by a one time event, likely a pulse of saltwater pushed in by a hurricane via Weeks and Stumpy Bayous. Water covered the marsh in some areas, ranging in depth from 0" to 6", but the average depth was 1.6".

Iberia Unit I-12 (No. I-12)

This unit is located south and west of the Trunkline Gas Pipeline, east of the Iberia port canal, west and north of Stumpy Bayou, and north of Weeks Island, Louisiana.

The soils of this unit are Maurepas and Lafitte Associations. The Maurepas soils are found in the shrub/scrub swamp and the Lafitte are found in the soft marshes. These soils are soft soils, which have a thick layer of organic material.

Plugs exist at each end of the pipeline canal. Historically the drainage for the entire area was through numerous natural Bayous which are as follows.

1) Stumpy Bayou
2) Warehouse Bayou
3) Bayou Pete
4) Long Ride Bayou
5) Bayou Patout
6) Bayou Carlin
7) Weeks Bayou

All of these channels flowed south and entered Weeks Bay at a point north and west of Weeks Island. This point was where Bayou Carlin and Weeks Bayou converged before entering Weeks Bay. Since this was the only outlet to the bay, the tidal influence to the area was limited to the size of this outlet. Although the remnants of these Bayous are still evident today, the hydrology of the area has drastically been altered by man to improve drainage to the uplands and provide access for oil exploration. The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Commercial Canal
3) Trunkline Gas Pipeline
4) Oil Field Slips on North Side of Weeks Island

These channels have altered the hydrology of the unit by increasing the tidal energy in the unit. The plan objective is to actively manage the unit for fresh to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the Commercial Canal and GIWW. It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings and armoring shoreline along GIWW (12A). High tidal energy in the interior of the unit will be managed by installing water control structures at the mouths of natural and man made channels which provide drainage to the unit (12B, E & F). Tidal energy is also to be managed by installing a water control structure and Channel re-establishment shown in Unit I-13. They will be designed to better utilize the available freshwater and sediments. These components will need to be in conjunction with component 17A to prevent problems in Unit I-17. A plug in Bayou Carlin is planned where it intersects the Commercial Canal to prevent scouring and draining of the area due to tidal fluctuation (12D). Existing plugs will be maintained to maintain stability of the interior of the unit.

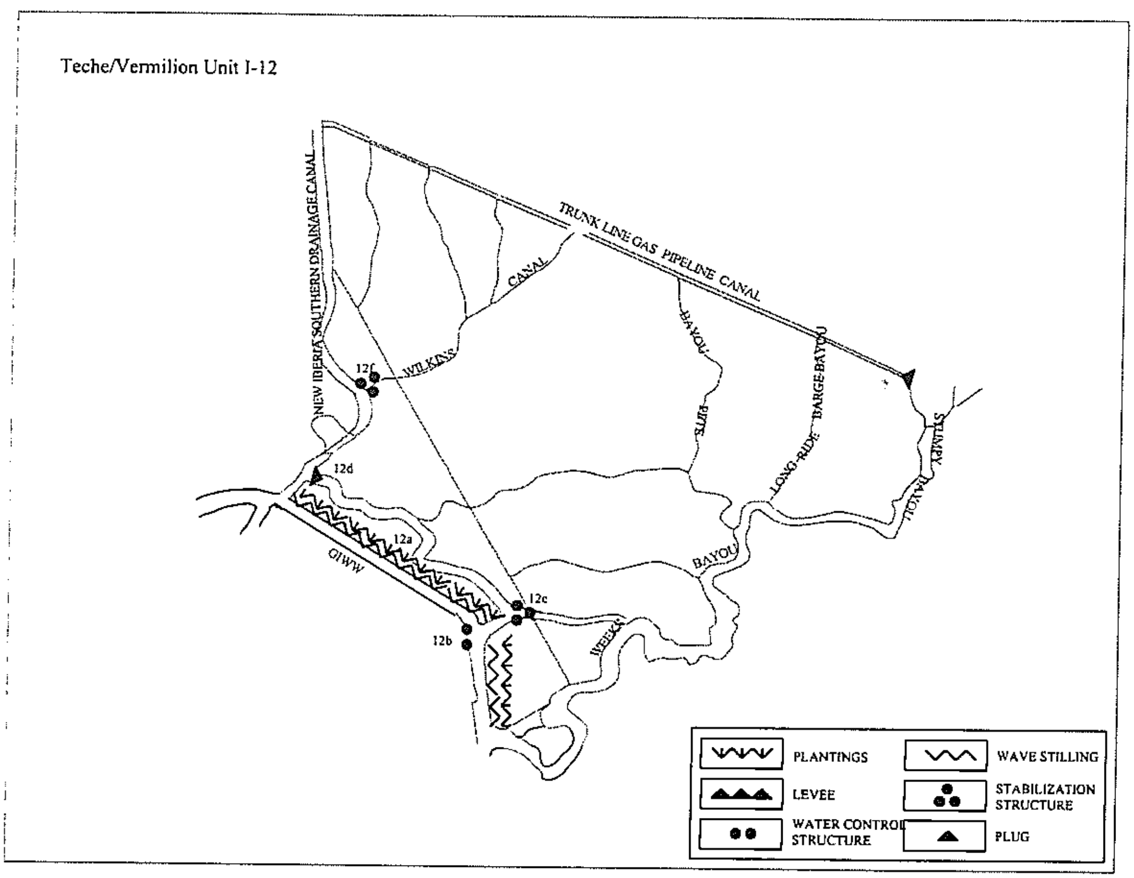


Figure 64. Hydrologic Unit I-12

Overall, this unit is primarily dominated by hog cane (Spartina cynosuroides), and secondarily by bulltongue and marshhay cordgrass. However, field investigation did reveal a trend in the relationship between location and prevalence of species. At evaluation sites lying within the central and east-central portion of the unit, switchgrass is the most dominant species (composing up to 70% of the plant community), and leafy three-square (Scirpus robustus) and bulltongue are the second most dominant species. Soft rush, spikerush, marshhay cordgrass, and maidencane are also present. Other species occurring in trace amounts at more than one site are iris, deer pea, (Vigna luteola), marshelder, and marsh morningglory (Ipomoea sagittata).

Moving into the northwest corner of the unit, hog cane is the dominant species (up to 70%) and bulltongue is the secondary species (5% to 10%) in this area. Other species occurring are marshhay cordgrass, wax myrtle, eastern baccharis, coffeeweed (Sesbania macrocarpa), sedge and cattail. Traces of iris and alligatorweed were also noted at more than one site.

In the southern portion of the unit, soft rush (up to 50%), Roseau (Phragmites australis) (up to 40%), and marshhay cordgrass (up to 40%) compose the majority of the plant community, and sedge, hog cane, and leafy three-square occur as secondary species. Alligatorweed, bulltongue, cattail, and black needlerush (Juncus roemerianus) are also present at some evaluation sites. The species composition of this portion of the unit reflects the influence of the proximity of Weeks Bay and exposure to saltwater intrusion.

Water covered the marsh in some areas only in the northern half of the unit, but averaged only 1.5" to 2" in depth at those sites. Salinity level data remained less than 1 ppt throughout the unit.

Iberia Unit I-13 (No. I-13)

This unit is located south and west of the GIWW, east and north of Weeks Bay, and north of Bayou Garrett. The area west of the GIWW and east of Weeks Bay is a chain of island caused by oilfield location canals that dissect the unit. Severe streambank erosion occurs due to extreme tidal fluctuation and boat traffic. The west bank along Weeks Bay has severe shoreline erosion.

The soil of this unit is the Lafitte Association. This soil is a soft marsh with a thick layer of organic material.

This unit was created when the GIWW was dredged across the southern tip of Weeks Island, which created an island. Now a chain of islands, they are severely eroding and a project is planned to recover some of the land area that was previously eroded. The historic drainage patterns of this unit are difficult to distinguish but the natural landscape of Weeks Island salt dome leads one to believe that the central portion of the unit drained south and north into Bayou Garret and Weeks Bayou which both emptied into Weeks Bay. The dredging of the following channel altered the hydrology of the unit.

1) GIWW
2) Commercial Canal
3) Oilfield Access Channels through out the unit

These channels have altered the hydrology by creating new drainage patterns and hydrologic unit boundaries. They have also increased the tidal energy in the unit. The GIWW brings silts and sediments from the east, which could be used to help rebuild the island chain along

Weeks Bay. The plan objective of this unit is to actively manage the unit for fresh to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. Another plan objective is to reestablish the land boundary between Weeks Bay and GIWW. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the Commercial canal (13A) and GIWW (13E). It is also the plans objective to protect these spoil banks in high wave energy areas by utilizing vegetative shoreline plantings behind wave stilling along the GIWW and Weeks Bay shoreline (13D). Rock stabilization structures will be installed on small bayous that provide drainage to the unit (13B, 13C). The plan also call for a stabilization structure at the mouth of Weeks Bayou and Bayou Carlin at Weeks Bay (13G). This structure will attempt to restore this opening to its original width and depth, which would help channelize freshwater and sediment in the GIWW allowing these resources to move further westward. A plug is also planned in Bayou Garret at Weeks Bay to reduce scouring caused by tidal fluctuation yet still allow freshwater and sediment to enter the unit from the south from GIWW (13F). Existing plugs will be maintained to maintain stability of the interior of the unit.

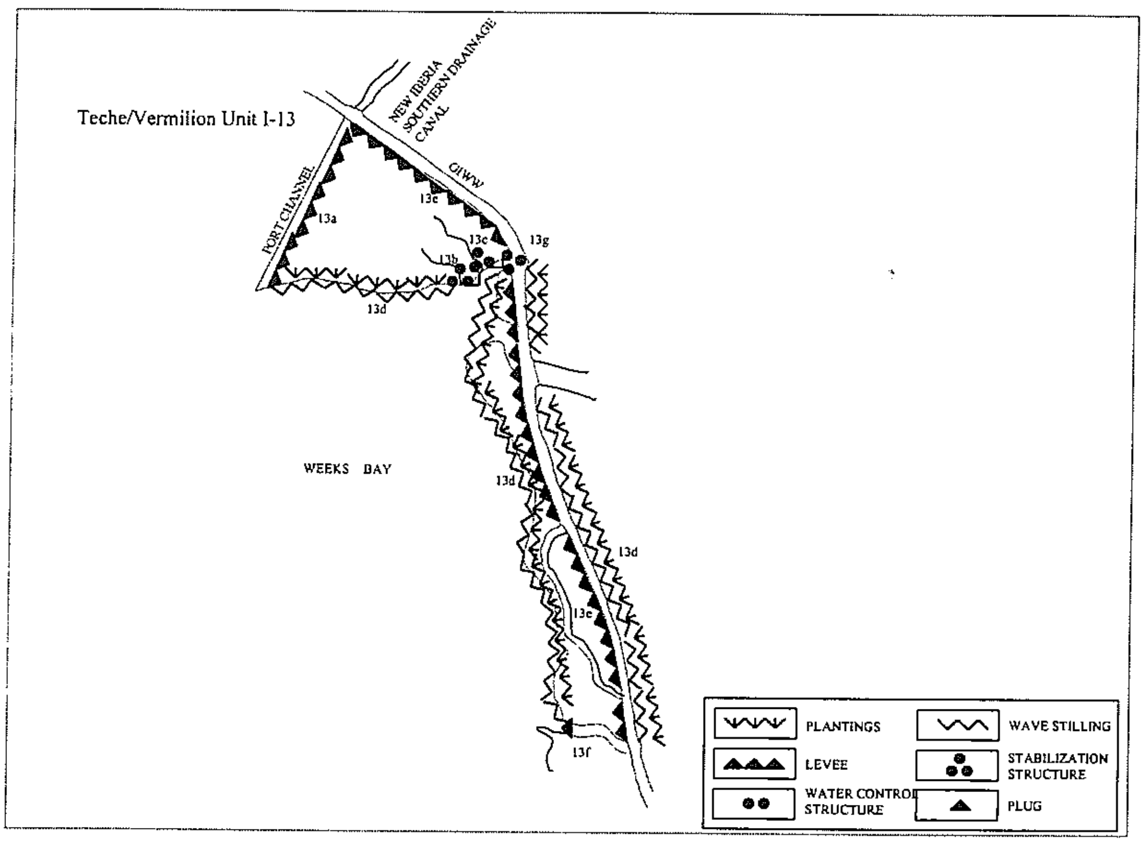


Figure 65. Hydrologic Unit I-13

The dominant species in this unit are three-corner grass and sedge (<u>Carex sp</u>.). Species which occur in amounts less than 5% are alligatorweed, bagscale, butterweed, cattail, dog fennel, goldenrod, marshhay cordgrass, pigweed, and Walter's millet.

The three-corner grass is most prevalent in the western half of this unit near open water areas, which are developing adjacent to the Commercial Canal's spoil bank.

Iberia Unit I-14 (No. I-14)

This unit is located on Shark Island. It is bounded on the north by Weeks Bay, west and south by Vermilion Bay, and east by Shark Bayou.

The soil on this unit is of the Lafitte association. This soil is a soft organic marsh that is frequently flooded and is subject to tidal influence. These marshes tend to be saline to brackish. The Lafitte soils a soft marsh with a thick layer of organic material.

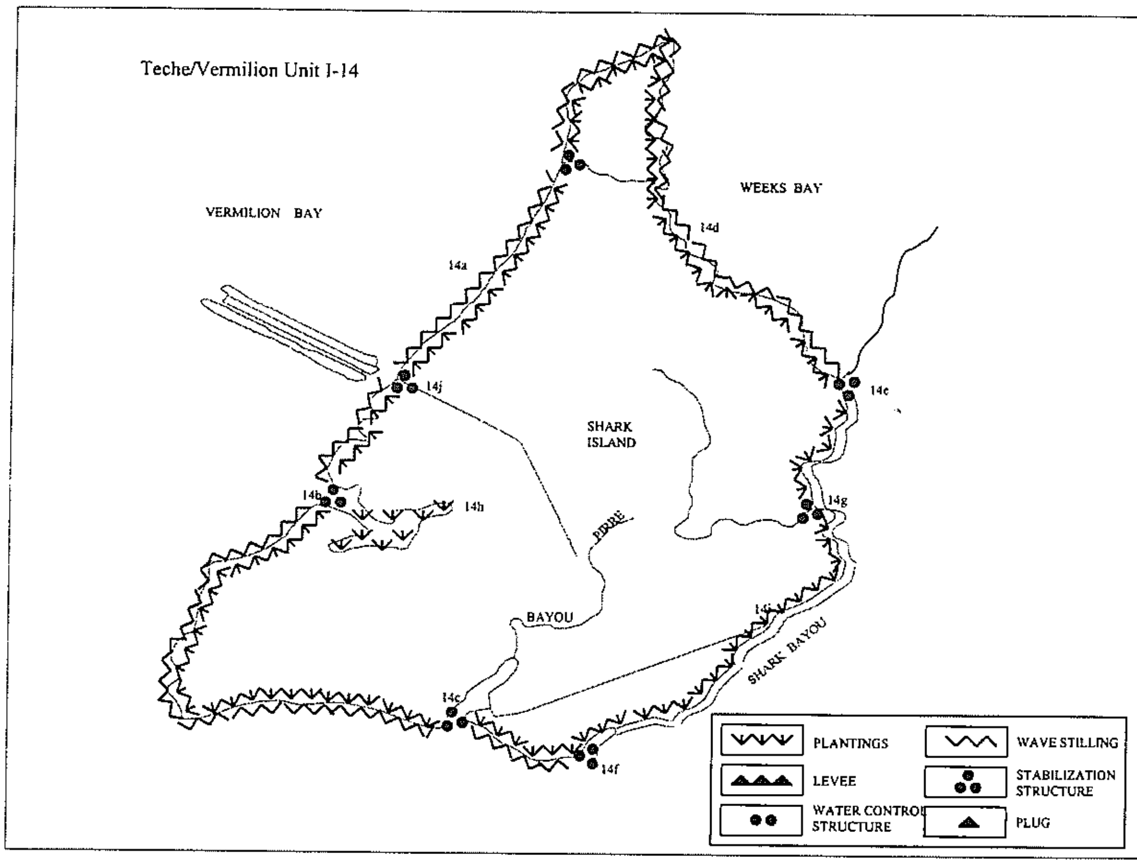


Figure 66. Hydrologic Unit I-14

This unit has wooden bulkheads on each end of the pipeline. The principal landowner is Miami Corporation. They have planned to install structures (lowlevel weirs) in the levee of the location canal to ensure water levels in the marsh area. Numerous low level structures are also planned in the smaller streams, which are distributaries of the marsh. Historically, the drainage patterns indicates that the unit drained south through Bayou Pierre and east through Shark Bayou. Both of these channels empty into the Bay Complex. The hydrology of the unit has been altered very little when compared to most units in Iberia Parish. The dredging of the following channels have altered the hydrology of the unit.

1) Oilfield access channel which enters the unit from Vermilion Bay
2) Oilfield access channel which modified Bayou Pierre

This dredging has increased tidal energy within the interior of the unit. The plan objective of this unit is to actively manage the unit for intermediate to brackish marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by installing Rock Weirs at the outlets of channels (14B, C, E, F, & G). It is also the plans objective to protect banks in high wave energy areas by utilizing wave stilling measures and vegetative shoreline plantings (14A & D). Vegetative shoreline plantings will be utilized along Shark Bayou to protect these banks from erosion due to tidal fluctuation in the area (14I).

Iberia Unit I-15 (No. I-15)

This unit is located in the southern most wetlands of Iberia Parish. It is bounded on the west by Shark Bayou, north by the Gulf Intra Coastal Waterway (GIWW), Bayou Garret and Weeks Bay, south by Cypremort Point, and east by LA Hwy 319. Unit I-15 encompasses the part of St. Mary Parish west of LA Hwy 319.

The soils of the unit are made up of Lafitte Association on the west one-half and Maurepas on the east half. The Lafitte association is a soft organic marsh which varies from saline to intermediate. The soils of the Maurepas association have a thick organic woody surface layer. They are found in tidal swamps and soft marshes near the mainland.

At present, the only structure that exists is on the end of the pipeline crossing Shark Bayou. Historically the drainage patterns of the unit indicates that the area drained to the east from the Bayou Cypermort ridge through natural tributaries which drained into Shark Bayou and Weeks Bay. The unit's hydrology has been altered by the construction of the following:

1) GIWW
2) Oilfield Access slip off of the GIWW
3) Oilfield Access Slip off of the Quintana Canal
4) The Dredging of the Quintana Canal
5) The Cypremort Point Recreational Area
6) Oilfield Access road from Bayou Cypremort to Shark Bayou

The plan objective of this unit is to actively manage the unit for intermediate to brackish marsh vegetation and better utilize the available freshwater and sediments. These goals will be accomplished by installing stabilization structures at the outlets of channels (15C, D, & I). A water control structure is planned for Two Mouth Bayou to allow freshwater and sediments to filter through the marsh into the unit from GIWW (15 F). The plan calls for installing plugs on Bayou Garret and Two Mouth Bayou to limit the amount of sediments entering Weeks Bay from the GIWW (15B & E). It is also the plans objective to protect banks in high wave energy areas by utilizing wave stilling measures and vegetative shoreline plantings (15A). Rock wave stilling and vegetative plantings or plantings alone will be utilized along GIWW to protect these banks from erosion (15G & H).

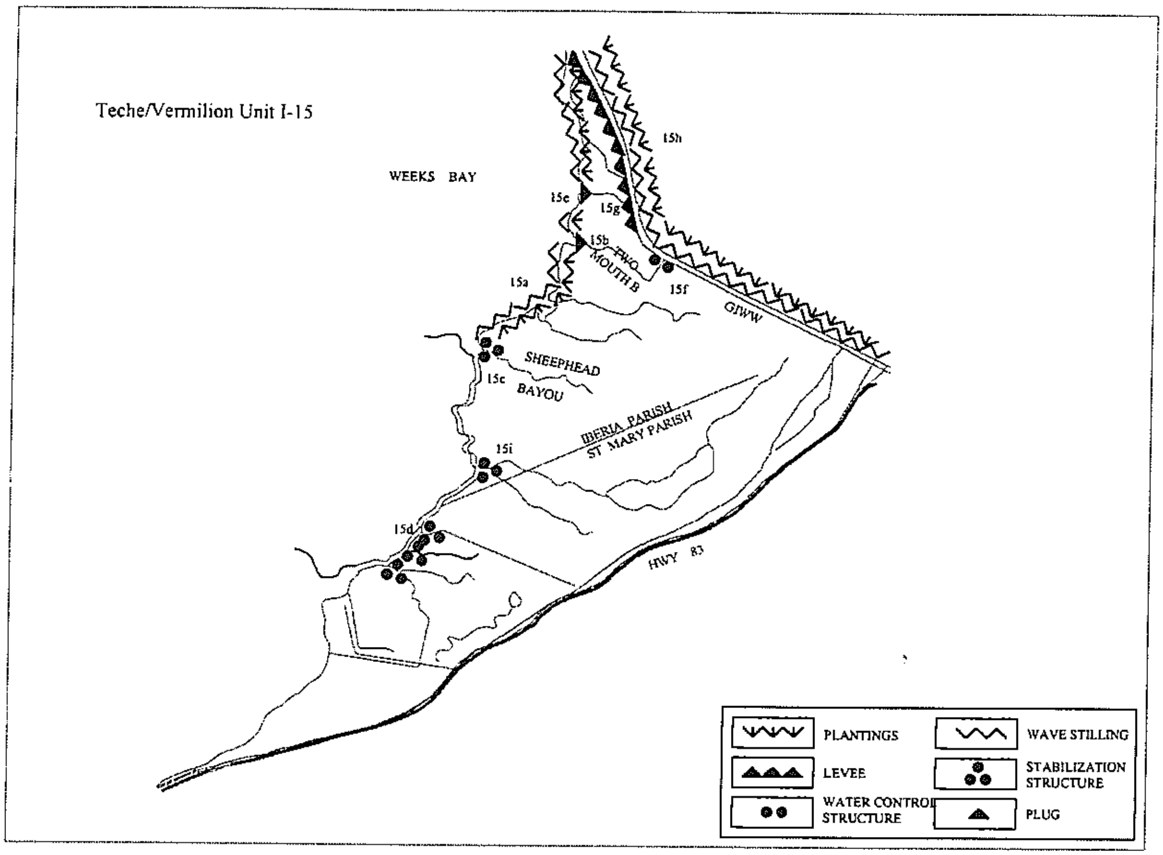


Figure 67. Hydrologic Unit I-15

Bulltongue is the distinctly dominant species occurring throughout this unit. Marshhay cordgrass and sumpweed were recorded as each composing 12% to 13% of the community, and a wide variety of fresh/intermediate species are interspersed throughout in amounts of trace to 5% (see table). Vermilion Bay, Shark Bayou and Weeks Bay border the western portion of this unit. Several bayous and waterways connect these bordering water bodies to interior marshes. Those interior areas connected with Shark Bayou appear to be intact fresh marsh, with submerged aquatic vegetation occurring in shallow ponds. Interior marshes with closer connections with the bays are recorded as containing more turbid ponds, and being more fragmented with less species diversity, although the majority of species noted were fresh. This fact, in conjunction with the notable percentage of marshhay cordgrass, shows that these areas have been previoiusly subjected to storms or drier conditions which allowed saltwater to penetrate further into the interior marsh.

Iberia Unit I-16 (No. I-16)

This unit is located in the wetlands southwest of Lyons, LA and southeast of Patoutville, LA. This unit is bordered on the south by the Trunkline Gas pipeline canal, on the west by Weeks Canal, east by the Delahoussaye Canal, and the north by a cropland levee system.

The soils of this unit are of the Maurepas and Delcomb Association. Both of these soils are of the saline to intermediate type. They have a thick organic layer and are soft in nature. The Maurepas are shrub/scrub swamp. The Delcomb Association is underlain by mineral soils.

The only structures in this unit are the plugs at the end of the pipeline canal.
The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Commercial Canal

These channels have altered the hydrology of the unit by increasing the tidal energy in the unit. The plan objective of this unit is to actively manage the unit for fresh marsh vegetation and better utilize the available freshwater and sediments present in the area. High tidal energy is to be managed by installing a water control structure on Stumpy Bayou at Hwy. 83 this structure will be designed to better utilize the available freshwater and sediments (16A). Existing plugs will be maintained to maintain stability of the interior of the unit.

The majority of this unit is wooded (second growth) or shrub/scrub area intermixed with open areas. Two areas of the unit are an exception to this: one in the northernmost portion of the unit, and one in the easternmost portion. At the northernmost evaluation site, hog cane is the dominant species (75%), followed by cypress (10%) and red bay (5%). Trace amounts of southern dewberry (Rubus trivialis), goldenrod (Solidago sempervirens), Hawthorne (Crataegus sp.), palmetto, and thistle were also recorded. At the eastern location, cattail is dominant (50%), followed by bulltongue and alligatorweed (20% each). Black willow (Salix nigra), red maple (Acer rubrum), and buttonbush (Cephalanthus occidentalis) are present in smaller amounts (5% each). These areas are typical of sites located just outside of wooded swamps.

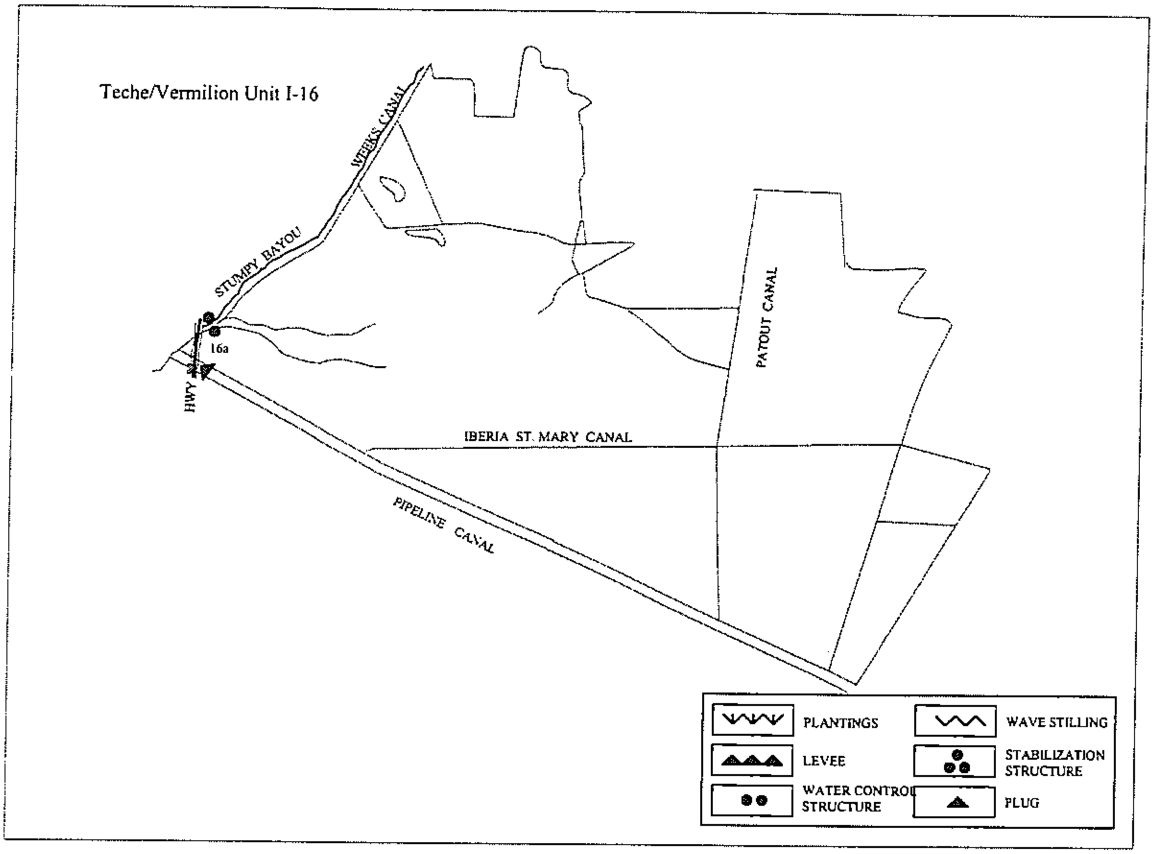


Figure 68. Hydrologic Unit I-16

Generally, on open sites bulltongue tends to be the dominant species. Cattail, hog cane, and switchgrass are also generally prevalent as secondary species, but, in singular circumstances, were found to dominate a site. The wooded or shrub/scrub areas are dominated by cypress, wax myrtle, black willow, and red maple, white tupelo, palmetto, and red bay are secondary. Alligatorweed, pickerel weed, and bulltongue are present in the understory or along edges of bayous and canals.

On the date of investigation, the abnormally high water levels were receding and at the few sites where water still lingered over the marsh, the average depth was less than one inch.

Iberia Unit I-17 (No. I-17)

This unit is located northeast of Weeks Island, LA. It is bordered by LA Hwy. 83 on the southwest, the northwest by Stumpy Bayou, northeast by Trunkline Gas pipeline, and southeast by un-named-man-made cypress logging canal.

The predominate soil of this unit is Maurepas Association. There is some Lafitte Association in an area on either side of LA Hwy. 83 starting from the Trunkline Gas pipeline canal south to Weeks Island. The Maurepas Association is a soft soil which has a thick layer of organic material. This organic material has a large concentration of woody material which indicates swampy conditions. The Lafitte Association is a soft marsh soil. Both Associations have some degree of salinity varying from saline to intermediate.

The only known structures in this unit are on the ends of the pipeline canal. The pipeline is in two segments. It is divided by the Iberia-St. Mary Canal which is allowed to flow freely. The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Commercial Canal
3) Oilfield location channels

All of these channels have altered the hydrology of the unit by increasing the tidal energy in the unit. The plan objective of this unit is to actively manage the unit for fresh to intermediate marsh vegetation and better utilize the available freshwater and sediments present in the area. These goals will be accomplished by reestablishing and maintaining continuos spoil banks along the oilfield location channels. Wave stilling and vegetative plantings along GIWW is planned to protect the unit from increased erosion of banks, which would undermine the effectiveness of other planned components (17B). It is also the plans objective to protect the unit from high tidal energy by installing a water control structure on Weeks Bayou where it intersects GIWW (17A). This structure will be designed to better utilize the available freshwater and sediments but will need to provide for boat traffic. This component will need to be in conjunction with component 12B to prevent problems in Unit I-12. Existing plugs will be maintained to maintain stability of the interior of the unit.

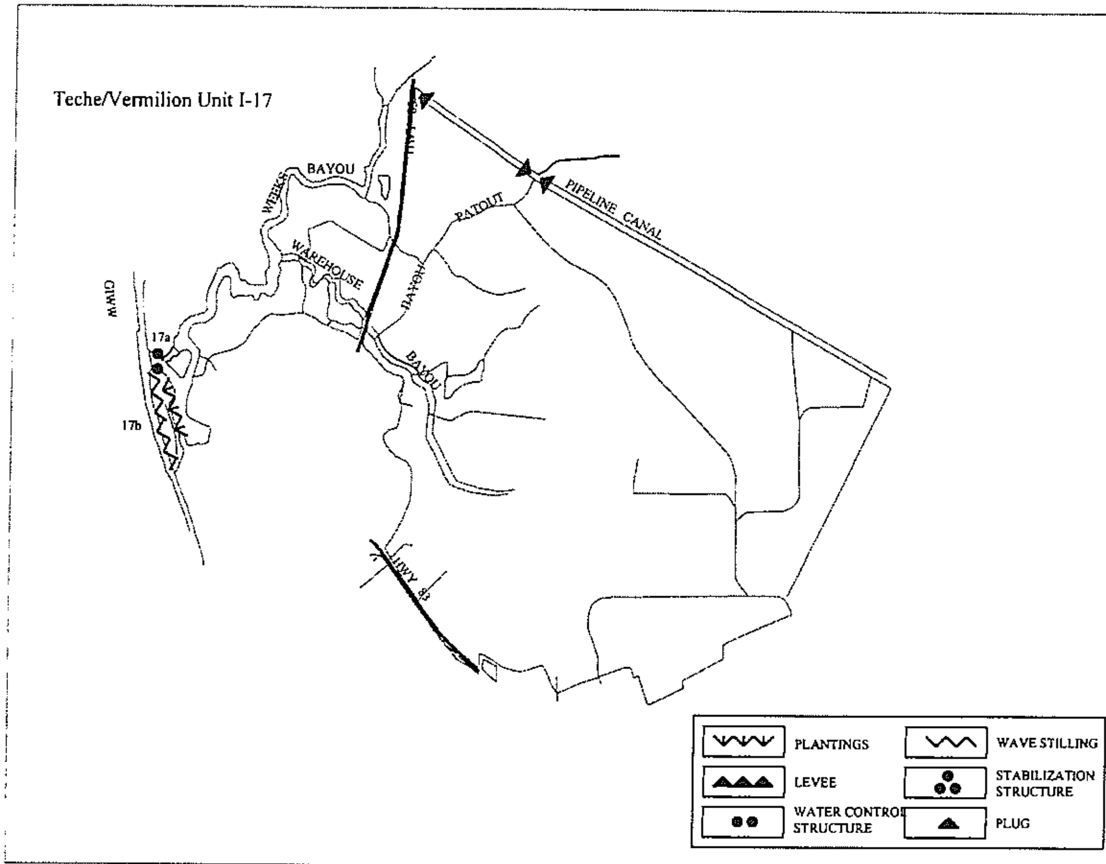


Figure 69. Hydrologic Unit I-17

Of the portion of this unit that lies east of Weeks Island, the majority is described as second-growth wooded or shrub/scrub area. The dominant species are bald cypress, tupelo, red maple, wax myrtle, and live oak. Bald cypress is only slightly the more prevalent of the group. The typical understory species are palmetto, alligatorweed, pennywort, and smartweed. Species found in trace amounts are elephants ear (Colocasia antiquorum), goldenrod, water hyacinth (Eichhornia crassipes), marsh fern (Thelypteris palustris), water hickory (Carya aquatica), and yaupon.

In the portion of this unit that lies north and west of Weeks Island, the dominant species are switchgrass and cattail. Leafy three-square and roseau are also prevalent, and Jamaican sawgrass (Cladium jamaicense), hog cane, and bulltongue are present (approximately 5% of the community) in smaller amounts.

Within the transition zones between open and wooded areas, the following species are present in approximately equal proportions: alligatorweed, baccharis, bulltongue, marshelder, live oak, wax myrtle. Cattail, leafy three-square, red maple, and red bay are present in amounts of 15% or less.

Iberia Unit I-18 (No. I-18)

This unit is located south of Weeks Island, Louisiana. The unit bounded on the west by the Gulf Intra Coastal Waterway, the east by Louisiana Highway 83, north by Weeks Island, and south by cropland area.

The soil of unit is of the Maurepas Association. This mapping unit has a thick organic layer which contains logs, stumps and fragments of wood. It is subject to tidal influence. The majority of this unit is intact, fresh marsh and swamp areas.

This area is under a planned system by the majority landowner. Structures are planned to allow for management of water conditions. The location canals are constructed with spoil areas to be deposited along banks to provide a levee around location canal. The planning for levees and structures will provide for a closed system to allow for water control. The dredging of the following channels altered the hydrology of the unit.

1) GIWW
2) Oilfield Access Channels

These alterations have affected the unit's hydrology by increasing tidal fluctuations in the unit. The plan objective of this unit is to actively manage the unit for intermediate marsh vegetation and better utilize the available freshwater and sediments. Spoil banks along oil field location channels will be maintained to provide water control (18A). These goals will be accomplished by installing a stabilization structure at the outlet of channel (18C). It is also the plans objective to protect banks in high wave energy areas by utilizing wave stilling measures and vegetative shoreline plantings along GIWW (18B & D).

Alligatorweed (Alternanthera philoxeroides) occurs as the dominant species within the unit. In the western portion of the unit, Olney bulrush is the secondary species and in the east, sumpweed is the predominant secondary species. Also several woody species were found in notable amounts (see table) in the southeastern area, such as cypress (Taxodium distichum), live oak (Quercus virginicus), red maple (Acer rubrum), wax myrtle (Myrica cerifera), with black willow (Salix nigra), and yaupon (Ilex vomitoria) in small amounts.

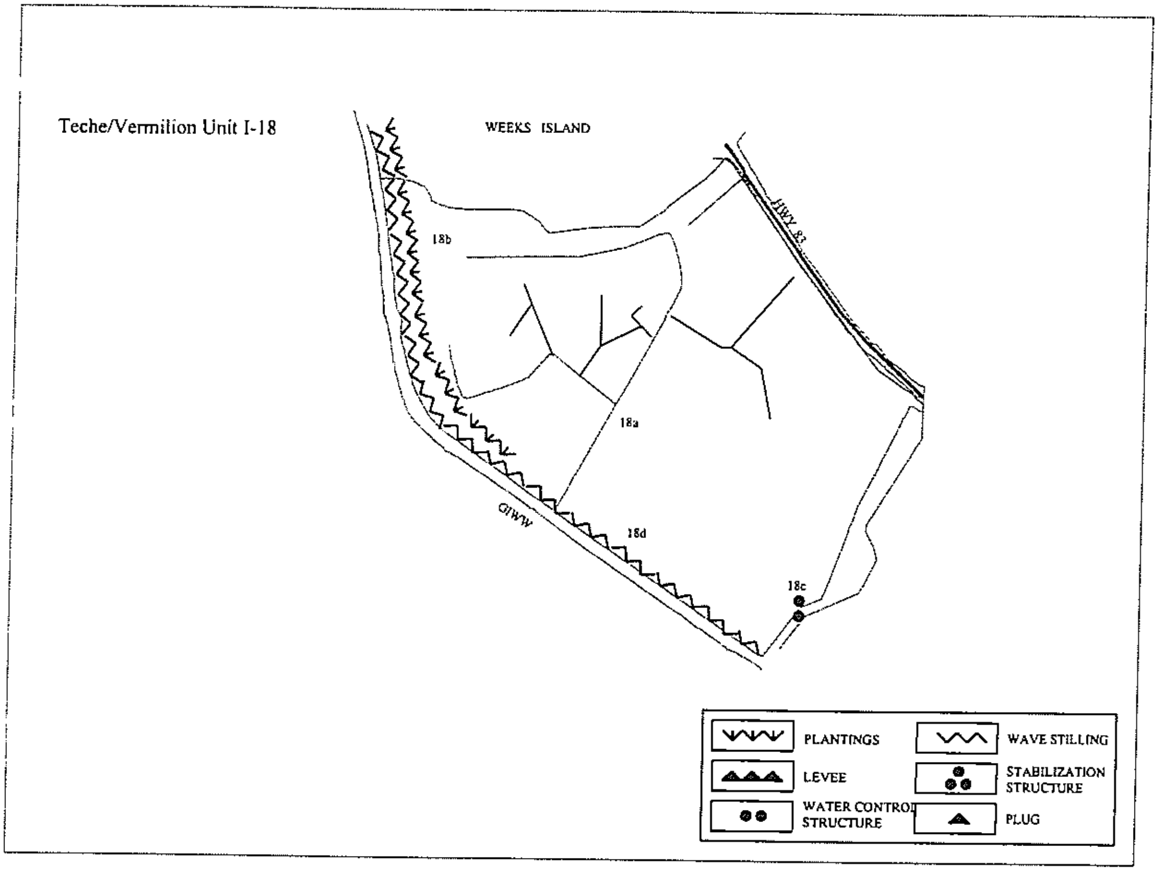


Figure 70. Hydrologic Unit I-18

The predominant plant species, occurring at 37% of the vegetative community in this CTU, is black needlerush (Juncus roemerianus), and is followed by marshhay cordgrass (Spartina patens) at 19%. Spikesedge (Eleocharis sp.) and bulltongue (Sagittaria lancifolia) were noted to occur in amounts of 10% of the community each. Interspersed throughout the CTU in amounts of trace to 5% were typically fresher type species of broomsedge (Andropogon sp.), cattail (Typha latifolia), deer pea (Vigna luteola), goldenrod (Solidago sp.), iris (Iris virginica), marshmallow (hibiscus sp.), marsh morningglory (Ipomeoa sagittata), olney bulrush (Scirpus olneyi), paille fine (Panicum hemitomon), pennywort(Hydrocotyle sp.), salt marsh astor (Astor sp.), sumpweed (Iva frutescens), and thistle (Cirsium sp.).

The distribution of species indicates brackish/intermediate marsh conditions in the southern and western portions of the CTU, adjacent to Vermilion Bay. In interior and marsh areas to the north, near Weeks Bay, the marsh changes to intermediate/fresh type and the diversity of fresh species increases. However, black needlerush, a typical transition species, was found throughout the CTU, which is indicative of marsh exposed to fluctuating salinity and water level conditions. This and the fact that all the fresh/intermediate type species were found in such small amounts, suggests that the freshening conditions have occurred in this CTU recently.

St. Mary Parish

There are 16 hydrologic units in St. Mary Parish, however only four of the coastal hydrologic units warranted an inventory for the purposes of this study. A discussion on each of the four units can be found below.

St. Mary Unit SM-1 (No. SM-1)

The hydrologic unit (Figure 70) is a 5,346 acre area located in the southwestern portion of the study area in St. Mary Parish. The soil types in the unit are Clovelly Brackish, Peat. The unit is bordered by the GIWW to the north, Ivanhoe Canal to the east, West Cote Blanche Bay to the south and Bayou Cypremort Point to the northwest. The unit has one bayou (Horse Bayou) meandering through the area. Also, there is one lake in the unit area, Prince Lake, which is located in the southcentral portion of the study area. The area is non-forested wetland and is primarily owned by the Miami Corporation.

This unit was mapped according to O'Neil (1949) as a brackish to saline marsh.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of bulrush (Scirpus americanus), bulltongue (Sagittaria lancifdlia), with traces of some of the following: soft rush (Juncas effusus), spike sedge (Eleocharis sp.), cattail (Typha latifloia), and alligator weed (Alternanthera philoxoides).

Problems revealed by field observations and aerial photography indicatès erosion along the shore from wave action on West Cote Blanche Bay. There is a fair amount of shell along the shoreline, however it is continually being reworked backward into the marsh.

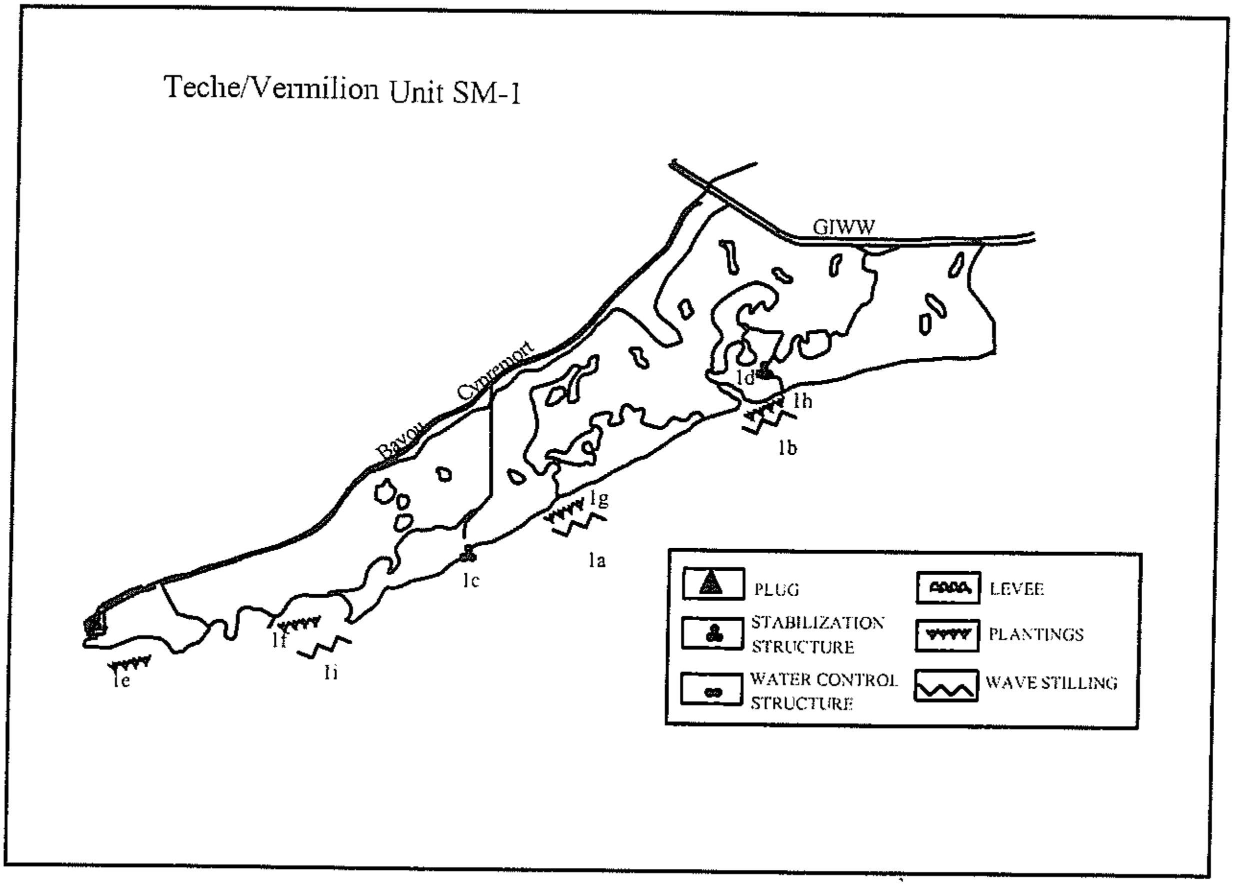


Figure 71. Hydrologic Unit No. SM-1

The plan objective for the hydrologic unit is to actively manage for intermediate marsh. This will be accomplished by maintaining and enhancing the existing intermediate marsh to provide habitat for waterfowl, estuarine organisms and to reduce saltwater intrusion. The plan objective also calls for reducing or preventing the current shoreline erosion rate. Hard structural measures should be installed at critical points along the shoreline which may regress back into various lakes along Cote Blanche Bay shoreline.

Element No. 1a and No. 1b calls for 2,500 linear ft., each of wave stilling devices to be installed along the shoreline of the hydrologic unit. Element No. 1c and 1d calls for installing stabilization structures at both sites. Elements No. 1e, 1f, 1g, 1h, and 1i call for approximately 2,500 ft., each of vegetative plantings. The Hammock Lake Christmas Tree Project is ongoing. It should be monitored with DNR for effectiveness. It could be that hard structures may be necessary to prevent the shoreline erosion in the area. If it is decided that it is necessary another 3,000 linear ft. Of wave stilling devices along the Cote Blanche Bay shoreline should be installed. This could be called alternative element No. 9.

St. Mary Unit SM-2 (No. SM-2)

The hydrologic unit (Figure 72) is a 187 acre small island south and west of Hammock Bayou and Hammock Lake. The study area is decreasing in size primarily because of erosion along the shore from wave action on West Cote Blanche Bay. The soil type in the unit is Clovelly Brackish Marsh Muck. There is a fair amount of shell along the shoreline, however, it is continuously reworked backward into the marsh. Because of its relatively small size and therefore reduced habitat unit value, very little is possible to stop, or even slow, the shoreline erosion. Currently also is a fresh marsh that according to O'Neil (1949) was once brackish to saline.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists mainly of Black needle rush (Juncus roemeranus) with traces of Bulltongue (Sagittaria lancifolia) and marsh morning glory (Ipomoea lacunosa).

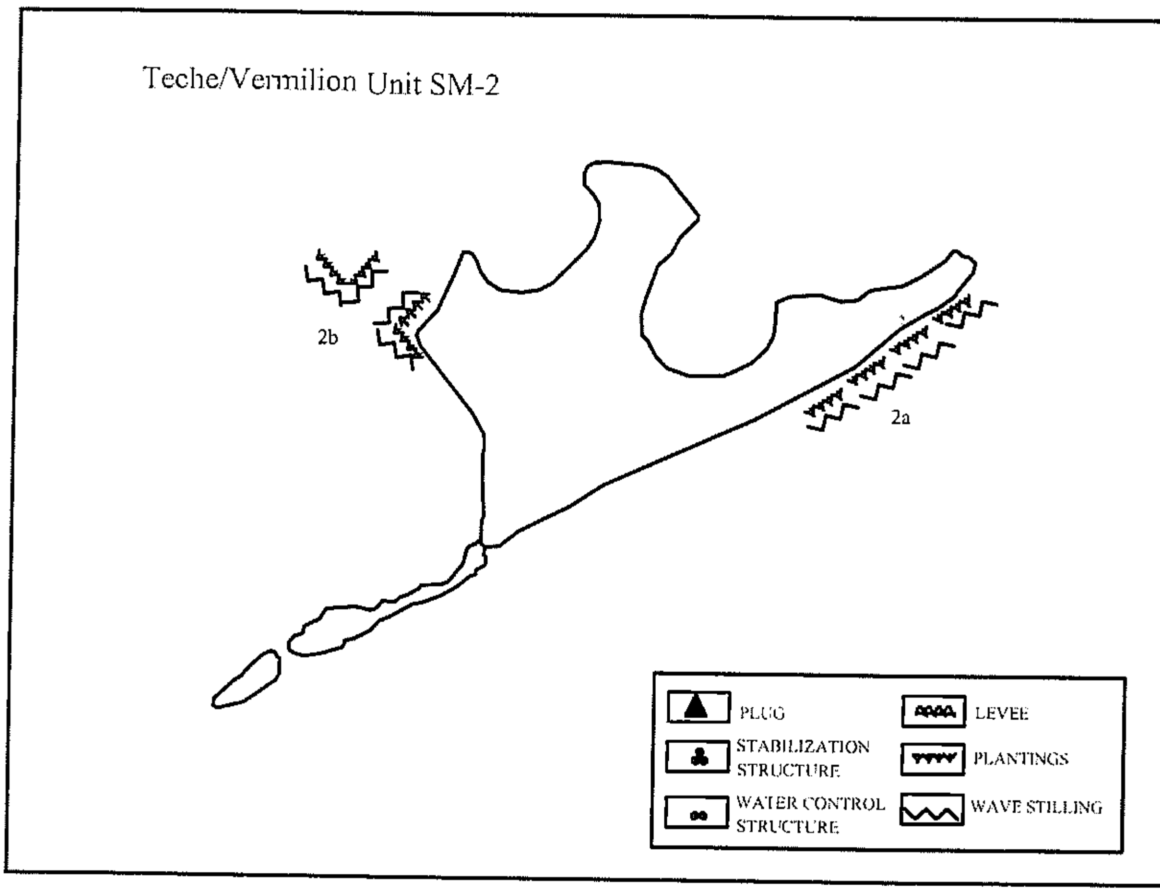


Figure 72. Hydrologic Unit No. SM-2

The plan objective for the hydrologic unit is to actively manage for fresh marsh. The management plan will be accomplished by maintaining and enhancing to present marsh to provide habitat for water fowl, estuarine organisms and reduce saltwater intrusion.

Element No. 2a calls for 3,400 linear ft. of wave stilling devices to be installed along the shoreline of the hydrologic unit. Between the wave stilling device and the shoreline, vegetative plantings will be installed. Element No. 2b will consist of 2,170 linear ft. of wave stilling devices and vegetative planting. This will be installed at the mouth of Hammock Bayou to restore the banks of the bayou and prevent further marsh deterioration. The Hammock Lake Christmas Tree project is ongoing. It should be monitored with DNR for effectiveness.

St. Mary Unit SM-4 (No. SM-4)

The hydrologic unit (Figure 73) is a 5,363 acre area located in the southern portion of the study area. The area is bordered by the GIWW to the north, the Jaws to the east, West Cote Blanche Bay to the south, and Ivanhoe Canal to the west. The geographic features within the unit include a series of bayous and oil field location canals Hackberry Lake and the Cote Blanche Island Salt Mine. The soil types in the unit area consist of Brackish Marsh Muck, Brackish Marsh Peat, Made land in marsh, and Richland and Lintonia.

This is a fresh marsh that, according to O'Neil (1949), was previously brackish to saline. The primary problem in this CTU is erosion along the shore from wave action on West Cote Blanche Bay. There is a fair amount of shell along the shoreline, however, it is continuously reworked backward into the marsh. Some of the oil field canals that have been drilled off the GIWW are in danger of becoming connected, if not already, to West Cote Blanche Bay. Additionally, Hackberry Lake is silting in from sediment being discharged at the Jaws.

Field evaluations of this unit, conducted in April 1995, revealed that the natural emergent vegetation consists of (Typha sp.) Cattail, (Sagittaria lancifolia) Bulltongue, (Scirpus olneyi) Olney bulrush and (Iris sp.) Iris with traces of (Alternanthera philoxeroides) Alligatorweed and (Hymenocallis crassifolia) Spiderlily.

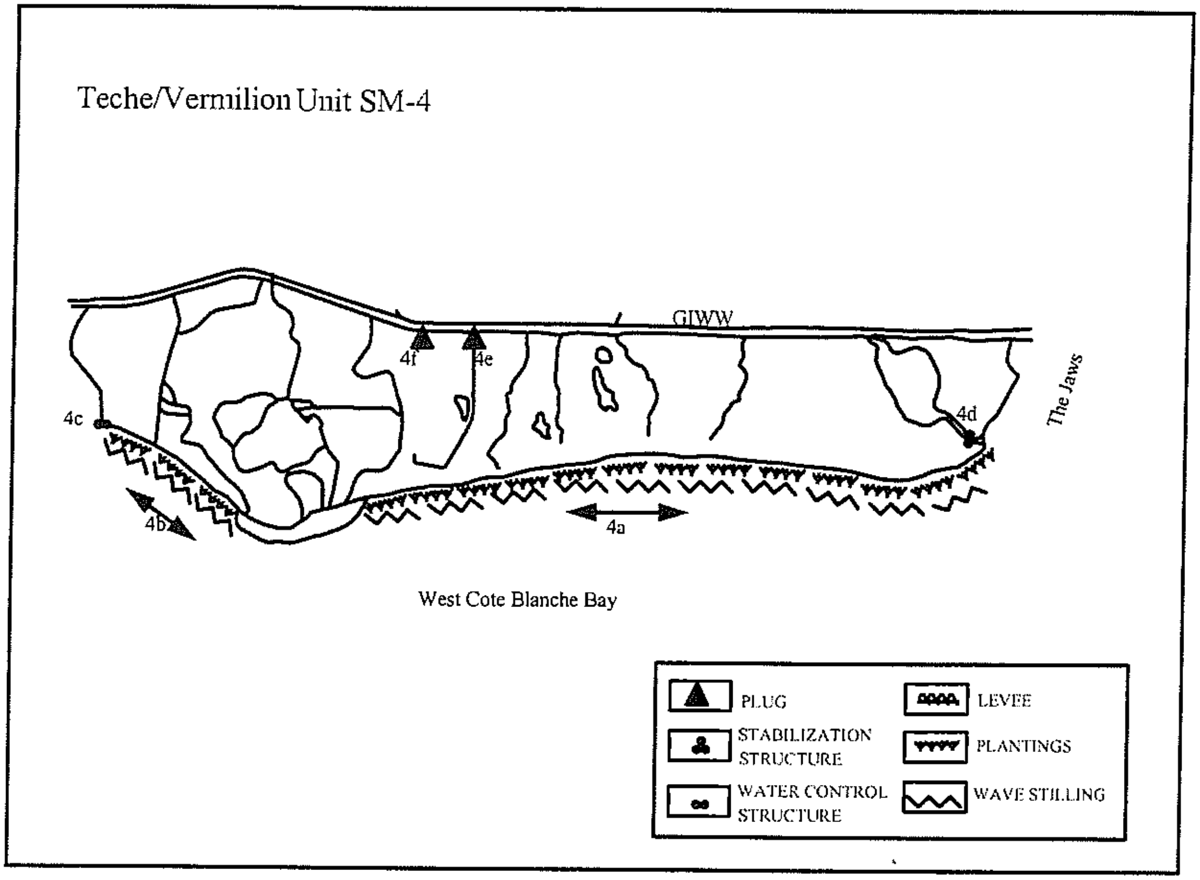


Figure 73. Hydrologic Unit No. SM-4

The plan objective for this hydrologic unit is to actively manage for fresh marsh and provide accessibility for petroleum activity. This will be accomplished by maintaining and enhancing the existing fresh marsh to provide habitat for water fowl, estuarine organisms and to reduce saltwater intrusion. The plan objective also calls for reducing or preventing the current shoreline erosion rates. Hard structural measures should be installed at critical points along the shoreline which unaddressed may regress back and breach interior lakes.

Element No. 4a calls for 26,000 linear feet of wave stilling devices to be installed along the shoreline from the Cote Blanche Salt Mine to the mouth of the Hackberry Lake Outlet. Between the wave stilling devices and the shoreline, vegetative plantings will be installed. Element No. 4b calls for 7,500 linear feet of wave stilling devices to be installed along the shoreline of the hydrologic unit with vegetative plantings placed between the shoreline and the wave stilling devices. Element No. 4c will consist of a 350 linear foot riprap rock F/C weir. Element No. 4d will consist of a 150 linear foot riprap rock F/C weir. Element No. 4e calls for a 150 linear foot riprap rock F/C weir. Element No. 4f is an existing rock plug.

St. Mary Unit SM-14 (No. SM-14)

The hydrologic unit (Figure 74) is a 2,300 acre area located at the lower portion of the Bayou Sale area. The soil types for this unit are Brackish Marsh, clays and mucky clay, Swamp, clay and mucky clay, Baldwin Silt loam), Baldwin silty clay loam, low phase, Baldwin silty clay loam, and Cypremort silty clay loam. The unit is bordered by East Cote Blanche Bay to the west and south, Bayou Sale to the east, and by the Miami Corporation property to the north. There are 2 bayous meandering through the unit, Shrimp Bayou and Oyster Bayou. A series of oil and gas location canals intersect the unit in different areas. One recreational park, Burns Point, is located at the southern portion of the area. The area is non-forested wetland and is primarily owned by the St. Mary Parish Land Company.

The St. Mary Soil and Water Conservation District has planted 1,260 individual trade gallon containers of California bulrush (Scirpus californicus) in the unit. These plantings were intended to reduce wave energy and decrease shoreline erosion. But, due to the high energy wave action from East Cote Blanche Bay these projects failed.

O'Neil classified this area as brackish marsh in 1949. In 1978, the area was classified as fresh marsh by Chabreck and Linscombe. In 1988, field investigations also identified this area as fresh marsh.

Field evaluations of this unit, conducted in 1995, revealed that the dominant natural emergent vegetation consists mainly of bulltongue (Sagittaria lancifolia), elephantsear (Colocasia esculenta), Cattail (Typha sp.), alligatorweed (Alternanthera philoxeroides), deerpea (Vigna luteola), and smartweed (Polygonum sp.).

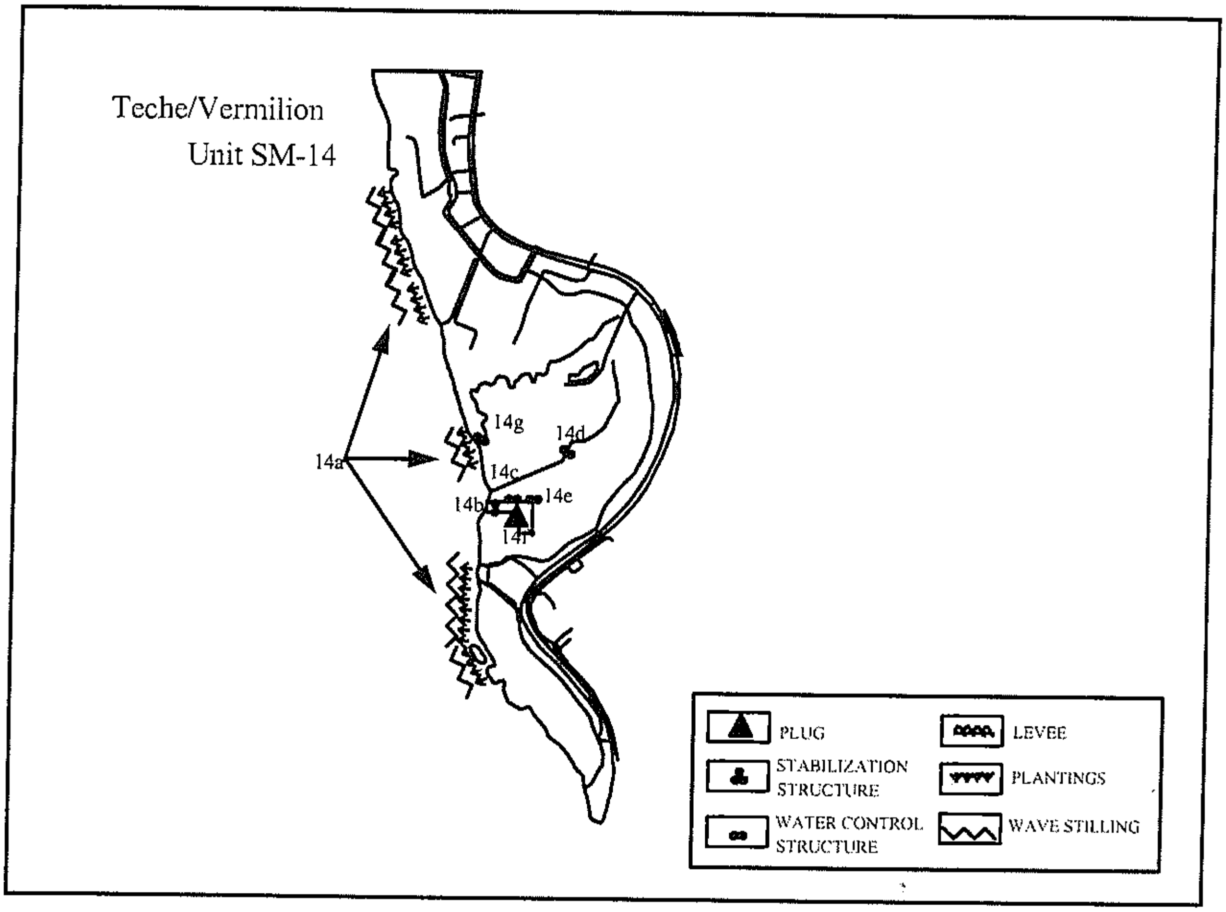


Figure 74. Hydrologic Unit No. SM-14

The plan objective for this hydrologic unit is to actively manage for fresh marsh. The management plan will be accomplished by maintaining and enhancing the present marsh to provide habitat for water fowl, estuarine organisms and reduce shoreline erosion.

Element No. 14a calls for 10,000 linear feet of wave stilling devices to be installed along the shoreline of the hydrologic unit. Between the wave stilling devices and the shoreline, vegetative plantings will be installed. Element No. 14b will consist of a 230 linear foot riprap rock F/C weir. The channel width at 14b is 210 feet and the channel depth is 11 feet. Element No. 14c will be a 106 linear foot riprap rock F/C weir. The channel width at No. 14c is 86 feet and 3.2 feet in depth. Element No. 14d calls for a 45 linear foot riprap rock F/C weir. The channel width at element No. 14 d is 25 feet and the depth is 5.9 feet. Element No. 14e will consist of a 145 foot riprap rock F/C weir. The channel depth at No. 14e is 115 feet and the depth is 10.0 feet. Element No. 14f will consist of 1 earthen embankment plug. Element No. 14g will be a 40 foot riprap rock F/C weir. The channel width at No. 14h is 20 feet and the width is 5.3 feet.

ALTERNATIVES AND ANALYSIS

The Teche/Vermilion Basin is a relatively stable area. One of the reasons is that the growth of the Atchafalaya River Delta is also gradually freshening this basin, and Chabreck and Linscombe(1982) found that saltwater intrusion was not common here. However, geomorphologic and hydrologic conditions were altered by navigation and petroleum access canals and spoil banks and levees . The effects of canals, spoil banks, and levees varies greatly from place to place, but generally they have created artificial barriers between wetlands and wetland maintenance processes, or removed natural barriers protecting wetlands and eliminating wetland delay processes.

ALTERNATIVE I

Alternative one is no action and a future with no project conditions. Under this alternative, the basin's wetlands will continue to deteriorate. Table 12 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 12. Projected Wetland Loss

Loss	Projected Loss (20 yrs.)		Projected Loss (50 yrs.)	
1932-1990	(Acre)	(Percent)	(Acre)	(Percent)
42,293	14,700	6.1	36,750	15.1

In 50 years , shoreline erosion will remove portions of Marone and Redfish Points. Shark Island will be reduced in size, and Weeks Bay will be larger. The interior marshes on Marone Point, those north and south of the GIWW between the Vermilion River Cutoff and Tigre Lagoon, the south central marshes on Marsh Island, and marshes on State and Rainey refuges will become shallow ponds.

ALTERNATIVE II

The second alternative will increase spring flooding and sedimentation on a regional scale. This alternative involves diverting more freshwater and sediments from the Atchafalaya River into this basin via bayou Teche, the Vermilion River, and GIWW. Increased sediment delivery to the Wax Lake Delta in the Atchafalaya Basin is also expected to contribute to this strategy because sediment delivery would likely increase in East Cote Blanche Bay and eventually cause new wetlands to be created. Efforts to increase fresh water and sediment introduction to the Teche/Vermilion Basin would also greatly benefit from increased discharge of the Atchafalaya River at Old River Control Structures but does not depend on it. In addition it might be necessary to modify or remove some water control structures in the marsh that currently prevent salt water entry during summer in order to allow marsh flooding with fresh water during the spring.

ALTERNATIVE III

This alternative will increase spring flooding and sedimentation on a local scale. Specific actions will vary depending on local conditions, but this will primarily require that marshes are not completely surrounded by levees with elevations too high to be topped by spring floods. This technique may be most effective where spring flooding depths are generally greater than summer high tide depths. Lowering spoil banks rather than gapping them may allow spring floods of freshwater and winter storm water widespread access to some interior marshes, and still prevent significant tidal flooding with higher saline water during the summers. Some saltwater entry could be tolerated because the marshes would be flushed with fresh water the following spring. The use of flap-gated control structures without encircling levees may allow flooding of the marsh by spring floods and winter storms, but will prevent ponding and will restrict salt-water entry during the summer. Additionally enhancing sediment accumulation in shallow water areas to create new marshes may also be possible on a local scale under this alternative. New marsh creation in the bays might also benefit adjacent marshes because the new wetlands may reduce buffer wave energy and shoreline erosion of adjacent marshes.

ALTERNATIVE IV

Under this alternative shorelines will be stabilized. Preventing erosion on the shorelines and especially where erosion is particularly rapid requires a variety of methods and independent projects. Beach nourishment, beneficial use of dredged material, and sediment trapping would be the preferable techniques, but it may be necessary to use hard structures in some cases. One example that has worked are brush fences, which have trapped sediment in various basins. Another example is limestone dikes, which prevented erosion and promoted sediment accumulation at Blind Lake in the Mermentau Basin.

IMPLEMENTATION

INTRODUCTION

Implementation of his river basin plan can be accomplished by government agencies, corporations, or individuals who could potentially institute certain portions of a conceptual plan. It is not designed to say that a certain group or individual will perform tasks to fulfill the plan requirements. The groups discussed in this section both private and public. The public groups are local, state, and Federal government.

PRIVATE

The Selected Plan is designed so that individual landowners and landusers can implement the proposed components to arrest or reduce wetland loss within particular hydrologic units. Some of the unit proposals may be too costly and require funding sources or technical expertise beyond individual capabilities. However, other financial and technical sources can be sought at the local, state, and federal level.

STATE AND LOCAL

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 statutorily 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.

Parish Coastal Management Programs

Nineteen parishes are either partially or entirely within the boundary of the Louisiana Coastal Zone. These coastal parishes are authorized to develop, seek approval for and implement local coastal management programs within the parish boundaries. Eight parishes have chosen to develop and implement local coastal management programs. These are Calcasieu, Lafourche, Orleans, St. Bernard, St. James and St. Tammany.

A parish with an approved program has its own permitting authority and fee schedule. Certain resource-use activities such as the construction of camps, bulkheads and piers are usually regarded as concerns of local programs rather than state concerns. Although it is recommended that a permit application be submitted to the agency with permitting authority over that particular use, an application for an activity in a parish with an approved program may be submitted either to that parish or to the state. In such cases, the state and parish communicate with each other, quickly determine (within two working days) which agency has jurisdiction over the activity and notify the applicant accordingly. It should be noted that the state retains jurisdiction over all uses in parishes which do not have approved local programs. Both the local coastal management programs and the Louisiana Department of Natural Resources Coastal Management Division can provide technical assistance in guiding the protection and development of coastal resources.

Coastal Zone Grants

Federal coastal zone legislation provides for granting of monies for small construction projects know as section 306A projects. Proposals are submitted by governmental entities (local parishes) to DNR. The Louisiana Department of Natural Resources (LDNR) Coastal Management Division (CMD) reviews and nominates projects to the National Oceanic and Atmospheric Administration (NOAA) that best meet program criteria. If the nomination is approved by NOAA, monies are granted to the parish for that project. These important projects are aimed at facilitating increased access for everyone to the state's coastal resources.

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. As the leading soil and water conservation agency in Louisiana, this committee 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 SWCC 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.

Coast 2050

A Coast 2050 Planning Management Team has been established in Louisiana. The purpose of this team is to develop a strategic coastal plan. This plan will include measures (strategies) deemed appropriate to achieve the sought-after objectives, such as flood protection or fisheries and wildlife production. Once the coastal plan is developed in accordance with the Coast 2050 manual, the Breaux Act Task Force, the State Wetlands Authority, and the DNR Coastal Zone Management (CZM) Authority may undertake the appropriate steps to establish this plan, with or without amendments, as coastal policy. This policy may form the basis of the amended Breaux Act Restoration Plan, the state's strategic plan, and CZM guidance, respectively.

State Soil and Water Conservation District (SWCD)

In Louisiana, SWCD's have been charged with the responsibility of conserving Louisiana's soil and water resources since 1938 when the Louisiana Legislature passes 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 Act recognized Louisiana's farm, grazing, and forestlands as assets basic to survival of mankind. The Vermilion, Iberia, and St. Mary Soil and Water Conservation Districts serve the landowners in the study area. Offices are located in Abbeville, New Iberia, and Franklin, Louisiana respectively.

FEDERAL GOVERNMENT

United States Department of Agriculture Programs

Natural Resources Conservation Service

The Soil Conservation and Domestic Allotment Act, Public Law 74-46, approved April 27, 1935, is the authorizing legislation that created the Soil Conservation Service which is now the Natural Resources Conservation Service (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 soil, water, and related resources.

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

NRCS in Louisiana has 10 field offices that provide technical assistance to marsh landowners. This is not a new concept, because NRCS technical 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, New Iberia, and Franklin, Louisiana serve landowners in the Teche/Vermilion Basin.

During the period of 1981-1984, 185 resource management plans were developed, covering 663,600 acres.

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.

Assistance is provided in planning, designing, and installing watershed works of improvement; in sharing implementation costs of flood prevention, irrigation, drainage, watershed protection, sedimentation control, and public water based fish and wildlife 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 provide protection for marsh areas in two watersheds. About 26 miles of levees and several structures for water control have been installed.

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 farmlands, wetlands, flood plains, and other special resources; improving irrigation efficiencies; and identifying flood hazards and other flood plains resources to assist local governments develop a local flood plain management program.

Parts of Louisiana's coastal area have been included in six river basin studies since 1967 as follows:

Name	Type	Completion Date
Sabine	B[1]	1967
Coastal & Independent Streams	CRBS[2]	1971
Lower Mississippi River	I[3]	1974
Southwest Louisiana Basin	CRBS	1974
Louisiana Statewide	CRBS	1974
Lafourche-Terrebonne	CRBS	1986
East Central Barataria	CRBS	1989
Mermentau	CRBS	1997

[1] Comprehensive Study
[2] Cooperative River Basin Study
[3] Framework Study

The major objectives of each study are to identify water and related land resource problems. Each study further identifies those USDA project-types and related programs which can be used effectively to meet the needs for water related goods and services in the study area and to ensure that agricultural interests are identified and protected in any overall water and related land development program.

River basin studies have provided input for the State water plan, coastal zone management plan, and Section 208 planning process. The State Soil and Water Conservation Districts have based parts of their long-range programs on information provided by river basin studies.

Inventory and Monitoring

The program was authorized under the Soil Conservation and Domestic Allotment Act, Public Law 74-76, April 27, 1935; Rural Development Act, Public Law 92-419, Section 302, Title III, August 30, 1982; and Resources Conservation Act, Public Law 95-192, November 18, 1977. The objectives 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.

Inventories will provide data on prime, unique, and other important farmland that are used to carry out surface mining regulations, prepare environmental impact statements, and appraise the rural lands that produce food, feed, forage, fiber, and oilseed crops for domestic use and export. Other inventories of the status and condition of natural and related resources furnish data for resource analyses and evaluation, programming, and planning at the State and National levels.

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; and 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. The 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.

Other Federal Programs

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

The act was enacted by the 101st Congress as House Bill No. 646 to provide for the long-term protection, restoration, and enhancement of Louisiana coastal wetlands. The projects that go into the annual plan are evaluated as to need and cost-effectiveness of implementation. The Act request 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

RANGELAND SECTION

Rangeland 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 plant communities, coastal marshes, wet meadows, and introduced plant communities managed like rangeland.

RANGE SITES / SOILS

The Teche/Vermilion River Basin (CSRB) area consists of seventeen different soil 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 kinds, amounts, and proportions of vegetation 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 condition 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. 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 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.. 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

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. 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 type range site is made up of Bancker soils. 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 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 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 Range Site

This type range site typically contains Scatlake soils which have a surface layer of very fluid mucky clay about 10 inches thick with underlying layers of very fluid clay. The soil has high concentrations of available salts and is predominantly vegetated with smooth cordgrass (Spartina alterniflora) and seashore saltgrass. The soil has poor trafficability, and cannot support the weight of domestic livestock. Most forage is utilized by nutria, muskrat, and other wetland wildlife.

Chenier and Beach Ridges Range Site

This range site is made up of Peveto and Hackberry soils. These soils have firm and consolidated sand and shell layers and low concentrations of available salts. This range site is predominately vegetated with gulf cordgrass, common bermuda grass, and hackberry trees. These soils have excellent trafficability throughout the year.

Spoil Banks

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 can be found along the numerous small navigational canals in this area. The soils in these areas have low to high concentrations of available salts. Udifluvents soil type has good to excellent trafficability. Domestic livestock utilize these areas as bedding and resting areas, and for refuge from storm tides and other flood periods. These areas have high populations of whitetail deer and swamp rabbits.

Aquents soils are the lower spoil areas and are vegetated with grasses and forbs. These soils consist of slightly fluid and very fluid soil layers. These soils have low to high concentrations of available salts. Trafficability is fair to poor. Whitetail deer, swamp rabbits, domestic goats, nutria, and muskrat utilize most of the forage in these areas.

VEGETATION

In the first half of the 20th 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 in the vicinity of Weeks and Avery Islands, and portions of the basin east of Freshwater Bayou; intermediate marshes predominately found along the GIWW in St. Mary Parish; brackish marshes along the GIWW in Iberia and Vermilion Parishes, marsh island, the Paul J. Rainey and State Wildlife Refuge; the western boundary of marsh island and the eastern boundary the Paul J. Rainey Wildlife Sanctuary contained salt marshes.

Intermediate marshes serve as a buffer zone between the brackish marsh and fresh marshes. Historically, intermediate marshes were represented predominantly by Creole and Bancker soils. Hydrologic modifications such as oilfield and transportation canals expanded the number of avenues for saltwater intrusion into these zones of intermediate marsh. By increasing the area for saltwater intrusion, the effects of tidal fluctuation were also expanded. Previously the less salt tolerant plant communities of the intermediate marsh were affected gradually throughout the day by the tides. With more avenues, the effects of the tides and the duration of saltwater on the plant communities were increased. Prolonged durations of saltwater gradually transformed intermediate marsh plant communities to a more brackish plant community.

Historically, the dominant vegetation of the intermediate marshes consisted of Jamaica sawgrass (Cladium jamaicense), interspersed with marshhay cordgrass. The vegetation was altered due to saltwater intrusion during droughts and `trapped' saltwater from hurricanes Audrey in 1957 and Carla in 1961. Conditions of higher salinity in the upper soil strata permitted more salt tolerant plants such as marshhay cordgrass the opportunity to expand in these areas and vegetative communities that evolved were typical of brackish marsh. The basin was formed upon marine sediments which have salinity concentrations ranging from saline to brackish.

The basin is built upon marine sediments which have salinity concentrations ranging from saline to brackish. The plant community which ultimately inhabits the different marsh types is relative to the salinity of the water in the upper soil strata, which includes the root zone. Even though the soil in the root mat may be of intermediate concentration, the substrate can be brackish; marsh communities such as these will be referred to as brackish marsh in this report.

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 comprised of marshhay cordgrass along with associated grasslike vegetation. These plants make up the majority of the grazeable vegetation as well as providing wildlife habitat.

Long growing seasons in the basin coupled with the enomorous growth potential of marsh vegetation necessitates the removal of annual growth. In the absence of plant removal either by grazing 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.

Plant communities in the marsh overlie soils with varying degrees of load bearing capacity. The organic and mineral components of the soil as well as the hydrology of the area impact the strengths of these marshes concerning livestock trafficability. While trafficibility is related to the inherent ability of the soil to hold up under the weight of animals, areas holding water can contribute to poor trafficabilty. Much of the lower lying marsh is now holding water at levels and durations that most grass plants such as marshhay cordgrass cannot tolerate. Vegetative communities in these areas are being altered, with California bulrush as the dominant plant. While this plant provides foliar cover and habitat for wildlife it does not provide as much basal coverage as a grass dominated marsh, therefore trafficability suffers as well as access for livestock in some instances. Other areas of the same soil type, in which the hydrology has not been significantly altered, exhibit a much higher proportion of marshhay cordgrass. Evidence of better drainage in areas such as these is supported by a lower density of California bulrush.

In marshes with better water exchange and drainage, plants such as alligatorweed (Alternathera philoxeroides), seashore paspalum, and various sedges (Carex sp.) become establishedinitially Marshhay cordgrass, Olney bulrush, and leafy threesquare (Scirpus robustus) tend to out-compete these plants and push them into isolated communities as water levels stabilize.

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 that is associated with seashore saltgrass in the swales and on lower positions, and gulf cordgrass on low ridges. Individual communities of seashore paspalum, sedges, and annuals occupy natural drains; while the backslopes grading toward the gulf become dominated by gulf cordgrass and seashore saltgrass with smooth cordgrass in the intertidal zone.

Fresh sandy cheniers composed of Hackberry and Peveto soils provide excellent trafficibility. These soils are well drained and support a community dominated by gulf cordgrass and marshhay cordgrass. Cattle tend to concentrate on these ridges due to their proximity to prevailing gulf winds and better footing. Under intense grazing, gulf cordgrass will dominate along with torpedograss (Panicum repens) and marshhay cordgrass to a lesser extent. Traditional upland species such as common bermudagrass, windmillgrass (Chloris sp.), and bristlegrass (Setaria sp.) invade this site under further heavy use.

NUTRITIONAL VALUES OF MARSH PLANTS

The nutritional value of forage plants in the southeastern U.S. are noted for having a low nutritional value after they mature or enter dormancy. However, many plants are an exception to this rule. Some examples are:

Plant	Crude Protein % Young Growing	Crude Protein % Mature or Dormant
Smooth Cordgrass	8 - 13	8 - 10
Marshhay Cordgrass (unburned)	3.5 - 7	3.5 - 8
Marshhay Cordgrass (burned)	12 - 20	5 - 8
Gulf Cordgrass	7 - 8.5	6 - 7
Longtom	10 - 13	6.5 - 8
Giant Cutgrass	14 - 16	6 - 12

Also marsh forages typically supply the cow with needed calcium and phosphorus for fetal development and lactation. Furthermore, cattle will select those plants and plant parts that approximate their nutritional demands. Normally the only supplemental feeding needs are to supply additional energy during periods of cold, wet weather, typically "Blue Northerns" during January and February.

GRAZING MANAGEMENT PRACTICES

Due to the seasonal possibility of tropical storms, many producers move cattle to upland areas between June and October of each year. This provides a rest - rotation grazing system for much of the marsh range. Other producers move cattle from the `front marshes', those nearest to the Gulf of Mexico, to the `back marshes', or those farthest inland. This movement is primarily to avoid high concentrations of insects, mainly mosquitoes in the brackish marshes. Ridges and relic coastal dunes provide land areas of higher elevation. These areas provide some relief from the insect problems.

Many grazing operations rely on lands that are leased for grazing. These same lands are often leased for activities centered around wildlife resources such as hunting and trapping. Coordination between resource use is needed to attain multiple use management.

Prescribed Burning

Prescribed burns do several things to benefit wildlife and beef cattle in marsh areas. The most important is to reduce foliar cover and excessive rough allowing ecologically lower plants to compete with higher order plants. As the foliar cover of the dominant plants increases and competes for space and sunlight, they will once again reduce the number and +amount of secondary plants. Additionally, the dense cover of mature marsh vegetation is burned to stimulate new, succulent vegetative growth for both wildlife and cattle and to increase the availability of forage. This is best illustrated by a marsh dominated by marshhay cordgrass which, when dominant, produces very little wildlife food. The burn will remove the accumulated rough and allow desirable secondary plants such Olney bulrush to grow. Under controlled water conditions, a burn will also encourage growth of desirable duck foods such as duckmillets (Echinochloa spp.), sprangletop (Leptochloa spp.), coastal waterhyssop (Bacopa monnieri) and saltmarsh bulrush (Scirpus robustus).

Other benefits of burns include the increase of nutrients necessary for plant growth, and the blackened soils warm up more quickly and enhance the growth of plants. Burns provide landing areas for geese and ducks in otherwise unbroken stands of tall stands of marshhay cordgrass.

Cattle Walkways

Walkways are earthen levees constructed from cheniers into marsh areas to improve accessibility and encourage uniform use of the marsh vegetation. The walkways benefit cattle by serving as trails, bedgrounds, calving locations, and places for young calves to rest while their mothers graze.

Walkways provide refuge for wildlife and cattle during periods of high water. They provide resting, nesting, and den sites for several types of birds and mammals as well as providing different species of food plants.

Range Proper Use

Range proper use means grazing at an intensity that will maintain or improve the quality and the 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 the range from cattle grazing during the major growth period of the key plants to encourage improvement through increased plant vigor, vegetative increase through rhizomes and stolons, and from seed production. This practice also provides to have cattle off of marsh range during periods when insects, especially mosquitoes, become intolerable during the late spring and summer months.

Fencing

Fencing is needed to distribute grazing and facilitate livestock and forage management. Fencing (property line fences, cross fences, and blind fences) will keep livestock out of areas which are being deferred from grazing, as well as in areas designated for grazing. For example, fences can prevent livestock from entering areas that have been over-utilized or grazed out by waterfowl or furbearers such as nutria and muskrats.

Brush Management

Control of competitive shrubs such as Cherokee rose, Eastern Baccharis (Baccharis halimifolia), Rattlebox (Sesbania drummondii) and Chinese Tallow trees is needed to provide for favorable food plants. When controlling brush, consideration should be given to leaving some trees and shrubs such as oaks and yaupons, which can provide shade for livestock and food and cover for wildlife. Management which favors the better forage plants is the best overall weed control.

Brush management methods include mowing, burning, and chemical control. Follow all directions and heed all precautions on the container's label when chemical treatment is needed.

NON - LIVESTOCK USE OF MARSH RANGES

Marsh ranges in the Teche/Vermilion River Basin study area are utilized by a number of herbivores. The major non-domestic livestock users include migratory waterfowl, furbearers, rabbits, and deer (Existing Resources).

Management practices that enhance marsh vegetation for livestock can also benefit wildlife. Prescribed burning is an example. Geese prefer sites that have lower vegetation which will not impede landing. The tender new shoots provide excellent quality food. Nutria, rabbit, and deer also thrive on freshly greened up marsh. In addition, burning opens the marsh so the less dominant plants speices can increase. This is especially true for the grasslike and annual plants which are noted for their wildlife food value.

Overpopulation of any herbivore can cause problems in maintaining the marsh vegetation. "Eat-outs" caused by nutria, muskrat, or geese can cause severe damage to the plant community, often leading to the area being converted to open water. "Eat-outs" occur when the population density of the herbivores exceeds the carrying capacity of the plant community. Typically, nutria or geese will graze the plants to the ground surface and uproot the plants to forage on the rootstock. When this happens the plants loose the capacity to vegetatively reproduce. In the case of nutria, the lack of sufficient predator or trapping pressure can lead to overpopulations. Geese concentrate on fresh burns and if the burned areas are limited, especially on the marsh sites with higher elevations, the herbivore population will be out of balance with the food source.

Planned burning rotations need to consider past use of the area by migratory waterfowl, resident herbivore populations, and domestic livestock. Burns should be rotated so that adjacent marshes that have been burned or heavily utilized in the past growing season do not get excessive use due to proximate of the current years burns. Several areas exist in the basin where high nutria concentrations have occurred. Additional "eat-outs" can be expected to occur unless the nutria populations are controlled.

ECONOMICS

In 1996 Vermilion, Iberia, and St. Mary Parishes had a combined beef cattle production of 48, 700 head, according to the Louisiana Cooperative Extension Service. Vermilion Parish alone had 41,200 units of production. Beef cattle sales in the basin totaled $11,117,454 in 1996. Almost all of the cattle in the basin are in the cow-calf phase of the industry.

APPENDIX B

PRIVATE LANDS CONSERVATION MENU

Management Actions	Agency Group	Delivery Programs	Benefits to Landowner
A. Reforestation on Cropland Forestland	FSA	Conservation Reserve Program	Rental payment & 50% cost-share.
	NRCS	Wetland Reserve Program	Easement purchase & restoration cost-share.
	NRCS	EQIP	Cost-share & technical assistance.
	NRCS	Forestry Incentive Program	50% cost-share.
	NRCS	Conservation Operations Program	Technical assistance.
	FWS	Partners for Wildlife	Technical assistance, up to 100% cost-share.
	LCES	Outreach Educational Programs	Information & education
	LOF	Technical Assistance	Technical assistance.
	LOF	Forest Stewardship Program	Technical assistance, 50% cost-share.
B. Marsh Protection	MULTI	Public Law 101-646 5(CWPPRA)	Funding & design for priority projects.
	DELTA	Conservation Easement	Cost-share.
	LDWF (NHP)	Louisiana Natural Areas Registry Program	Management plan development, tax incentive.
	LDNR	Technical Assistance	Information resources, technical assistance.
	LDWF	Technical Assistance	Information resources, technical assistance.
	FWS	N. American Wetland Conservation Act Grant	50% federal matching funds.
	FSA	CRP	Rental payment & cost-share.
	NFWF	National Fish & Wildlife Foundation Grant	33% federal matching funds.
C. Marsh Restoration	NRCS	Wetland Reserve Program	Easement purchase and 75% restoration cost-share.
	LDNR	Technical Assistance Restoration Projects	Information resources, technical assistance,
	LDWF	Technical Assistance	Information resources,

D. Management Actions	Agency Group	Delivery Programs	Benefits to Landowner
	LDWF	Technical Assistance	Information resources technical assistance.
	NRCS	Marsh Management/Rest. Technical assistance	Technical assistance.
	FWS	Partners for Wildlife	Technical assistance, up to 100% cost-share.
	LCES	Outreach Educational Programs	Information & education.
	FWS	FWS Challenge Grant	50% federal cost-share.
	FWS	N. American Wetland Conservation Act Grant	50% federal matching funds.
	NFWF	National Fish & Wildlife Foundation Grant	33% federal matching funds.
	MULTI	Public Law 101-646 (CWPPRA)	Funding and design for priority projects.
E. Marsh Management	NRCS & (FWS)	Marsh Management/Rest. Technical Assistance	Technical Assistance
	FWS	Mini-Refuge Leases	Posting & law enforcement.
	LCES	Outreach Educational Programs	Information & education.
	LDNR	Technical Assistance	Information resources & technical assistance.
	LDWF	Technical Assistance	Information resources & technical assistance.
	LDWF	Deer Management Assistance Program	Technical assistance, signs for posting.
	FWS	Challenge Grant	50% federal cost-share.
	FWS	N. American Wetland Conservation Act Grant	50% federal matching funds.
	NFWF	National Fish & Wildlife	33% federal matching funds.

Agency Groups

FSA	Farm Service Agency	NRCS	Natural Resources Conservation Service
FWS	Fish & Wildlife Service	LCES	Louisiana Cooperative Extension Service
LOF	Louisiana Office of Forestry	LDNR	Louisiana Department of Natural Resources
		LDWF	Louisiana Department of Wildlife & Fisheries

APPENDIX C

LIST OF VEGETATION IN THE TECHE-VERMILION RIVER BASIN

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PTERIDOPHYTES

EQUISETACEAE	
Equisetum hyemale	Horsetail
PSILOTACEAE	
Psilotum nudum	Whisk Fern
SELAGINELLACEAE	
Selaginella apoda	Meadow Spikemoss
POLYPODIACEAE	
Adiantum pedatum	Northern Maidenhair Fern
Asplenium platyneuron	Ebony Spleenwort
Athyrium aspleniodes	Southern Lady Fern
Athyrium filax-femina aspleniodes	
Cyrtomium fortunei	Holly Fern
Dryopteris ludoviciana	Louisiana Wood-fern
Onoclea sensibilis	Sensitive Fern

Polypodium polypodioides	Resurrection Fern
Polystichum acrostichoides	Christmas Fern
Pteridium aquilinum pseudocaudatum	Bracken Fern
Pteris cretica	Cretan Brake
Pteris vittata	Ladder Brake
Thelypteris dentata	Downy Shield Fern
Thelypteris interrupta	Willdenous Shield Fern
Thelypteris kunthii	Widespread Maiden Fern
Thelypteris quadrangularis	Shield Fern
Thelypteris hispidula	
Thelypteris thelypteroides	Southern Marsh Fern
Thelypteris torresiana	Mariana Maiden Fern
Macrothelypteris torresiana	
Woodsia obtusa	Blunt-lobed Woodsia
Woodwardia areolata	Netted Chain Fern
Woodwardia virginica	Virginia Chain Fern
SCHIZAEACEAE	
Lygodium japonicum	Japanese Climbing-Fern
OSMUNDACEAE	
Osmunda regalis	Royal Fern
SALVINIACEAE	
Azolla caroliniana	Mosquito Fern
Salvinia minima	Salvinia
MARSILEACEAE	
Marsilea vestita	Hairy Waterclover
OPHIOGLOSSACEAE	
Botrychium biternatum	Southern Grape Fern
Botrychium dissectum	Cutleaf Grape Fern
Botrychium virginianum	Rattlesnake-Fern
Ophioglossum crotalophoroides	Bulbous Adder's-Tongue
Ophioglossum engelmannii	Limestone Adder's-Tongue
Ophioglossum petiolatum	Long-stemmed Adder's-Tongue
Ophioglossum vulgatum	Common Adder's-Tongue
GYMNOSPERMS	
PINACEAE	
Juniperus virginiana	Eastern Red Cedar
Pinus echinata	Shortleaf Pine
Pinus elliottii	Slash Pine
Pinus taeda	Loblolly Pine
Taxodium distichum	Baldcypress
ANGIOSPERMS	
TYPHACEAE	
Typha domingensis	Southern Cattail

Typha latifolia	Common Cattail
POTAMOGETONACEA	
Potamogeton diversifolius	Waterthread Pondweed
Potamogeton nodosus	Long-leaved Pondweed
Potamogeton pectinatus	Sago Pondweed
Potamogeton pusillus	Small Pondweed
NAJADACEAE	
Najas guadalupensis	Southern Naiad
Najas minor	Brittle Naiad
ALISMATACEAE	
Echinodorus cordifolius	Creeping Burhead
Sagittaria calycina	Hooded Arrowhead
Sagittaria falcata	Coastal Arrowhead
Sagittaria graminea	Grassy Arrowhead
Sagittaria lancifolia	Bulltongue
Sagittaria latifolia	Duck-Potato
Sagittaria montevidensis	Hooded Arrowleaf
Sagittaria platyphylla	Delta Arrowhead
HYDROCHARITACEAE	
Hydrilla verticillata	Hydrilla
Limnobium spongia	Frog's-Bit
Ottelia alismoides	Ducklettuce
Vallisneria americana	Wildcelery
GRAMINEAE	
Agrostis elliottiana	Elliot Bentgrass
Agrostis hyemalis	Spring Bentgrass
Alopecurus carolinianus	Carolina Foxtail
Andropogon gerardii	Big Bluestem
Andropogon glomeratus	Bushy Bluestem
Andropogon virginicus	Broomsedge
Aristida longispica	Slim-spike Three-awn Grass
Aristida oligantha	Prairie Three-awn Grass
Arundinaria gigantea	Giant Cane
Arundo donax	Giant Reed
Avena sativa	Common Oats
Axonopus affinis	Carpetgrass
Axonopus compressus	Tropical Carpetgrass
Bothriochloa exaristata	Awnless Bluestem
Bothriochloa ischaemum	King Ranch Bluestem
Bothriochloa saccharoides	Silver Bluestem
Brachiaria fasciculatum	Browntop Panicum
Brachiaria platyphylla	Broadleaf Signalgrass
Brachiaria reptans	Sprawling Panicum
Briza minor	Little Quaking-grass
Bromus japonicus	Japanese Chess
Bromus racemosus	Hairy Bromegrass
Bromus tectorum	Downy Bromegrass
Bromus unioloides	Rescuegrass

Cenchrus echinatus	Southern Sandbur
Cenchrus incertus	Coastal Sandbur
Cenchrus myosuroides	Big Sandbur
Chasmanthium latifolium	Inland Sea Oats
Chasmanthium laxum	Chasmanthium
Chasmanthium sessiliflorum	Longleaf Uniola
Chloris virgata	Showy Chloris
Coelorachis tesselata	Jointgrass
Cynodon dactylon	Bermudagrass
Dactyloctenium aegyptium	Durban Crowfootgrass
Dichanthelium boscii	Bosc Panicum
Dichanthelium oligosanthes	Scribner Panicum
Dichanthelium scabriusculun	Velvet Panicum
Dichanthelium scoparium	Velvet Panicum
Dichanthelium sphaerocarpon	Roundseed Panicum
Digitaria adscendens	Southern Crabgrass
Digitaria ciliaris	
Digitaria ciliaris	Southern Crabgrass
Digitaria ischaemum	Smooth Crabgrass
Digitaria sanguinalis	Northern Crabgrass
Digitaria villosa	Crabgrass
Distichlis spicata	Seashore Saltgrass
Echinochloa colona	Junglerice
Echinochloa crusgalli	Barnyardgrass
Echinochloa muricata	Wild Millet
Echinochloa walteri	Walter's Millet
Eleusine indica	Goosegrass
Elymus virginicus	Virginia Wild Rye
Eragrostis bahiensis	Bahia Lovegrass
Eragrostis capillaris	Lacegrass
Eragrostis curvula	Weeping Lovegrass
Eragrostis glomerata	Pond Lovegrass
Eragrostis hypnoides	Teal Lovegrass
Eragrostis intermedia	Plains Lovegrass
Eragrostis lugens	Mourning Lovegrass
Eragrostis pectinacea	Carolina Lovegrass
Eragrostis refracta	Coastal Lovegrass
Eragrostis secundiflora	Red Lovegrass
Eragrostis spectabilis	Purple Lovegrass
Eragrostis spicata	Spike Lovegrass
Eragrostis tephrosanthos	Gulf Lovegrass
Eremochloa ophiuroides	Centipedegrass
Erianthus giganteus	Sugarcane Plumegrass
Festuca elatior	Meadow Fescue
Festuca pratensis	
Hordeum pusillum	Little Barley
Hydrochloa caroliniensis	Watergrass
Leersia hexandra	Southern Cutgrass
Leersia oryzoides	Rice Cutgrass
Leersia virginica	Whitegrass
Leptochloa fascicularis	Bearded Sprangletop
Leptochloa filiformis	Red Sprangletop
Leptochloa panicoides	Amazon Sprangletop
Leptochloa scabra	Rough Sprangletop

Limnodea arkansana	Ozarkgrass
Lolium perenne	Perennial Ryegrass
Manisuris exaltata	----
Muhlenbergia schreberi	Nimblewill Muhly
Oplismenus setarius	Basketgrass
Oplismenus hirtellus setarius	
Oryza sativa	Rice
Panicum anceps	Beaked Panicum
Panicum capillare	Witchgrass
Panicum commutatum	Variable Panicgrass
Dichanthelium commutatum	
Panicum dichotomiflorum	Fall Panicgrass
Panicum dichotomum	Clute Panicgrass
Dichanthelium dichotomum	
Panicum hemitomon	Paille Fine
Panicum laxiflorum	Openflower Panicgrass
Dichanthelium laxiflorum	
Panicum leucothrix	Wooly Panicgrass
Dichanthelium acuminatum implicatum	
Panicum lindheimeri	Panicgrass
Dichanthelium acuminatum lindheimeri	
Panicum repens	Torpedograss
Panicum rigidulum	Redtop Panicum
Panicum virgatum	Switchgrass
Paspalum boscianum	Bull Paspalum
Paspalum cojugatum	Sour Paspalum
Paspalum dilatatum	Dallisgrass
Paspalum distichum	Knotgrass
Paspalum floridanum	Florida Paspalum
Paspalum fluitans	Water Paspalum
Paspalum laeve	Field Paspalum
Paspalum langei	Rustyseed Paspalum
Paspalum lividum	Longtom
Paspalum notatum	Bahiagrass
Paspalum plicatulum	Brownseed Paspalum
Paspalum setaceum	Thin Paspalum
Paspalum urvillei	Vaseygrass
Paspalum vaginatum	Seashore Paspalum
Phalaris angusta	Canarygrass
Phalaris caroliniana	Carolina Canarygrass
Phanopyrum gymnocarpon	Savannah Panic
Phragmites australis	Common Reed
Poa annua	Annual Bluegrass
Poa sylvestris	Woodland Bluegrass
Polypogon monspeliensis	Rabbitfootgrass
Saccharum officinarum	Sugarcane
Sacciolepis striata	American Cupscale
Schizachyrium scoparium	Little Bluestem
Schizachyrium tenerum	Slender Bluestem
Setaria geniculata	Knotroot Bristlegrass
Setaria glauca	Yellow Foxtail
Setaria italica	Foxtail Millet
Setaria magna	Giant Bristlegrass
Setaria pallida-fusca	Foxtail

Sorghastrum avenaceum	Indiangrass
Sorghum bicolor	Sorghum
Sorghum halepense	Johnsongrass
Spartina alterniflora	Smooth Cordgrass
Spartina cynosuroides	Big Cordgrass
Spartina patens	Marshhay Cordgrass
Spartina spartinae	Gulf Cordgrass
Sphenopholis pensylvanica	Swamp Oats
Sporobolus asper	Tall Dropseed
Sporobolus indicus	Smutgrass
Steinchisma hians	Gaping Panicum
Stenotaphrum secundatum	St. Augustine
Tridens flavus	Purpletop
Tridens strictus	Longspike Tridens
Tripsacum dactyloides	Eastern Gamagrass
Trisetum pensylvanicum	Swamp Trisetum
Triticum aestivum	Wheat
Vulpia octoflora	Sixweeks Fescue
Zea mays	Corn
Zizania aquatica	Annual Wildrice
Zizaniopsis miliacea	Giant Cutgrass
CYPERACEAE	
Carex alata	Wingseed Sedge
Carex albolutescens	Greenish-white Sedge
Carex bromoides	Bromeline Sedge
Carex cherokeensis	Cherokee Sedge
Carex comosa	Longhair Sedge
Carex crus-corvi	Crowfoot Sedge
Carex flaccosperma	Thinfruit Sedge
Carex frankii	Frank's Sedge
Carex hyalinolepis	Thinscale Sedge
Carex impressa	Caric-sedge
Carex leavenworthii	Leavenworth Sedge
Carex louisianica	Louisiana Sedge
Carex lupulina	Hop Sedge
Carex oxylepis	Sharpscale Sedge
Carex retroflexa	Reflexed Sedge
Carex squarrosa	Squarrose Sedge
Carex triangularis	Anglestem Sedge
Carex tribuloides	Bristlebract Sedge
Carex vulpinoidea	Fox Sedge
Cladium jamaicensis	Jamaica Sawgrass
Cyperus articulatus	Jointed Flatsedge
Cyperus compressus	Poorland Flatsedge
Cyperus elegans	Sticky Flatsedge
Cyperus erythrorhizos	Redroot Flatsedge
Cyperus esculentus	Chufa
Cyperus ferruginescens	Rusty Flatsedge
Cyperus filicinus	Nerved Flatsedge
Cyperus flavescens	Yellow Flatsedge
Cyperus globulosus	Baldwin Flatsedge
Cyperus haspan	Sheathed Flatsedge
Cyperus iria	Ricefield Flatsedge

Cyperus odoratus	Fragrant Flatsedge
Cyperus ovularis	Globe Flatsedge
Cyperus oxylepis	Sharpscale Flatsedge
Cyperus polystachyos	Manyspiked Flatsedge
Cyperus pseudovegetus	Green Flatsedge
Cyperus rotundus	Nutgrass
Cyperus strigosus	Straw-colred Nutsedge
Cyperus tenuifolius	Thinleaved Flatsedge
Cyperus virens	Green Flatsedge
Dichromena colorata	Starrush Whitetop-Sedge
Dulichium arundinaceum	Three-way Sedge
Eleocharis albida	Saltmarsh Spikesedge
Eleocharis caribaea	Canada Spikesedge
Eleocharis cellulosa	Gulfcoast Spikesedge
Eleocharis equisetoides	Northern Jointed Spikesedge
Eleocharis montana	Mountain Spikesedge
Eleocharis obtusa	Blunt Spikesedge
Eleocharis parvula	Dwarf Spikesedge
Eleocharis quadrangulata	Squarestem Spikesedge
Eleocharis robbinisii	Robbin's Spikesedge
Eleocharis tuberculosa	Large-tubercled Spikesedge
Eleocharis vivipara	Viviparous Spikesedge
Fimbristylis annua	Weak Fimbry
Fimbristylis caroliniana	Hairy Fimbry
Fimbristylis castanea	Corm Fimbry
Fimbristylis miliacea	Globe Fimbry
Fimbristylis tomentosa	Fimbry
Fimbristylis vahlii	Vahl Fimbry
Rhynchospora caduca	Falling Beakrush
Rhynchospora corniculata	Horned Beakrush
Rhynchospora glomerata	Clustered Beakrush
Rhynchospora inexpansa	Nodding Beakrush
Scirpus americanus	American Bulrush
Scirpus atrovirens	Green Bulrush
Scirpus californicus	California Bulrush
Scirpus cyperinus	Woolgrass Bulrush
Scirpus koilolepis	Keeled Bulrush
Scirpus maritimus	Saltmarsh Bulrush
Scirpus olneyi	Olney Bulrush
Scirpus pendulus	Reddish Bulrush
Scirpus robustus	Saltmarsh Bulrush
Scirpus validus	Softstem Bulrush
Websteria submersa	-----
PALMAE	
Sabal minor	Dwarf Palmetto
ARACEAE	
Arisaema dracontium	Green Dragon
Colocasia esculenta	Elephant Ear
Peltandra virginica	Arrow-Arum
Pistia stratiotes	Waterlettuce

LEMNACEAE

Lemna minor	Lesser Duckweed
Lemna perpusilla	Minute Duckweed
Lemna valdiviana	Pale Duckweed
Spirodela polyrhiza	Duckmeat
Spirodela punctata	Great Duckweed
Wolffia columbiana	Columbia Watermeal
Wolffia papulifera	Watermeal
Wolfiella floridana	Florida Mudmidget
Wolfiella gladiata	Bogmat
Wolfiella lingulata	Tongue Mudmidget
Wolfiella oblonga	Oblong Mudmidget

XYRIDACEAE

Xyris difformis	Southern Yellow-eyed-grass

BROMELIACEAE

Tillandsia usneoides	Spanish Moss

COMMELINACEAE

Callisia repens	----
Commelina communis	Common Dayflower
Commelina diffusa	Widow's-tears
Commelina erecta	Narrowleaf Dayflower
Commelina virginica	Virginia Dayflower
Murdannia nudiflora	Naked-stem Dewflower
Tradescantia hirsutiflora	Hairystem Spiderwort
Tradescantia occidentalis	Prairie Spiderwort
Tradescantia ohiensis	Ohio Spiderwort
Tradescantia virginiana	Virginia Spiderwort

PONTEDERIACEAE

Eichhornia crassipes	Water Hyacinth
Heteranthera limosa	Longleaf Mudplaintain
Heteranthera reniformis	Roundleaf Mudplaintain
Pontederia cordata	Pickerelweed
Zosterella dubia	Waterstargrass

JUNCACEAE

Juncus acuminatus	Taperleaf Bog-Rush
Juncus bufonius	Toad Rush
Juncus effusus	Soft Rush
Juncus interior	Inland Rush
Juncus macer	Soft Rush
Juncus marginatus	Shore Rush
Juncus repens	Creeping Rush
Juncus roemerianus	Black Needlerush
Juncus tenuis	Slender Rush

LILIACEAE

Allium bivalve	False Garlic
Allium canadense	Canada Garlic
Allium reticulatum	Garlic

Asparagus officinalis	Garden Asparagus
Smilax bona-nox	Saw Greenbrier
Smilax glauca	Cat Greenbrier
Smilax hispida	Bristly Greenbier
Smilax laurifolia	Laurel Greenbrier
Smilax pumila	Sarsaparillavine
Smilax rotundifolia	Common Greenbier
Smilax smallii	Small's Greenbier
Smilax walteri	Coral Greenbrier
AMARYLLIDACEAE	
Crinum americanum	Swamp Lily
Crinum bulbispermum	Hardy Crinum
Hymenocallis caroliniana	Carolina Spiderlily
Manfreda virginica	Green Manfreda
Zephyranthes candida	Zephyr Lily
DIOSCOREACEAE	
Dioscorea bulbifera	Wild Yam
Dioscorea villosa	Wild Yam
IRIDACEAE	
Iris fulva	Red Flag
Iris virginica	Southern Blue Flag
Sisyrinchium angustifolium	Stout Blue-eyed Grass
Sisyrinchium atlanticum	Eastern Blue-eyed Grass
Sisyrinchium exile	Yellow Blue-eyed Grass
Sisyrinchium rosulatum	Annual Blue-eyed Grass
CANNACEAE	
Canna flaccida	Golden Canna
Canna glauca	Louisiana Canna
Canna indica	Indian Canna
Thalia dealbata	Powdered Thalia
ORCHIDACEAE	
Habenaria repens	Waterspider Orchid
Spiranthes cernua	Nodding Ladies Tresses
SAURURACEAE	
Saururus cernuus	Lizard's-tail
SALICACEAE	
Populus deltoides	Eastern Cottonwood
Salix interior	Sandbar Willow
Salix exigua interior	
Salix nigra	Black Willow
MYRICACEAE	
Myrica cerifera	Southern Waxmyrtle
JUGLANDACEAE	

Carya aquatica	Bitter Pecan
Carya cordiformis	Bitternut Hickory
Carya glabra	Pignut Hickory
Carya illinoensis	Pecan
Carya myristiciformis	Nutmeg Hickory
Juglans nigra	Black Walnut
BETULACEAE	
Carpinus caroliniana	Ironwood
FAGACEAE	
Castanea pumila	Chinquapin
Quercus falcata leucophylla	Cherrybark Oak
Quercus falcata pagodaefolia	Cherrybark Oak
Quercus laurifolia	Laurel Oak
Quercus michauxii	Cow Oak
Quercus minima	Small Live Oak
Quercus nigra	Water Oak
Quercus nuttallii	Nuttall Oak
Quercus phellos	Willow Oak
Quercus stellata	Post Oak
Quercus undulata	Wavyleaf Oak
Quercus virginiana	Live Oak
ULMACEAE	
Celtis laevigata	Hackberry
Planera aquatica	Water Elm
Ulmus alata	Winged Elm
Ulmus americana	American Elm
Ulmus crassifolia	Cedar Elm
Ulmus rubra	Slippery Elm
MORACEAE	
Ficus carica	Fig
Morus alba	White Mulberry
Morus nigra	Black Mulberry
Morus rubra	Red Mulberry
URTICACEAE	
Boehmeria cylindrica	Boghemp
Laportea canadensis	Woodnettle
Parietaria pensylvanica	Hammerwort
Pilea pumila	Clearweed
Urtica chamaedryoides	Stinging Nettle
LORANTHACEAE	
Phoradendron tomentosum	Mistletoe
POLYGONACEAE	
Antenoron virginianum	Jumpseed
Polygonum virginianum	
Brunnichia ovata	Ladie's Ear-Drops

APPENDIX C

LIST OF VEGETATION IN THE TECHE-VERMILION RIVER BASIN

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PTERIDOPHYTES

EQUISETACEAE	
Equisetum hyemale	Horsetail
PSILOTACEAE	
Psilotum nudum	Whisk Fern
SELAGINELLACEAE	
Selaginella apoda	Meadow Spikemoss
POLYPODIACEAE	
Adiantum pedatum	Northern Maidenhair Fern
Asplenium platyneuron	Ebony Spleenwort
Athyrium aspleniodes	Southern Lady Fern
Athyrium filax-femina aspleniodes	
Cyrtomium fortunei	Holly Fern
Dryopteris ludoviciana	Louisiana Wood-fern
Onoclea sensibilis	Sensitive Fern

Polypodium polypodioides	Resurrection Fern
Polystichum acrostichoides	Christmas Fern
Pteridium aquilinum pseudocaudatum	Bracken Fern
Pteris cretica	Cretan Brake
Pteris vittata	Ladder Brake
Thelypteris dentata	Downy Shield Fern
Thelypteris interrupta	Willdenous Shield Fern
Thelypteris kunthii	Widespread Maiden Fern
Thelypteris quadrangularis	Shield Fern
Thelypteris hispidula	
Thelypteris thelypteroides	Southern Marsh Fern
Thelypteris torresiana	Mariana Maiden Fern
Macrothelypteris torresiana	
Woodsia obtusa	Blunt-lobed Woodsia
Woodwardia areolata	Netted Chain Fern
Woodwardia virginica	Virginia Chain Fern
SCHIZAEACEAE	
Lygodium japonicum	Japanese Climbing-Fern
OSMUNDACEAE	
Osmunda regalis	Royal Fern
SALVINIACEAE	
Azolla caroliniana	Mosquito Fern
Salvinia minima	Salvinia
MARSILEACEAE	
Marsilea vestita	Hairy Waterclover
OPHIOGLOSSACEAE	
Botrychium biternatum	Southern Grape Fern
Botrychium dissectum	Cutleaf Grape Fern
Botrychium virginianum	Rattlesnake-Fern
Ophioglossum crotalophoroides	Bulbous Adder's-Tongue
Ophioglossum engelmannii	Limestone Adder's-Tongue
Ophioglossum petiolatum	Long-stemmed Adder's-Tongue
Ophioglossum vulgatum	Common Adder's-Tongue
GYMNOSPERMS	
PINACEAE	
Juniperus virginiana	Eastern Red Cedar
Pinus echinata	Shortleaf Pine
Pinus elliottii	Slash Pine
Pinus taeda	Loblolly Pine
Taxodium distichum	Baldcypress
ANGIOSPERMS	
TYPHACEAE	
Typha domingensis	Southern Cattail

Typha latifolia	Common Cattail
POTAMOGETONACEA	
Potamogeton diversifolius	Waterthread Pondweed
Potamogeton nodosus	Long-leaved Pondweed
Potamogeton pectinatus	Sago Pondweed
Potamogeton pusillus	Small Pondweed
NAJADACEAE	
Najas guadalupensis	Southern Naiad
Najas minor	Brittle Naiad
ALISMATACEAE	
Echinodorus cordifolius	Creeping Burhead
Sagittaria calycina	Hooded Arrowhead
Sagittaria falcata	Coastal Arrowhead
Sagittaria graminea	Grassy Arrowhead
Sagittaria lancifolia	Bulltongue
Sagittaria latifolia	Duck-Potato
Sagittaria montevidensis	Hooded Arrowleaf
Sagittaria platyphylla	Delta Arrowhead
HYDROCHARITACEAE	
Hydrilla verticillata	Hydrilla
Limnobium spongia	Frog's-Bit
Ottelia alismoides	Ducklettuce
Vallisneria americana	Wildcelery
GRAMINEAE	
Agrostis elliottiana	Elliot Bentgrass
Agrostis hyemalis	Spring Bentgrass
Alopecurus carolinianus	Carolina Foxtail
Andropogon gerardii	Big Bluestem
Andropogon glomeratus	Bushy Bluestem
Andropogon virginicus	Broomsedge
Aristida longispica	Slim-spike Three-awn Grass
Aristida oligantha	Prairie Three-awn Grass
Arundinaria gigantea	Giant Cane
Arundo donax	Giant Reed
Avena sativa	Common Oats
Axonopus affinis	Carpetgrass
Axonopus compressus	Tropical Carpetgrass
Bothriochloa exaristata	Awnless Bluestem
Bothriochloa ischaemum	King Ranch Bluestem
Bothriochloa saccharoides	Silver Bluestem
Brachiaria fasciculatum	Browntop Panicum
Brachiaria platyphylla	Broadleaf Signalgrass
Brachiaria reptans	Sprawling Panicum
Briza minor	Little Quaking-grass
Bromus japonicus	Japanese Chess
Bromus racemosus	Hairy Bromegrass
Bromus tectorum	Downy Bromegrass
Bromus unioloides	Rescuegrass

Cenchrus echinatus	Southern Sandbur
Cenchrus incertus	Coastal Sandbur
Cenchrus myosuroides	Big Sandbur
Chasmanthium latifolium	Inland Sea Oats
Chasmanthium laxum	Chasmanthium
Chasmanthium sessiliflorum	Longleaf Uniola
Chloris virgata	Showy Chloris
Coelorachis tesselata	Jointgrass
Cynodon dactylon	Bermudagrass
Dactyloctenium aegyptium	Durban Crowfootgrass
Dichanthelium boscii	Bosc Panicum
Dichanthelium oligosanthes	Scribner Panicum
Dichanthelium scabriusculun	Velvet Panicum
Dichanthelium scoparium	Velvet Panicum
Dichanthelium sphaerocarpon	Roundseed Panicum
Digitaria adscendens	Southern Crabgrass
Digitaria ciliaris	
Digitaria ciliaris	Southern Crabgrass
Digitaria ischaemum	Smooth Crabgrass
Digitaria sanguinalis	Northern Crabgrass
Digitaria villosa	Crabgrass
Distichlis spicata	Seashore Saltgrass
Echinochloa colona	Junglerice
Echinochloa crusgalli	Barnyardgrass
Echinochloa muricata	Wild Millet
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Eragrostis pectinacea	Carolina Lovegrass
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Eragrostis tephrosanthos	Gulf Lovegrass
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Erianthus giganteus	Sugarcane Plumegrass
Festuca elatior	Meadow Fescue
Festuca pratensis	
Hordeum pusillum	Little Barley
Hydrochloa caroliniensis	Watergrass
Leersia hexandra	Southern Cutgrass
Leersia oryzoides	Rice Cutgrass
Leersia virginica	Whitegrass
Leptochloa fascicularis	Bearded Sprangletop
Leptochloa filiformis	Red Sprangletop
Leptochloa panicoides	Amazon Sprangletop
Leptochloa scabra	Rough Sprangletop

Limnodea arkansana	Ozarkgrass
Lolium perenne	Perennial Ryegrass
Manisuris exaltata	----
Muhlenbergia schreberi	Nimblewill Muhly
Oplismenus setarius	Basketgrass
Oplismenus hirtellus setarius	
Oryza sativa	Rice
Panicum anceps	Beaked Panicum
Panicum capillare	Witchgrass
Panicum commutatum	Variable Panicgrass
Dichanthelium commutatum	
Panicum dichotomiflorum	Fall Panicgrass
Panicum dichotomum	Clute Panicgrass
Dichanthelium dichotomum	
Panicum hemitomon	Paille Fine
Panicum laxiflorum	Openflower Panicgrass
Dichanthelium laxiflorum	
Panicum leucothrix	Wooly Panicgrass
Dichanthelium acuminatum implicatum	
Panicum lindheimeri	Panicgrass
Dichanthelium acuminatum lindheimeri	
Panicum repens	Torpedograss
Panicum rigidulum	Redtop Panicum
Panicum virgatum	Switchgrass
Paspalum boscianum	Bull Paspalum
Paspalum cojugatum	Sour Paspalum
Paspalum dilatatum	Dallisgrass
Paspalum distichum	Knotgrass
Paspalum floridanum	Florida Paspalum
Paspalum fluitans	Water Paspalum
Paspalum laeve	Field Paspalum
Paspalum langei	Rustyseed Paspalum
Paspalum lividum	Longtom
Paspalum notatum	Bahiagrass
Paspalum plicatulum	Brownseed Paspalum
Paspalum setaceum	Thin Paspalum
Paspalum urvillei	Vaseygrass
Paspalum vaginatum	Seashore Paspalum
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Poa sylvestris	Woodland Bluegrass
Polypogon monspeliensis	Rabbitfootgrass
Saccharum officinarum	Sugarcane
Sacciolepis striata	American Cupscale
Schizachyrium scoparium	Little Bluestem
Schizachyrium tenerum	Slender Bluestem
Setaria geniculata	Knotroot Bristlegrass
Setaria glauca	Yellow Foxtail
Setaria italica	Foxtail Millet
Setaria magna	Giant Bristlegrass
Setaria pallida-fusca	Foxtail

Sorghastrum avenaceum	Indiangrass
Sorghum bicolor	Sorghum
Sorghum halepense	Johnsongrass
Spartina alterniflora	Smooth Cordgrass
Spartina cynosuroides	Big Cordgrass
Spartina patens	Marshhay Cordgrass
Spartina spartinae	Gulf Cordgrass
Sphenopholis pensylvanica	Swamp Oats
Sporobolus asper	Tall Dropseed
Sporobolus indicus	Smutgrass
Steinchisma hians	Gaping Panicum
Stenotaphrum secundatum	St. Augustine
Tridens flavus	Purpletop
Tridens strictus	Longspike Tridens
Tripsacum dactyloides	Eastern Gamagrass
Trisetum pensylvanicum	Swamp Trisetum
Triticum aestivum	Wheat
Vulpia octoflora	Sixweeks Fescue
Zea mays	Corn
Zizania aquatica	Annual Wildrice
Zizaniopsis miliacea	Giant Cutgrass
CYPERACEAE	
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Carex albolutescens	Greenish-white Sedge
Carex bromoides	Bromeline Sedge
Carex cherokeensis	Cherokee Sedge
Carex comosa	Longhair Sedge
Carex crus-corvi	Crowfoot Sedge
Carex flaccosperma	Thinfruit Sedge
Carex frankii	Frank's Sedge
Carex hyalinolepis	Thinscale Sedge
Carex impressa	Caric-sedge
Carex leavenworthii	Leavenworth Sedge
Carex louisianica	Louisiana Sedge
Carex lupulina	Hop Sedge
Carex oxylepis	Sharpscale Sedge
Carex retroflexa	Reflexed Sedge
Carex squarrosa	Squarrose Sedge
Carex triangularis	Anglestem Sedge
Carex tribuloides	Bristlebract Sedge
Carex vulpinoidea	Fox Sedge
Cladium jamaicensis	Jamaica Sawgrass
Cyperus articulatus	Jointed Flatsedge
Cyperus compressus	Poorland Flatsedge
Cyperus elegans	Sticky Flatsedge
Cyperus erythrorhizos	Redroot Flatsedge
Cyperus esculentus	Chufa
Cyperus ferruginescens	Rusty Flatsedge
Cyperus filicinus	Nerved Flatsedge
Cyperus flavescens	Yellow Flatsedge
Cyperus globulosus	Baldwin Flatsedge
Cyperus haspan	Sheathed Flatsedge
Cyperus iria	Ricefield Flatsedge

Cyperus odoratus	Fragrant Flatsedge
Cyperus ovularis	Globe Flatsedge
Cyperus oxylepis	Sharpscale Flatsedge
Cyperus polystachyos	Manyspiked Flatsedge
Cyperus pseudovegetus	Green Flatsedge
Cyperus rotundus	Nutgrass
Cyperus strigosus	Straw-colred Nutsedge
Cyperus tenuifolius	Thinleaved Flatsedge
Cyperus virens	Green Flatsedge
Dichromena colorata	Starrush Whitetop-Sedge
Dulichium arundinaceum	Three-way Sedge
Eleocharis albida	Saltmarsh Spikesedge
Eleocharis caribaea	Canada Spikesedge
Eleocharis cellulosa	Gulfcoast Spikesedge
Eleocharis equisetoides	Northern Jointed Spikesedge
Eleocharis montana	Mountain Spikesedge
Eleocharis obtusa	Blunt Spikesedge
Eleocharis parvula	Dwarf Spikesedge
Eleocharis quadrangulata	Squarestem Spikesedge
Eleocharis robbinisii	Robbin's Spikesedge
Eleocharis tuberculosa	Large-tubercled Spikesedge
Eleocharis vivipara	Viviparous Spikesedge
Fimbristylis annua	Weak Fimbry
Fimbristylis caroliniana	Hairy Fimbry
Fimbristylis castanea	Corm Fimbry
Fimbristylis miliacea	Globe Fimbry
Fimbristylis tomentosa	Fimbry
Fimbristylis vahlii	Vahl Fimbry
Rhynchospora caduca	Falling Beakrush
Rhynchospora corniculata	Horned Beakrush
Rhynchospora glomerata	Clustered Beakrush
Rhynchospora inexpansa	Nodding Beakrush
Scirpus americanus	American Bulrush
Scirpus atrovirens	Green Bulrush
Scirpus californicus	California Bulrush
Scirpus cyperinus	Woolgrass Bulrush
Scirpus koilolepis	Keeled Bulrush
Scirpus maritimus	Saltmarsh Bulrush
Scirpus olneyi	Olney Bulrush
Scirpus pendulus	Reddish Bulrush
Scirpus robustus	Saltmarsh Bulrush
Scirpus validus	Softstem Bulrush
Websteria submersa	-----
PALMAE	
Sabal minor	Dwarf Palmetto
ARACEAE	
Arisaema dracontium	Green Dragon
Colocasia esculenta	Elephant Ear
Peltandra virginica	Arrow-Arum
Pistia stratiotes	Waterlettuce

LEMNACEAE	
Lemna minor	Lesser Duckweed
Lemna perpusilla	Minute Duckweed
Lemna valdiviana	Pale Duckweed
Spirodela polyrhiza	Duckmeat
Spirodela punctata	Great Duckweed
Wolffia columbiana	Columbia Watermeal
Wolffia papulifera	Watermeal
Wolfiella floridana	Florida Mudmidget
Wolfiella gladiata	Bogmat
Wolfiella lingulata	Tongue Mudmidget
Wolfiella oblonga	Oblong Mudmidget
XYRIDACEAE	
Xyris difformis	Southern Yellow-eyed-grass
BROMELIACEAE	
Tillandsia usneoides	Spanish Moss
COMMELINACEAE	
Callisia repens	----
Commelina communis	Common Dayflower
Commelina diffusa	Widow's-tears
Commelina erecta	Narrowleaf Dayflower
Commelina virginica	Virginia Dayflower
Murdannia nudiflora	Naked-stem Dewflower
Tradescantia hirsutiflora	Hairystem Spiderwort
Tradescantia occidentalis	Prairie Spiderwort
Tradescantia ohiensis	Ohio Spiderwort
Tradescantia virginiana	Virginia Spiderwort
PONTEDERIACEAE	
Eichhornia crassipes	Water Hyacinth
Heteranthera limosa	Longleaf Mudplaintain
Heteranthera reniformis	Roundleaf Mudplaintain
Pontederia cordata	Pickerelweed
Zosterella dubia	Waterstargrass
JUNCACEAE	
Juncus acuminatus	Taperleaf Bog-Rush
Juncus bufonius	Toad Rush
Juncus effusus	Soft Rush
Juncus interior	Inland Rush
Juncus macer	Soft Rush
Juncus marginatus	Shore Rush
Juncus repens	Creeping Rush
Juncus roemerianus	Black Needlerush
Juncus tenuis	Slender Rush
LILIACEAE	
Allium bivalve	False Garlic
Allium canadense	Canada Garlic
Allium reticulatum	Garlic

Asparagus officinalis	Garden Asparagus
Smilax bona-nox	Saw Greenbrier
Smilax glauca	Cat Greenbrier
Smilax hispida	Bristly Greenbier
Smilax laurifolia	Laurel Greenbrier
Smilax pumila	Sarsaparillavine
Smilax rotundifolia	Common Greenbier
Smilax smallii	Small's Greenbier
Smilax walteri	Coral Greenbrier
AMARYLLIDACEAE	
Crinum americanum	Swamp Lily
Crinum bulbispermum	Hardy Crinum
Hymenocallis caroliniana	Carolina Spiderlily
Manfreda virginica	Green Manfreda
Zephyranthes candida	Zephyr Lily
DIOSCOREACEAE	
Dioscorea bulbifera	Wild Yam
Dioscorea villosa	Wild Yam
IRIDACEAE	
Iris fulva	Red Flag
Iris virginica	Southern Blue Flag
Sisyrinchium angustifolium	Stout Blue-eyed Grass
Sisyrinchium atlanticum	Eastern Blue-eyed Grass
Sisyrinchium exile	Yellow Blue-eyed Grass
Sisyrinchium rosulatum	Annual Blue-eyed Grass
CANNACEAE	
Canna flaccida	Golden Canna
Canna glauca	Louisiana Canna
Canna indica	Indian Canna
Thalia dealbata	Powdered Thalia
ORCHIDACEAE	
Habenaria repens	Waterspider Orchid
Spiranthes cernua	Nodding Ladies Tresses
SAURURACEAE	
Saururus cernuus	Lizard's-tail
SALICACEAE	
Populus deltoides	Eastern Cottonwood
Salix interior	Sandbar Willow
Salix exigua interior	
Salix nigra	Black Willow
MYRICACEAE	
Myrica cerifera	Southern Waxmyrtle
JUGLANDACEAE	

Carya aquatica	Bitter Pecan
Carya cordiformis	Bitternut Hickory
Carya glabra	Pignut Hickory
Carya illinoensis	Pecan
Carya myristiciformis	Nutmeg Hickory
Juglans nigra	Black Walnut
BETULACEAE	
Carpinus caroliniana	Ironwood
FAGACEAE	
Castanea pumila	Chinquapin
Quercus falcata leucophylla	Cherrybark Oak
Quercus falcata pagodaefolia	Cherrybark Oak
Quercus laurifolia	Laurel Oak
Quercus michauxii	Cow Oak
Quercus minima	Small Live Oak
Quercus nigra	Water Oak
Quercus nuttallii	Nuttall Oak
Quercus phellos	Willow Oak
Quercus stellata	Post Oak
Quercus undulata	Wavyleaf Oak
Quercus virginiana	Live Oak
ULMACEAE	
Celtis laevigata	Hackberry
Planera aquatica	Water Elm
Ulmus alata	Winged Elm
Ulmus americana	American Elm
Ulmus crassifolia	Cedar Elm
Ulmus rubra	Slippery Elm
MORACEAE	
Ficus carica	Fig
Morus alba	White Mulberry
Morus nigra	Black Mulberry
Morus rubra	Red Mulberry
URTICACEAE	
Boehmeria cylindrica	Boghemp
Laportea canadensis	Woodnettle
Parietaria pensylvanica	Hammerwort
Pilea pumila	Clearweed
Urtica chamaedryoides	Stinging Nettle
LORANTHACEAE	
Phoradendron tomentosum	Mistletoe
POLYGONACEAE	
Antenoron virginianum	Jumpseed
Polygonum virginianum	
Brunnichia ovata	Ladie's Ear-Drops

Brunnichia cirrhosa	
Persicaria hydropiper	Water Smartweed
Polygonum hydropiper	
Persicaria hydropiperoides	Smartweed
Polygonum hydropiperoides	
Persicaria lapathifolium	Smartweed
Polygonum lapathifolium	
Persicaria punctata	Water Smartweed
Polygonum punctatum	
Polygonum aviculare	Dooryard-weed
Polygonum persicaria	Ladie's-thumb
Polygonum sagittatum	Arrow-leaf Tearthumb
Rumex chrysocarpus	Amamastla
Rumex crispus	Curly Dock
Rumex mexicanus	Mexican Dock
Rumex paraguayensis	Dock
Rumex pulcher	Fiddle Dock
Tovara virginiana	Virginia Knotweed
Polygonum virginianum	
CHENOPODIACEAE	
Atriplex arenaria	Seabeach Orach
Atriplex patula	Fathen Saltbush
Atriplex pentandra	Saltbush
Chenopodium album	Lamb's-quarter
Chenopodium ambrosioides	Mexican Tea
Chenopodium b erlandieri	Goosefoot
Chenopodium desiccatum	Thickleaf Goosefoot
Chenopodium glaucum	Goosefoot
Chenopodium murale	Lamb's-Quarter
Chenopodium standleyanum	Pigweed
Salicornia bigelovii	Bigelow Glasswort
Salicornia virginica	Woody Glasswort
Suaeda linearis	Annual Seepweed
AMARANTHACEAE	
Alternanthera philoxeroides	Alligatorweed
Amaranthus albus	White Amaranth
Amaranthus arenicola	Sandhills Amaranth
Amaranthus hybridus	Green Amaranth
Amaranthus spinosus	Spiny Amaranth
Amaranthus viridis	Pigweed
Iresine rhizomatosa	Bloodleaf
NYCTAGINACEAE	
Boerhavia diffusa	Scarlet Spiderling
Boerhavia erecta	Upright Spiderling
Mirabilis jalapa	Four-O'clock
Mirabilis nyctaginea	Four-O'clock
BATACEAE	
Batis maritima	Maritime Saltwort

PHYTOLACCACEAE	
Phytolacca americana	Pokeweed
Rivina humilis	Pigeon-berry
AIZOACEAE	
Mollugo verticillata	Carpetweed
Sesuvium maritimum	Seaside Purslane
Sesuvium portulacastrum	Coast Purslane
Trianthema portulacastrum	Horse Purslane
PORTULACACEAE	
Claytonia virginica	Spring Beauty
Portulaca oleracea	Purslane
CARYOPHYLLACEAE	
Arenaria seryllifolia	Sandwort
Cerastium brachypodum	Shortstalk Chickweed
Cerastium glomeratum	Mouse-ear Chickweed
Cerastium semidecandrum	Mouse-ear Chickweed
Sagina decumbens	Pearlwort
Saponaria officinalis	Bouncing-Bet
Silene antirrhina	Sleepy Catchfly
Spergularia echinosperma	Bristleseed Sand-Spurry
Spergularia marina	Marine Sand-Spurry
Stellaria media	Chickweed
NYMPHAEACEAE	
Brasenia schreberi	Watershield
Cabomba caroliniana	Carolina Fanwort
Nelumbo lutea	American Lotus
Nuphar luteum	Spadderdock
Nuphar luteum macrophyllum	Littlehead Spadderdock
Nymphaea elegans	Blue Waterlily
Nymphaea mexicana	Yellow Waterlily
Nymphaea odorata	White Waterlily
CERATOPHYLLACEAE	
Ceratophyllum demersum	Coontail
Ceratophyllum echinatum	Pimpled Hornwort
Ceratophyllum muricatum	
RANUNCULACEAE	
Clematis crispa	Blue Jasmine
Clematis ternifolia	Clematis
Clematis virginiana	Virgin's-Bower
Delphinium ajacis	Rocket Larkspur
Consolida ambigua	
Ranunculus marginatus	Buttercup
Ranunculus muricatus	Buttercup
Ranunculus parviflorus	Small-flowered Crowfoot
Ranunculus platensis	Spearwort

Ranunculus pusillus	Low Spearwort
Ranunculus recurvatus	Hooked Crowfoot
Ranunculus sardous	Early Buttercup
Ranunculus scleratus	Cursed Buttercup
Ranunculus trilobus	Threelobed Buttercup
BERBERIDACEAE	
Nandina domestica	Nandina
Podophyllum peltatum	Mayapple
MENISPERMACEAE	
Calycocarpum lyoni	Lyon Cupseed
Cocculus carolinus	Carolina Snailseed
MAGNOLIACEAE	
Magnolia grandiflora	Southern Magnolia
Magnolia virginiana	Sweetbay
Schisandra coccinea	Bay Starvine
ANNONACEAE	
Asimina triloba	Pawpaw
LAURACEAE	
Cinnamomum camphora	Camphortree
Lindera benzoin	Spicebush
Persea borbonia	Red Bay
Sassafras albidum	Sassafras
PAPAVERACEAE	
Argemone albiflora	White Prickly Poppy
Corydalis micrantha	Scrambled Eggs
CRUCIFERAE	
Brassica napus	Rape
Brassica nigra	Black Mustard
Brassica oleracea	Common Kale
Cardamine hirsuta	Hairy Bittercress
Cardamine parviflora	Smallflowered Cress
Cardamine pensylvanica	Bittercress
Coronopus didymus	Swinecress
Lepidium densiflorum	Denseflower Peppergrass
Lepidium virginicum	Virginia Pepperweed
Palustris cernua	Marsh Yellowcress
Rorippa sessiliflora	Yellowcress
Sibara virginica	Rockcress
SAXIFRAGACEAE	
Itea virginica	Virginia Sweetspire
Penthorum sedoides	Ditch Stonecrop
HAMAMELIDACEAE	

Liquidambar styraciflua	Sweetgum
PLATANACEAE	
Platanus occidentalis	Sycamore
ROSACEAE	
Crataegus intermedia	Hawthorn
Crataegus marshallii	Parsley Haw
Crataegus viridis	Green Hawthorn
Duchesnea indica	Indian Strawberry
Geum canadense	White Avens
Prunus angustifolia	Chickasaw Plum
Prunus caroliniana	Laurel Cherry
Prunus mexicana	Bigtree Plum
Prunus persica	Peach
Prunus serotina	Black Cherry
Prunus umbellata	Flatwood Plum
Rosa laevigata	Cherokee Rose
Rosa multiflora	Multiflora Rose
Rubus flagellaris	Northern Dewberry
Rubus louisianus	Louisiana Blackberry
Rubus trivialis	Southern Dewberry
LEGUMINOSAE	
Acacia farnesiana	Huisache
Acacia smallii	Sweet Acacia
Aeschynomene indica	Jointvetch
Albizzia julibrissin	Mimosa
Amorpha fruticosa	Leadplant
Amorpha laevigata	Amorpha
Amphicarpa bracteata	Hog Peanut
Apios americana	American Potato Bean
Baptistia bracteata glabrescens	Cream Wild Indigo
Baptistia bracteata laevicaulis	Plains Wild Indigo
Baptistia lactea	White Wild Indigo
Baptistia sphaerocarpa	Round Wild Indigo
Cassia fasciculata	Partridge Pea
Cassia obtusifolia	Sicklepod
Cassia occidentalis	Coffee Senna
Centrosema virginianum	Butterfly Pea
Cercis canadensis	Redbud
Clitoria mariana	Pigeonwings
Crotalaria spectabilis	Showy Crotalaria
Dalea candida	Prairie Clover
Desmanthus illinoensis	Illinois Bunchflower
Desmodium ciliare	Littleleaf Tick-Clover
Desmodium illinoensis	Illinois Tick-Clover
Desmodium nudiflorum	Barestem Tick-Clover
Desmodium paniculatum	Panicled Tick-Clover
Erythrina herbacea	Coral-Bean
Galactia volubilis	Downy Milk-Pea
Gleditsia aquatica	Waterlocust
Gleditsia triacanthos	Honey Locust

Glycine max	Soybean
Lathyrus hirsutus	Singletary Pea
Lespedeza cuneata	Chinese Bush Clover
Lespedeza striata	Japanese Clover
Medicago arabica	Spotted Burclover
Medicago lupulina	Black Medic
Medicago polymorpha	Burclover
Melilotus alba	White Sweet Clover
Melilotus indica	Sour Clover
Melilotus officinalis	Yellow Sweet Clover
Mimosa strigillosa	Powder Puff
Neptunia lutea	Yellow-Puff
Neptunia pubescens	Tropical Neptunia
Parkinsonnia aculeata	Jerusalem Thorn
Pueraria lobata	Kudzu
Rhynchosia minima	Snoutbean
Robinia pseudoacacia	Black Locust
Schrankia hystericina	Sensative Brier
Sesbania drummondii	Rattlebush
Sesbania macrocarpa	Coffeebean
Sesbania exaltata	
Sesbania vesicaria	Bagpod Coffeebean
Strophostyles helvola	Trailing Wild Bean
Strophostyles umbellata	Pink Wild Bean
Tephrosia onobrychoides	Hoary Pea
Trifolium campestre	Big Hop-clover
Trifolium dubium	Least Hop-clover
Trifolium reflexum	Buffalo Clover
Trifolium repens	White Clover
Trifolium resupinatum	Persian Clover
Vicia ludoviciana	Deerpea
Vigna lutea	Deerpea
Wisteria floribunda	Wisteria
Wisteria macrostachya	Kentucky Wisteria
Wisteria sinense	Chinese Wisteria
GERANIACEAE	
Geranium carolinianum	Cranesbill
Geranium sphaerospermum	
Geranium dissectum	Dissected Cranesbill
OXALIDACEAE	
Oxalis corniculata	Creeping Ladies'-Sorrel
Oxalis florida	Wood-Sorrel
Oxalis rubra	Shamrock Sorrel
Oxalis stricta	Yellow Wood-Sorrel
Oxalis violacea	Violet Wood-Sorrel
155 ZYGOPHYLLACEAE	
Tribulus terrestris	Punctureweed
157 RUTACEAE	
Citrus reticulata	Satsuma Orange
Citrus trifoliata	Trifoliate Orange

Poncirus trifoliata	
Ptelea trifoliata	Common Hoptree
Zanthoxylum clava-hervulis	Prickly Ash
MELIACEAE	
Melia azedarach	Chinaberry Tree
POLYGALACEAE	
Polygala incarnata	Pink Milkwort
Polygala leptocaulis	Swamp Milkwort
Polygala verticillata	Whorled Milkwort
EUPHORBIACEAE	
Acalypha ostryifolia	Three-seeded Mercury
Acalypha rhomboidea	Three-seeded Mercury
Acalypha virginica	Three-seeded Mercury
Caperonia palustris	Caperonia
Croton capitatus	Wooly Croton
Croton glandulosa	Goat Croton
Croton monanthagynus	Croton
Euphorbia corollata	Flowering Spurge
Euphorbia dentata	Spurge
Euphorbia heterophylla	Summer Poinsetta
Euphorbia hirta	Spurge
Euphorbia maculata	Spotted Spurge
Euphorbia nutans	Eyebane
Euphorbia prostrata	Spurge
Euphorbia spathulata	Spurge
Phyllanthus caroliniensis	Leaf-flower
Phyllanthus urinaria	Leaf-flower
Sapium sebiferum	Chinese Tallowtree
CALLITRICHACEAE	
Callitriche heterophylla	Larger Water-Starwort
Callitriche terrestris	Terrestrial Water-Starwort
Callitriche deflexa austinii	
ANACARDIACEAE	
Rhus copallinum	Winged Sumac
Rhus glabra	Smooth Sumac
Toxicodendron radicans	Poison Ivy
AQUIFOLIACEAE	
Ilex cassine	Dahoon
Ilex decidua	Deciduous Holly
Ilex opaca	American Holly
Ilex vomitoria	Yaupon Holly
ACERACEAE	
Acer negundo	Box Elder
Acer rubrum drummondii	Drummond's Red Maple
Acer rubrum	Red Maple

HIPPOCASTANACEAE	
Aesculus pavia	Red Buckeye
SAPINDACEAE	
Cardiospermum halicacabum	Balloonvine
BALSAMINACEAE	
Impatiens capensis	Touch-Me-Not
RHAMNACEAE	
Berchemia scandens	Rattanvine
Rhamnus caroliniana	Carolina Buckthorn
VITACEAE	
Ampelopsis arborea	Peppervine
Ampelopsis cordata	Heartleaf Peppervine
Cissus incisa	Marinevine
Parthenocissus quinquefolia	Virginia Creeper
Vitis aestivalis	Summer Grape
Vitis cinerea	Gray Grape
Vitis labrusca	Fox Grape
Vitis mustangensis	Mustang Grape
Vitis palmata	Red Grape
Vitis rotundifolia	Muscadine
TILIACEAE	
Tilia caroliniana	Carolina Basswood
MALVACEAE	
Abutilon hulseamum	Butterprint
Abutilon theophrasti	Velvetleaf Butterprint
Hibiscus esculentus	Okra
Abelmoschus esculentus	
Hibiscus moscheutos lasiocarpus	Wooly Rose-Mallow
Hibiscus militaris	Halberd-leaved Rose-Mallow
Hibiscus laevis	
Hibiscus syriacus	Rose-of-Sharon
Kosteletzkya virginica	Virginia Saltmarsh-Mallow
Malva parviflora	---
Malvastrum coromandelianum	False Mallow
Malvaviscus arboreus	Wax Mallow
Modiola caroliniana	Carolina Mallow
Sida rhombifolia	Teaweed
Sida spinosa	Prickly Teaweed
STERCULIACEAE	
Melochia corchorifolia	Chocolate-Weed
GUTTIFERAE	
Ascyrum hypericoides	St. Andrew's Cross
Ascyrum stans	St. Peter's Wort

Hypericum densiflorum	Shrubby St. John's Wort
Hypericum drummondii	Nits-and-Lice
Hypericum gymnanthum	Clasping-leaved St.John's Wort
Hypericum mutilum	Dwarf St. John's Wort
Hypericum walteri	Marsh St. John's Wort
Triadenum walteri	
TAMARICACEAE	
Tamarix gallica	Salt Cedar
CISTACEAE	
Lechea mucronata	Pinweed
Lechea villosa	
VIOLACEAE	
Viola langloisii	Violet
Viola rafinesquii	Field Pansy
Viola bicolor	
PASSIFLORACEAE	
Passiflora incarnata	Maypop
Passiflora edulis	
Passiflora lutea	Passionflower
CACTACEAE	
Opuntia stricta	Prickly Pear
LYTHRACEAE	
Ammannia coccinea	Toothcup
Cuphea carthagenensis	Tarweed Cuphea
Cuphea glutinosa	Waxweed
Cuphea viscosissima	Blue Waxweed
Decodon verticillatus	Water-Willow
Lagerstroemia indica	Crepe-myrtle
Lythrum alatum	Winged Loosestrife
Lythrum lineare	Linear-leaved Loosestrife
Rotala ramosior	Toothcup
MELASTOMATACEAE	
Rhexia mariana	Maryland Meadow-Beauty
ONAGRACEAE	
Gaura lindheimeri	White Gaura
Gaura longiflora	Bigflower Gaura
Gaura parviflora	Velvetleaf Gaura
Ludwigia alternifolia	Seedbox
Ludwigia decurrens	Primrose-Willow
Ludwigia glandulosa	Cylindric-fruited Ludwigia
Ludwigia leptocarpa	Water-Primrose
Ludwigia linearis	Narrowleaf Water-Primrose
Ludwigia palustris	Marsh Purslane
Ludwigia peploides	Water-Primrose

Ludwigia repens	Red Ludwigia
Ludwigia uruguayensis	Primrose
Oenothera biennis	Common Evening Primrose
Oenothera laciniata	Cut-leaved Evening Primrose
Oenothera speciosa	Showy Primrose
HALORRHAGIDACEAE	
Myriophyllum brasiliense	Parrotfeather
Myriophyllum heterophyllum	Variable Watermilfoil
Myriophyllum spicatum	Eurasian Watermilfoil
Proserpinaca palustris	Marsh Mermaidweed
ARALIACEAE	
Aralia spinosa	Devil's Walkingstick
UMBELLIFERAE	
Apium leptophyllum	Marsh Parsley
Ciclospermum leptophyllum	
Centella asiatica	Spadeleaf
Chaerophyllum tainturieri	Wild Chervil
Cicuta mexicana	Mexican Water Hemlock
Daucus carota	Queen Anne's Lace
Eryngium prostratum	Button Eryngo
Eryngium yuccifolium	Rattlesnakemaster
Hydrocotyle bonariensis	Large-leafPennywort
Hydrocotyle ranunculoides	Floating Pennywort
Hydrocotyle umbellata	Umbrella Pennywort
Hydrocotyle verticillata	Water Pennywort
Lilaeopsis attenuata	Carolina Lilaeopsis
Limnosciadium pumilum	Dog-Sunshade
Ptilimnium costatum	Ribbed Mock Bishopweed
Sanicula canadensis	Black Snakeroot
Sium suave	Waterparsnip
Spermolepis echinata	Prickly Scaleseed
Trepocarpus aethusae	Trepocarpus
CORNACEAE	
Cornus drummondii	Roughleaf Dogwood
Cornus florida	Flowering Dogwood
Cornus foemina	Swamp Dogwood
Nyssa aquatica	Tupelo Gum
Nyssa sylvatica	Black Gum
PRIMULACEAE	
Centunculus minimus	Chaffweed
Hottonia inflata	Featherfoil
Samolus parviflorus	Water-Pimpernel
SAPOTACEAE	
Bumelia lanuginosa	False Buckthorn
EBENACEAE	

Diospyros virginiana	Persimmon
STYRACACEAE	
Styrax americana	Small Snowbell
OLEACEAE	
Forestiera acuminata	Swamp Privit
Fraxinus caroliniana	Carolina Ash
Fraxinus pennsylvanica	Green Ash
Fraxinus tomentosa	Pumpkin Ash
Fraxinus profunda	
Ligustrum japonicum	Japanese Privit
Ligustrum ovalifolium	Bigleaf Privit
Ligustrum sinense	Chinese Privit
Ligustrum vulgare	Privit
LOGANIACEAE	
Cynoctonum mitreola	Miterwort
Cynoctonum sessilifolium	Wand Hornpod
Gelsemium sempervirens	Yellow Jasmine
Polypremum procumbens	Juniperleaf
GENTIANACEAE	
Eustoma exaltatum	Catch-fly Gentian
Sabatia calycina	Coast Rose-Gentain
Sabatia campestris	Prairie Rose-Gentain
Sabatia gentianoides	Gentain-like Sabatia
Sabatia stellaris	Little Sea-Pink
APOCYNACEAE	
Amsonia glaberrima	Blue Star
Amsonia rigida	Blue Star
Amsonia tabernaemontana	Willow Amsonia
Apocynum cannabinum	Indian Hemp
Trachelospermum difforme	Climbing Dogbane
ASCLEPIADACEAE	
Asclepias perennis	Aquatic Milkweed
Asclepias rubra	Red Milkweed
Asclepias viridis	Antelope-Horn
Matelea decipiens	Climbing Milkweed
Matelea gonocarpa	Trailing Spring Rod
CONVOVULACEAE	
Cuscuta gronovii	Gronovius Dodder
Cuscuta indecora	Showy Dodder
Dichondra carolinensis	Pony's-foot
Ipomoea coccinea	Scarlet Morning-glory
Ipomoea lacunosa	Small White Morning-glory
Ipomoea quamoclit	Cypressvine Morning-glory
Ipomoea sagittata	Marsh Morning-glory
Ipomoea trichocarpa	Coastal Morning-glory

Ipomoea wrightii	Morning-glory
Jacquemontia tamnifolia	Tievine
POLEMONIACEAE	
Phlox pilosa	Downy Phlox
HYDROPHYLLACEAE	
Hydrolea ovata	Hydrolea
Hydrolea uniflora	Waterleaf
Nemophila triloba	Baby Blue-eyes
Nemophila aphylla	
Phacelia strictiflora	---
BORAGINACEAE	
Heliotropium amplexicaule	Heliotrope
Heliotropium curvassicum	Seaside Heliotrope
Heliotropium europaeum	European Heliotrope
Heliotropium indicum	Indian Turnsole
Heliotropium procumbens	Fourspike Heliotrope
Lithospermum carolinense	Carolina Gromwell
Myosotis macrosperma	White Forget-Me-Not
Myosotis verna	Spring Forget-Me-Not
Onosmodium molle hispidissimum	Hairy False Gromwell
VERBENACEAE	
Callicarpa americana	French Mulberry
Clerodendron indicum	---
Lantana camara	West Indian Lantana
Lantana horrida	Texas Lantana
Lantana montevidensis	Lantana
Phyla lanceolata	Northern Frogfruit
Phyla nodiflora	Common Frogfruit
Verbena bonariensis	South American Vervain
Verbena brasiliensis	Brazilian Vervain
Verbena canadensis	Rose Vervain
Verbena halei	Texas Vervain
Verbena rigida	Tuber Vervain
Verbena scabra	Sandpaper Vervain
Verbena urticifolia	White Vervain
Verbena xutha	Gulf Vervain
Verbena x. hybrida	Vervain
Vitex agnus-castus	Chaste-Tree
LABIATAE	
Ajuga reptans	Bugleweed
Clinopodium gracile	Clinopodium
Hedeoma hispidum	Rough Pennyroyal
Hyptis alata	Cluster Bushmint
Lamium amplexicaule	Henbit
Leonotis cardiaca	Lion's-Ears
Leonotis sibiricus	Lion's-Ears
Lycopus americanus	American Bugleweed

Lycopus rubellus	Stalked Water-Hoarhound
Lycopus virginicus	Virginia Bugleweed
Mentha rotundifolia	Applemint
Monarda punctata	Spotted Beebalm
Perilla frutescens	Beefsteakplant
Prunella vulgaris	Heal-All
Pycnanthemum albescens	White-leaved Mountain-Mint
Pycnanthemum tenuifolium	Slender Mountain-Mint
Salvia coccinea	Scarlet Sage
Salvia lyrata	Lyreleaf Sage
Satureja brownei	---
Scutellaria drummondii	Skullcap
Scutellaria integrifolia	Hyssop Skullcap
Scutellaria ovata	Heart-leaved Skullcap
Scutellaria parvula	Skullcap
Stachys agraria	Shade Betany
Stachys drummondii	Drummond Betany
Stachys floridana	Florida Betany
Stachys tenuifolia	Smooth Hedgenettle
Teucrium canadense	American Geremander
Teucrium cubense	Geremander

SOLANACEAE

Lycium carolinianum	Carolina Wolfberry
Lycopersicon esculentum	Tomato
Nicotiana longiflora	---
Physalis anqulata	Cutleaf Groundcherry
Physalis angustifolia	Groundcherry
Physalis cordata	Groundcherry
Physalis virginiana	Virginia Groundcherry
Solanum americanum	Nightshade
Solanum carolinense	Horsenettle
Solanum elaeagnifolium	Silverleaf Nightshade
Solanum nigrum	Black Nightshade
Solanum pseudocapsicum	Jerusalem-Cherry
Solanum ptycanthum	Jerusalem-Cherry

SCROPHULARIACEAE

Bacopa caroliniana	Blue Water-Hyssop
Bacopa monnieri	Coast Bacopa
Bacopa rotundifolia	Disc Water-Hyssop
Buchnera americana	American Bluehearts
Gratiola neglecta	Hedge Hyssop
Gratiola virginiana	Hedge Hyssop
Limnophila indica	Limnophila
Linaria canadensis	Oldfield Toadflax
Lindernia anagallidea	False Pimpernel
Mazus japonicus	Japanese Mazus
Mazus pumilus	Mazus
Mecardonia acuminata	Purple Mecardonia
Mecardonia dianthera	Mecardonia
Micranthemum umbrosum	Sahde Mudflower
Mimulus alatus	Sharp-winged Monkeyflower

Penstemon tenuis	Beard-Tongue
Scrophularia marilandica	---
Verbascum thapsus	Common Mullein
Veronica agrestis	Speedwell
Veronica arvensis	Corn Speedwell
Veronica peregrina	Purslane Speedwell
Veronica persica	Persian Speedwell
BIGNONIACEAE	
Bignonia capreolata	Crossvine
Campsis radicans	Trumpetcreeper
Catalpa bignonioides	Southern Catalpa
LENTIBULARIACEAE	
Utricularia cornuta	Horned Bladderwort
Utricularia gibba	Humped Bladderwort
Utricularia inflata	Floating Bladderwort
Utricularia radiata	Little Floating Bladderwort
ACANTHACEAE	
Hygrophila lacustris	Lake Acanthus
Justicia lanceolata	Lanceleaf Water-Willow
Justicia ovata lanceolata	
Ruellia caroliniensis	Wild Petunia
Ruellia humilis	Prairie Petunia
Ruellia nudiflora	Violet Wild-Petunia
PHRYMACEAE	
Phryma leptostachya	Lopseed
PLANTAGINACEAE	
Plantago lanceolata	English Plantain
Plantago major	Common Plaintain
Plantago rhodosperma	Red-Seed Plaintain
Plantago rugelii	Rugel's Plaintain
Plantago virginica	Pale-seeded Plaintain
RUBIACEAE	
Cephalanthus occidentalis	Buttonbush
Diodia teres	Poor Joe
Diodia virginiana	Buttonweed
Galium circaezans	Wild Licorice
Galium pilosum	Hairy Bedstraw
Hedyotis australis	Bluets
Houstonia pusilla	
Hedyotis crassifolia	Small Bluets
Houstonia minima	
Oldenlandia fasciculata	---
Sherardia arvensis	Field Madder
Spermococe glabra	Smooth Buttonweed
CAPRIFOLIACEAE	

Lonicera japonica	Japanese Honeysuckle
Sambucus canadensis	Elderberry
Viburnum dentatum	Southern Arrowwood
VALERIANACEAE	
Valerianella radiata	Corn Salad
CUCURBITACEAE	
Cucumis melo	Dudaim Melon
Cayaponia quinqueloba	Manso
Melothria pendula	Melonettee
Sicyos angulatus	One-seeded Bur-Cucumber
CAMPANULACEAE	
Lobelia cardinalis	Cardinalflower
Lobelia puberula	Downy Lobelia
Lobelia spicata	Palespike Lobelia
Sphenoclea zeylanica	Chickenspike
Triodanis biflora	Venus' Looking-glass
Triodanis perfoliata	Venus' Looking-glass
COMPOSITAE	
Achillea millefolium	Common Yarrow
Acmella oppositifolia	Creeping Spotflower
Ageratina rothrockii	White Snakeroot
Ambrosia artemisiifolia	Common Ragweed
Ambrosia psilostachya	Western Ragweed
Ambrosia trifida	Giant Ragweed
Amphiachyris dracunculoides	Annual Broomweed
Anthemis cotula	Dogfennel
Arnoglossum plantigineum	Tuberous Indian Plantain
Aster cordifolius	Heartleaf Aster
Aster drummondii	Drummond Aster
Aster dumosus	Bushy Aster
Aster exilis	Aster
Aster subulatus ligulatus	
Aster fragilis	Fragile Aster
Aster lateriflorus	White Woodland Aster
Aster nebraskensis	Nebraska Aster
Aster ontarionis	Ontario Aster
Aster pilosus	Frost Aster
Aster praealtus	Aster
Aster puniceus	Purple-stemmed Aster
Aster spinosus	Devilweed Aster
Aster subulatus	Slim Aster
Aster tenuifolius	Saline Aster
Baccharis halimifolia	Salt Bush
Bidens pilosa	Beggarticks
Boltonia diffusa	Boltonia
Borrichia frutescens	Bushy Sea-oxeye
Calyptocarpus vialis	Prostrate Lawnflower
Chromolaena ivifolia	Boneset
Cirsium horridulum	Bull Thistle

Conoclinium coelestinum	Mist Flower
Conyza bonariensis	Horseweed
Conyza canadensis	Horseweed
Coreopsis tinctoria	Garden Tickseed
Cosmos bipinnatus	Spanish Needles
Dracopis amplexicaulis	Clasping Coneflower
Echinacea purpurea	Purple Coneflower
Eclipta alba	Yerba del Tago
Elephantopus carolinianus	Leafy Elephant's Foot
Elephantopus tomentosus	Devil's Grandmother
Erechtites hieraciifolia	Fireweed
Erigeron philadelphicus	Philadelphia Fleabane
Erigeron strigosus	Whitetop Fleabane
Erigeron tenuis	Blue Fleabane
Eupatorium capillifolium	Cypressweed
Eupatorium compositifolium	Yankeeweed
Eupatorium pinnatifidum	Boneset
Eupatorium rugosum	White Snakeroot
Ageratina altissima	
Eupatorium serotinum	Late-Flowering Boneset
Euthamia leptocephala	Flat-Topped Goldenrod
Facelis retusa	Facelis
Fleischmannia incarnata	Pink Boneset
Gaillardia aestivalis	Winkler Gaillardia
Gaillardia pulchella	Indian Blanket
Gamochaeta calviceps	Cudweed
Gamochaeta pennsylvanicum	Wandering Cudweed
Gamochaeta purpurea	Purple Cudweed
Gnaphalium obtusifolium	Rabbit Tobacco
Helenium amarum	Bitterweed
Helenium flexuosum	Purple-headed Sneezeweed
Helianthus angustifolius	Narrowleaf Sunflower
Helianthus mollis	Ashy Sunflower
Helianthus simulans	Sunflower
Heterotheca subaxillaris	Golden Aster
Hypochaeris microcephala	Cat's-Ears
Iva annua	Sumpweed
Iva frutescens	Big-leaf Sumpweed
Iva imbricata	Dune Sumpweed
Krigia dandelion	Potato Dandelion
Lactuca canadensis	Lettuce
Lactuca floridana	Woodland Lettuce
Lactuca hirsuta	Hairy Lettuce
Liatris aspera	Rough Gayfeather
Liatris pycnostachya	Kansas Gayfeather
Machaeranthera phyllocephola	Camphor Daisy
Mikania cordifolia	Climbing Hempweed
Mikania scandens	Climbing Hempweed
Parthenium hysterophorus	Santa Maria Feverfew
Pluchea camphorata	Camphorweed
Pluchea foetida	Stinking Fleabane
Pluchea odorata	Saltmarsh Fleabane
Pluchea rosea	Stinkweed
Pyrrhopappus carolinianus	False Dandelion

Rudbeckia grandifolia	Rough Coneflower
Rudbeckia hirta pulcherrima	Late Brown-eyed Susan
Rudbeckia nitida	Texas Brown-eyed Susan
Rudbeckia triloba	Yellow Daisy
Senecio glabellus	Butterweed
Senecio imparipinnatus	Threadleaf Groundsel
Silphium gracile	Slender Rosinweed
Silphium integrifolium	Rosinweed
Silphium laciniatum	Compassplant
Silphium radula	Rosinweed
Smallanthus uvedalia	Bear's-Foot
Solidago altissima	Tall Goldenrod
Solidago canadensis	Goldenrod
Solidago sempervirens	Seaside Goldenrod
Soliva mutisii	Button Burweed
Soliva pterosperma	Stickerweed
Sonchus asper	Sow Thistle
Sonchus oleraceus	Sow Thistle
Spilanthes americana	American Spotflower
Taraxacum officianle	Dandelion
Verbesina alternifolia	Wingstem Crownbeard
Verbesina helianthoides	Gravelweed Crownbeard
Verbesina virginica	Frostweed
Vernonia baldwinii	Baldwin Ironweed
Vernonia gigantea	Tall Ironweed
Vernonia missurica	Missouri Ironweed
Vernonia texana	Texas Ironweed
Xanthium strumarium	Cocklebur
Youngia japonica	Oriental Hawkbeard

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APPENDIX D

LIST OF FISH AND WILDLIFE SPECIES IN THE TECHE-VERMILION RIVER BASIN

Fish and wildlife species that could occur in the Teche-Vermilion River Basin are provided in taxonomic order. These listings were derived from information obtained from the U.S. Fish and Wildlife Service, Louisiana Department of Wildlife and Fisheries - Natural Heritage Program, and the National Audubon Society's Paul J. Rainey Refuge.

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MARINE INVERTEBRATES WITHIN TECHE-VERMILION RIVER BASIN

Common Name	Scientific Name
Portuguese 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 TECHE-VERMILION 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*
Golden shiner	*Notemigonus crysoleucas*
Bigmouth buffalo	*Ictiobus cyprinellus*
Blue catfish	*Ictalurus furcatus*
Black bullhead	*Ictalurus melas*

Fish (continued)

Common Name	Scientific Name
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*
Atlantic bumper	*Chloroscombrus chrysurus*
Bluntnose jack	*Hemicaranx amblyrhynchus*
Leatherjack	*Oligoplites saurus*
Atlantic moonfish	*Selene setapinnis*
Lookdown	*Selene vomer*

Fish (continued)

Common Name	Scientific Name
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*
Gulf butterfish	*Peprilus burti*
Bighead searobin	*Prionotus tribulus*
Ocellated flounder	*Ancylopsetta quadrocellata*
Bay whiff	*Citharichthys spilopterus*
Fringe flounder	*Etropus crossotus*
Gulf flounder	*Paralichthys albigutta*

Fish (continued)

Common Name	Scientific Name
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 WITHIN TECHE-VERMILION RIVER BASIN

Common Name	Scientific Name
Western lesser siren	*Siren intermedia*
Central newt	*Notophthalmus viridescens*
Gulf coast toad	*Bufo valliceps*
Northern cricket frog	*Acris crepitans*
Green treefrog	*Hyla cinerea*
Spring peeper	*Hyla crucifer*
Squirrel treefrog	*Hyla squirella*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*
Bullfrog	*Rana catesbeiana*
Green frog	*Rana clamitans*
Southern leopard frog	*Rana sphenocephala*

REPTILES WITHIN TECHE-VERMILION RIVER BASIN

Common Name	Scientific Name
American alligator	*Alligator mississippiensis*
Green anole	*Anolis carolinensis*
Six-lined racerunner	*Cnemidophorus sexlineatus*
Five-lined skink	*Eumeces fasciatus*
Broad-headed skink	*Eumeces laticeps*
Ground skink	*Scincella lateralis*
Common snapping turtle	*Chelydra serpentina*
Common slider	*Trachemys scripta*
Stinkpot	*Sternotherus odoratus*
Common mud turtle	*Kinosternon subrubrum*
Salt marsh snake	*Nerodia clarkii*
Green water snake	*Nerodia cyclopion*
Plainbelly water snake	*Nerodia erythrogaster*
Southern water snake	*Nerodia fasciata*
Diamondback water snake	*Nerodia rhombifera*
Brown snake	*Storeria dekayi*
Rough earth snake	*Virginia striatula*
Rough green snake	*Opheodrys aestivus*
Western ribbon snake	*Thamnophis proximus*
Eastern garter snake	*Thamnophis sirtalis*
Glossy crayfish snake	*Regina rigida*
Graham's crayfish snake	*Regina grahamii*

Reptiles (continued)

Common Name	Scientific Name
Eastern hognose snake	*Heterdon platyrhinos*
Mud snake	*Farancia abacura*
Blue racer	*Coluber constrictor*
Corn snake	*Elaphe guttata*
Rat snake	*Elaphe obsoleta*
Common kingsnake	*Lampropeltis getulus*
Copperhead	*Agkistrodon contortrix*
Cottonmouth	*Agkistrodon piscivorus*
Timber rattlesnake	*Crotalus horridus*
Pygmy rattlesnake	*Sistrurus miliarius*

BIRDS WITHIN TECHE-VERMILION RIVER BASIN[3,4]

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*
Neotropic Cormorant	*Phalacrocorax brasilianus*
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 bicolor*
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*

[3] includes Louisiana Natural Heritage Program's Vertebrate Characterization Abstract database

[4] includes data from Atchafalaya River Basin and New Iberia Christmas Bird Counts

Birds (continued)

Common Name	Scientific Name
Greater White-fronted Goose	*Anser albifrons*
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 valisineria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
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*
Mississippi Kite	*Ictinia mississippiensis*
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*
Ferruginous Hawk	*Buteo regalis*
Rough-legged Hawk	*Buteo lagopus*
Golden Eagle	*Aquila chrysaetos*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Wild Turkey	*Meleagris gallopavo*
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*
Sandhill Crane	*Grus canadensis*
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*
American Oystercatcher	*Haematopus palliatus*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmated*
Spotted Sandpiper	*Actitis macularia*
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*
Herring Gull	*Larus argentatus*

Birds (continued)

Common Name	Scientific Name
Lesser Black-backed Gull	*Larus fuscus*
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 Tern	*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*
Common Nighthawk	*Chordeiles minor*
Chuck-will's-willow	*Caprimulgus carolinensis*
Whip-poor-will	*Caprimulgus vociferus*
Chimney Swift	*Chaetura pelagica*
Ruby-throated Hummingbird	*Archilochus colubris*
Black-chinned Hummingbird	*Archilochus alexandri*
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*
Pileated Woodpecker	*Dryocopus pileatus*
Olive-sided Flycatcher	*Contopus borealis*
Eastern Wood-Pewee	*Contopus virens*
Acadian Flycatcher	*Empidonax virescens*
Least Flycatcher	*Empidonax minimus*
Eastern Phoebe	*Sayornis phoebe*
Vermilion Flycatcher	*Pyrocephalus rubinus*
Ash-throated Flycatcher	*Myiarchus cinerascens*

Birds (continued)

Common Name	Scientific Name
Great Crested Flycatcher	*Myiarchus crinitus*
Eastern Kingbird	*Tyrannus tyrannus*
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 fuscescen*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
Wood Thrush	*Hylocichla mustelina*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
Water Pipit	*Anthus spinoletta*
Sprague's Pipit	*Anthus spragueii*
Cedar Waxwing	*Bombycilla cedrorum*
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*

Birds (continued)

Common Name	Scientific Name
Nashville Warbler	*Vermivora ruficapilla*
Virginia's Warbler	*Vermivora virginiae*
Northern Parula	*Parula americana*
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 nigrescens*
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	*Protonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Swainson's Warbler	*Limnothlypis swainsonii*
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*
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 ludovicianus*
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	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow	*Ammodramus savannarum*
Henslow's Sparrow	*Ammodramus henslowii*
LeConte's Sparrow	*Ammodramus leconteii*
Saltmarsh Sharp-tailed Sparrow	*Ammodramus caudacutus*
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*
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*
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*
Baltimore Oriole	*Icterus galbula*
Bullock's Oriole	*Icterus bullocki*
Purple Finch	*Carpodacus purpureus*
House Finch	*Carpodacus mexicanus*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*
House Sparrow	*Passer domesticus*

MAMMALS WITHIN TECHE-VERMILION RIVER BASIN

Common Name	Scientific Name
Virginia opossum	*Didelphis virginiana*
Short-tailed shrew	*Blarina brevicauda*
Least shrew	*Cryptotis parva*
Eastern mole	*Scalopus aquaticus*
Red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Northern yellow bat	*Lasiurus intermedius*
Seminole bat	*Lasiurus seminolus*
Southeastern myotis	*Myotis austroriparius*
Evening bat	*Nycticeius humeralis*
Rafinesque's big-eared bat	*Plecotus rafinesquii*
Nine-banded armadillo	*Dasypus novemcinctus*

Mammals (continued)

Common Name	Scientific Name
Swamp rabbit	*Sylvilagus aquaticus*
Eastern cottontail	*Sylvilagus floridanus*
Gray squirrel	*Sciurus carolinensis*
Fox squirrel	*Sciurus niger*
Marsh rice rat	*Oryzomys palustris*
Fulvous harvest mouse	*Reithrodontomys fulvescens*
White-footed mouse	*Peromyscus leucopus*
Cotton mouse	*Peromyscus gossypinus*
Hispid cotton rat	*Sigmodon hispidus*
Eastern wood rat	*Neotoma floridana*
Muskrat	*Ondatra zibethicus*
House mouse	*Mus musculus*
Black rat	*Rattus rattus*
Norway rat	*Rattus norvegicus*
Nutria	*Myocaster coypus*
Coyote	*Canis latrans*
Gray fox	*Urocyon cinereoargenteus*
Red fox	*Vulpes vulpes*
American black bear	*Ursus americanus*
Northern Raccoon	*Procyon lotor*
Long-tailed weasel	*Mustela frenata*
Mink	*Mustela vison*
Striped skunk	*Mephitis mephitis*
Nearctic River otter	*Lutra canadensis*
Bobcat	*Lynx felis*

APPENDIX E

NEW IBERIA, LOUISIANA CHRISTMAS BIRD COUNT

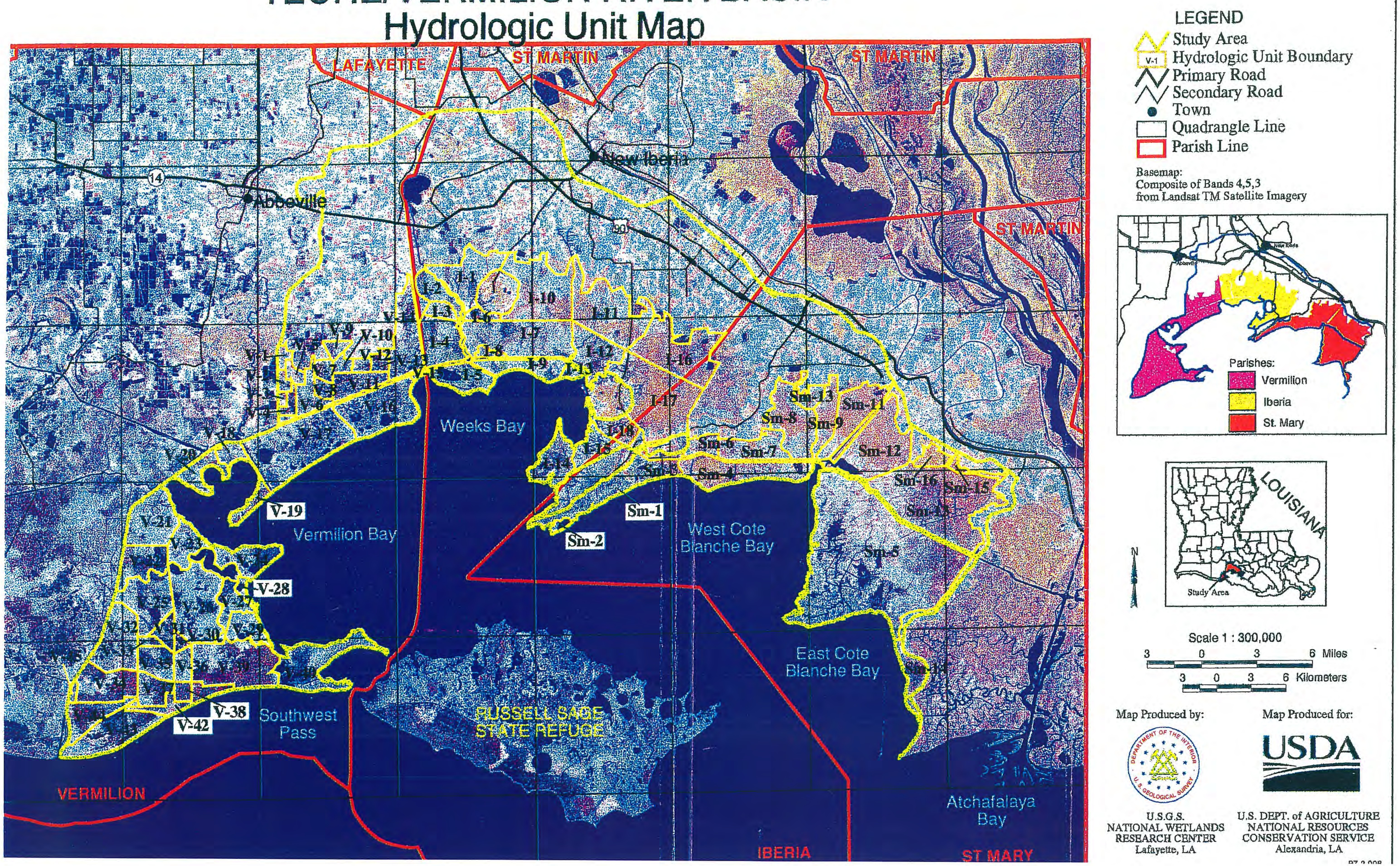
Dec. 26, 1931 - Lawrence E. Hicks - 82 species, 5533 individuals - 9 am to 5 pm - Mostly clear but partly cloudy, temp. 62° to 69°. By auto, 85 miles, and 12 miles on foot. 15 mile diameter area located southwest of New Iberia and including parts of Avery Island and cypress swamps and bayous on north shore of Vermilion Bay.[5]

4	Pied-billed Grebe
1	Horned Grebe
1	Double-crested Cormorant
1	Great Blue (or Ward's?) Heron
2	Snowy Egret
1	Louisiana Heron
1	American Bittern
22	Lesser Snow Goose
184	Blue Goose
162	Mallard
94	Common Black Duck
16	Gadwall
8	American Pintail
2	Green-winged Teal
16	Blue-winged Teal
1	Shoveler
11	Canvasback
1,084	Lesser Scaup Duck
18	Ruddy Duck
6	Hooded Merganser
64	Red-breasted Merganser
51	Turkey Vulture
86	Black Vulture
4	Sharp-shinned Hawk
14	Eastern Red-tailed Hawk
4	Northern Red-shouldered Hawk
1	Southern Bald Eagle
38	Marsh Hawk
22	Eastern Sparrow Hawk
9	Eastern Bob-white
4	King Rail
1	Sora Rail
6	Florida Gallinule
28	American Coot
32	Killdeer
1	American Woodcock
2	Wilson's Snipe
8	Eastern Mourning Dove
3	Barn Owl
1	Florida Screech Owl
14	Eastern Belted Kingfisher
2	Southern Flicker
12	Red-bellied Woodpecker
2	Red-headed Woodpecker
3	Yellow-bellied Sapsucker
4	Southern Downy Woodpecker
18	Eastern Phoebe
58	Tree Swallow
19	Northern (?) Blue Jay
28	Eastern Crow
84	Fish Crow
1	Tufted Titmouse
4	House Wren
12	Carolina Wren
1	Short-billed Marsh Wren
34	Eastern Mockingbird
6	Brown Thrasher
4	Eastern (?) Robin
12	Eastern Golden-crowned Kinglet
8	Eastern Ruby-crowned Kinglet
46	Migrant (?) Shrike
6	Blue-headed Vireo
86	Myrtle Warbler
2	Yellow Palm Warbler
84	Southern Meadowlark
1,860	Eastern Red-wing
64	Rusty Blackbird
258	Boat-tailed Grackle
160	Florida Grackle
8	Eastern Cowbird
16	Louisiana Cardinal
16	Eastern Goldfinch
38	Eastern Savannah Sparrow
6	Nelson's Sparrow

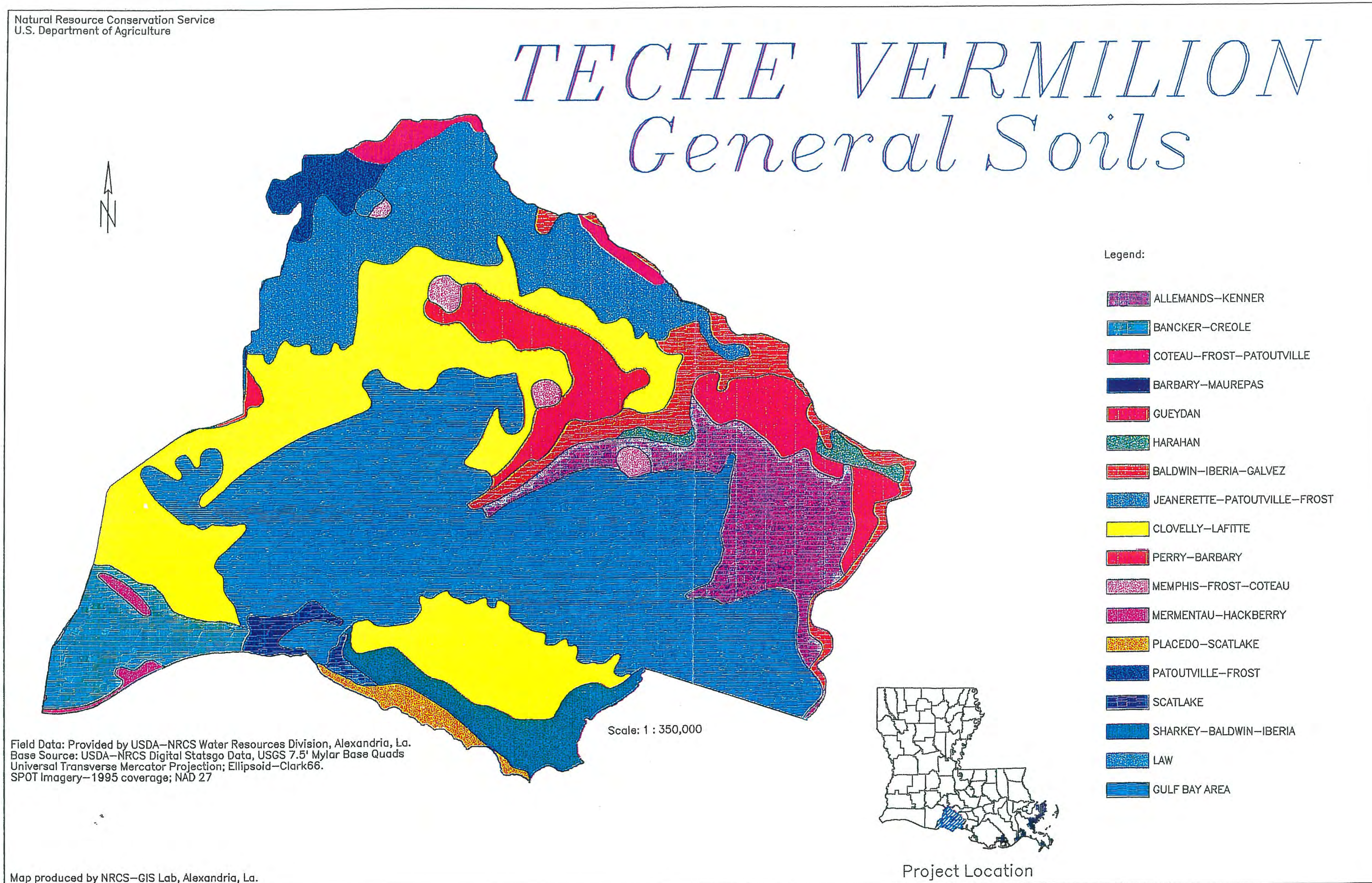
[5] Bird-Lore, January-February 1932, Bird-Lore's Thirty-Second Christmas Census, p69-70.

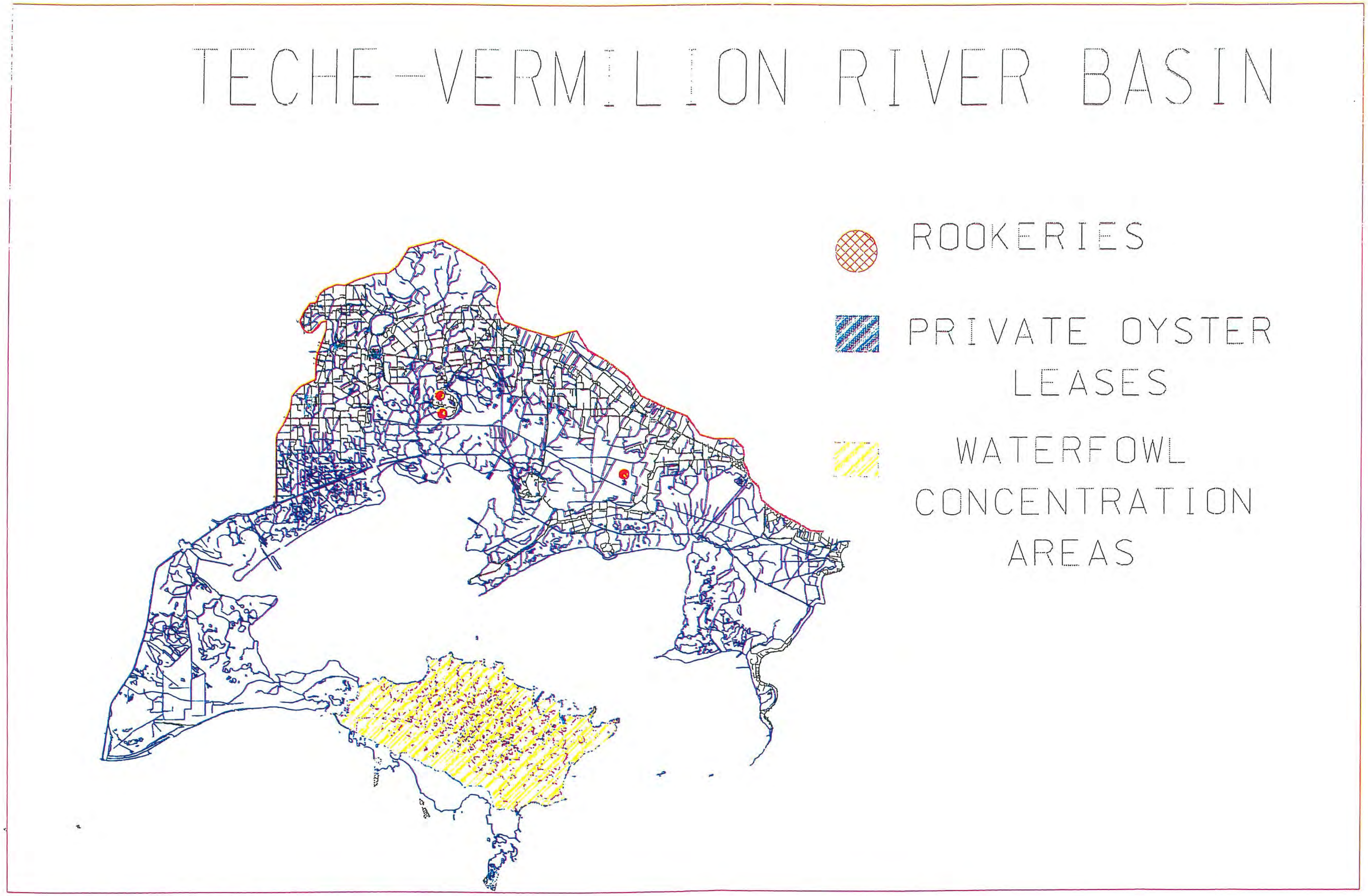
8 Red-backed Sandpiper
1 Herring Gull
462 Ring-billed Gull
26 Laughing Gull
32 Swamp Sparrow
2 Eastern (?) Song Sparrow

TECHE/VERMILION RIVER BASIN
Hydrologic Unit Map



MAP 2


Natural Resource Conservation Service
U.S. Department of Agriculture
TECHE VERMILION
General Soils
N
Legend:
ALLEMANDS–KENNER
BANCKER–CREOLE
COTEAU–FROST–PATOUTVILLE
BARBARY–MAUREPAS
GUEYDAN
HARAHAN
BALDWIN–IBERIA–GALVEZ
JEANERETTE–PATOUTVILLE–FROST
CLOVELLY–LAFITTE
PERRY–BARBARY
MEMPHIS–FROST–COTEAU
MERMENTAU–HACKBERRY
PLACEDO–SCATLAKE
PATOUTVILLE–FROST
SCATLAKE
SHARKEY–BALDWIN–IBERIA
LAW
GULF BAY AREA
Scale: 1 : 350,000
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
Project Location
Map produced by NRCS–GIS Lab, Alexandria, La.



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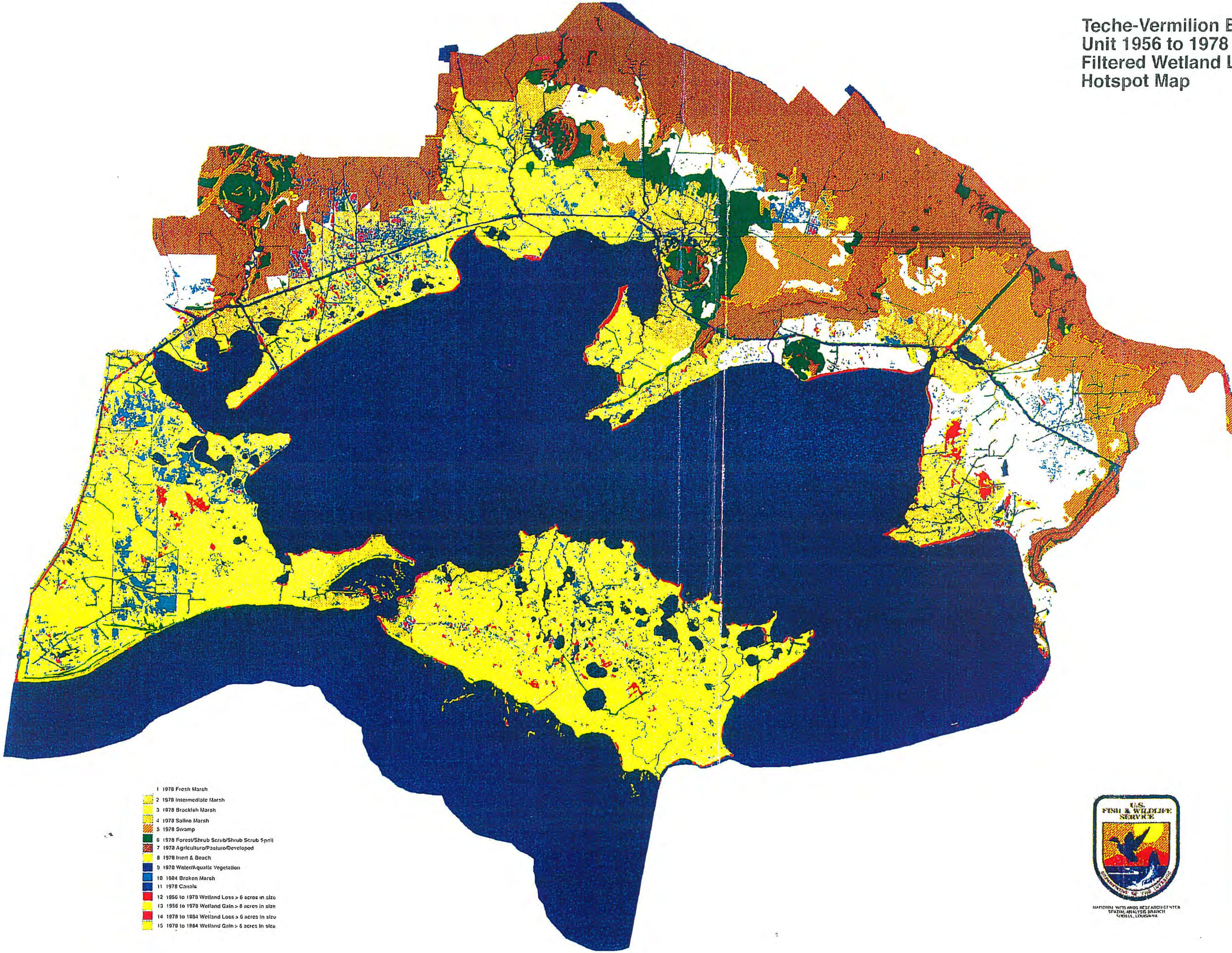
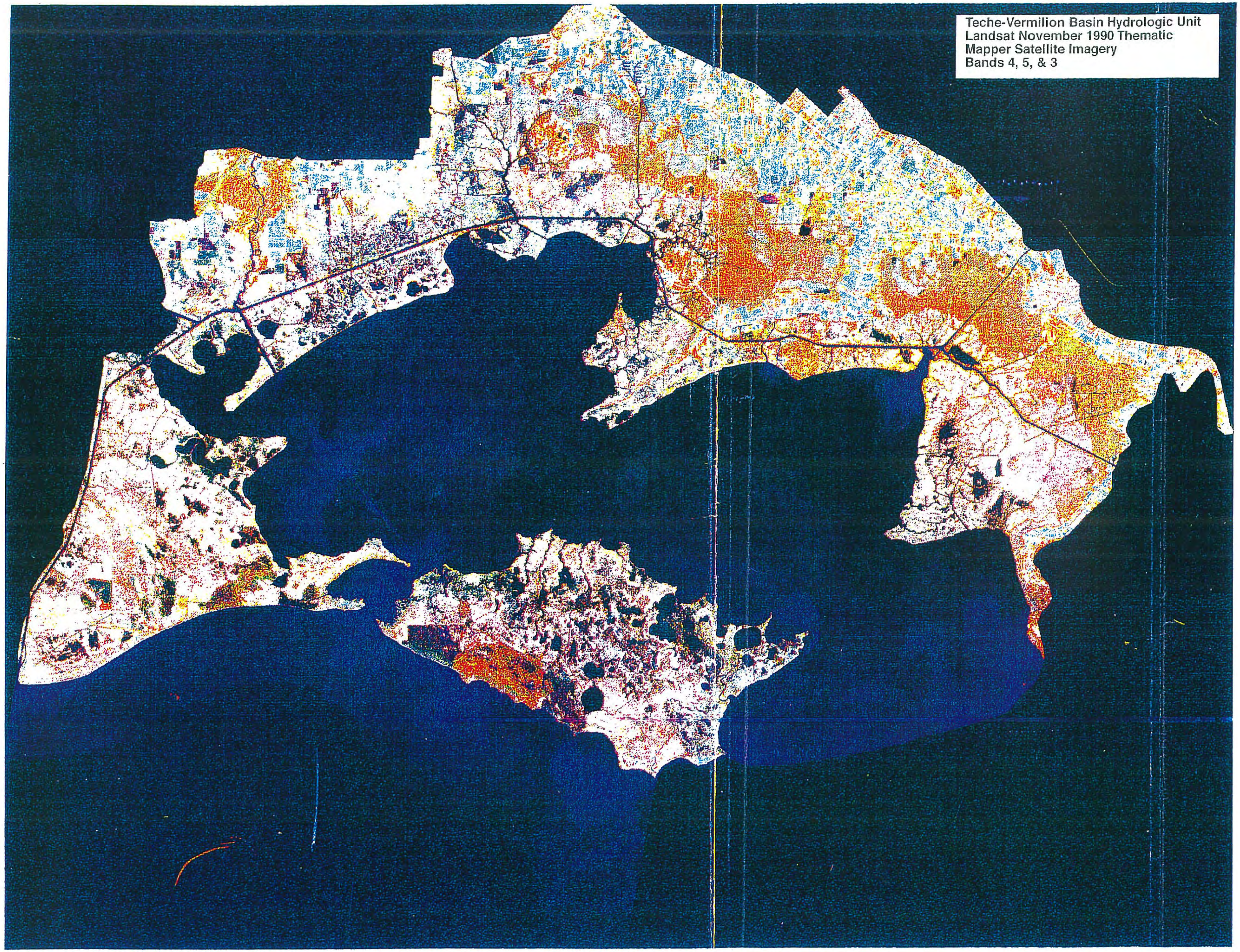
Teche-Vermilion Basin Hydrologic Unit 1956 to 1978 and 1978 to 1984 Filtered Wetland Loss/Gain Hotspot Map



U.S. FISH & WILDLIFE SERVICE
DEPARTMENT OF THE INTERIOR
NATIONAL WETLANDS RESEARCH CENTER
SPATIAL ANALYSIS BRANCH
SLIDELL, LOUISIANA

LOUISIANA DEPARTMENT OF NATURAL RESOURCES


Teche-Vermilion Basin Hydrologic Unit
Landsat November 1990 Thematic
Mapper Satellite Imagery
Bands 4, 5, & 3

LOUISIANA COASTAL MARSH VEGETATIVE TYPE MAP 1949

Teche - Vermilion

LEGEND

FRESH WATER MARSH

The fresh water marshes primarily support fresh water vegetation. It is comparatively poor muskrat habitat, but more important for mink, raccoon, and wintering waterfowl.

SEA RIM

This is made up of sand and shell deposits. There are many low or completely submerged sea rims throughout the marshes of Cameron and Vermilion Parishes.

SAW GRASS MARSH

Other species appearing in this marsh are cattail, bulrush, roseau cane, bull-tongue, hogcane, and spike rush with yellow cutgrass near the ridges. This is considered deep marsh. Water levels range from plus 4" to plus 15". Where water control is possible and salt or brackish water is available, this type marsh can be converted to a three-cornered grass marsh. This area produces the greater portion of mink in the western part of the State.

INTERMEDIATE MARSH (BETWEEN BRACKISH AND FRESH)

Marshes in a balance between brackish and fresh support a wide variety of vegetatinve species. The oustanding species are saw grass, roseau cane, cattail, and bulrush. From a distance this marsh appears to contain only these taller species, however, upon close examination one finds three-conered grass, wiregrass, bull-tongue, and hogcane. Occasionally when adjoining three-cornered grass marshes are heavily populated with muskrat, these areas are very productive, but only for a short period.

FLOATING FRESH MARSH

Floating fresh marshes are dominated by canouche, but the clay pan has subsided, leaving the marsh crust suspended on a sea of very loosely connected vegetative muck.

EXCESSIVELY DRAINED SALT MARSH

Marshes excessively drained by many tidal bayous give rise to raped tide fluctuations and marine deposits which elevate the marsh floor two to six inches above the muskrat producing area. Such marshes are practically without value as muskrat habitat. They produce some low quality raccoon and mink, but are the best clapper rail habitat in the coastal marshes. Outstanding vegetation: black rush (Juncus roemerianus), wiregrass (Spartina patens), oyster grass, and occasional clumps or stalks of saw grass. Salinities range from extremely saline to brackish.

BRACKISH THREE-CORNERED GRASS MARSH

At near normal high tide level the brackish three-cornered grass peat marshes produce approximately 80% of the State's muskrat crop. The vegetation is predominately three cornered grass (Scirpus olneyi), but it will revert to its climax species, wiregrass, if not properly burned at least every other year. Such marshes are also fair producers of mink and raccoon; they are also average waterfowl habitat. The three-cornered grass marsh extending from the east end of Marsh Island to Sabine Pass is the most important wintering range for blue geese.

LEAFY THREE-CORNERED GRASS OR COCO MARSH

A coco (Scirpus robustus) marsh is second to a brackish three-cornered grass marsh in muskrat productivity. Coco is also a subdominant species and difficult to produce. Wiregrass generally overpowers this valuable muskrat, waterfowl and goose food plant. Hogcane is also an associate in this type marsh, generally dominating the higher bayou banks and ridges.

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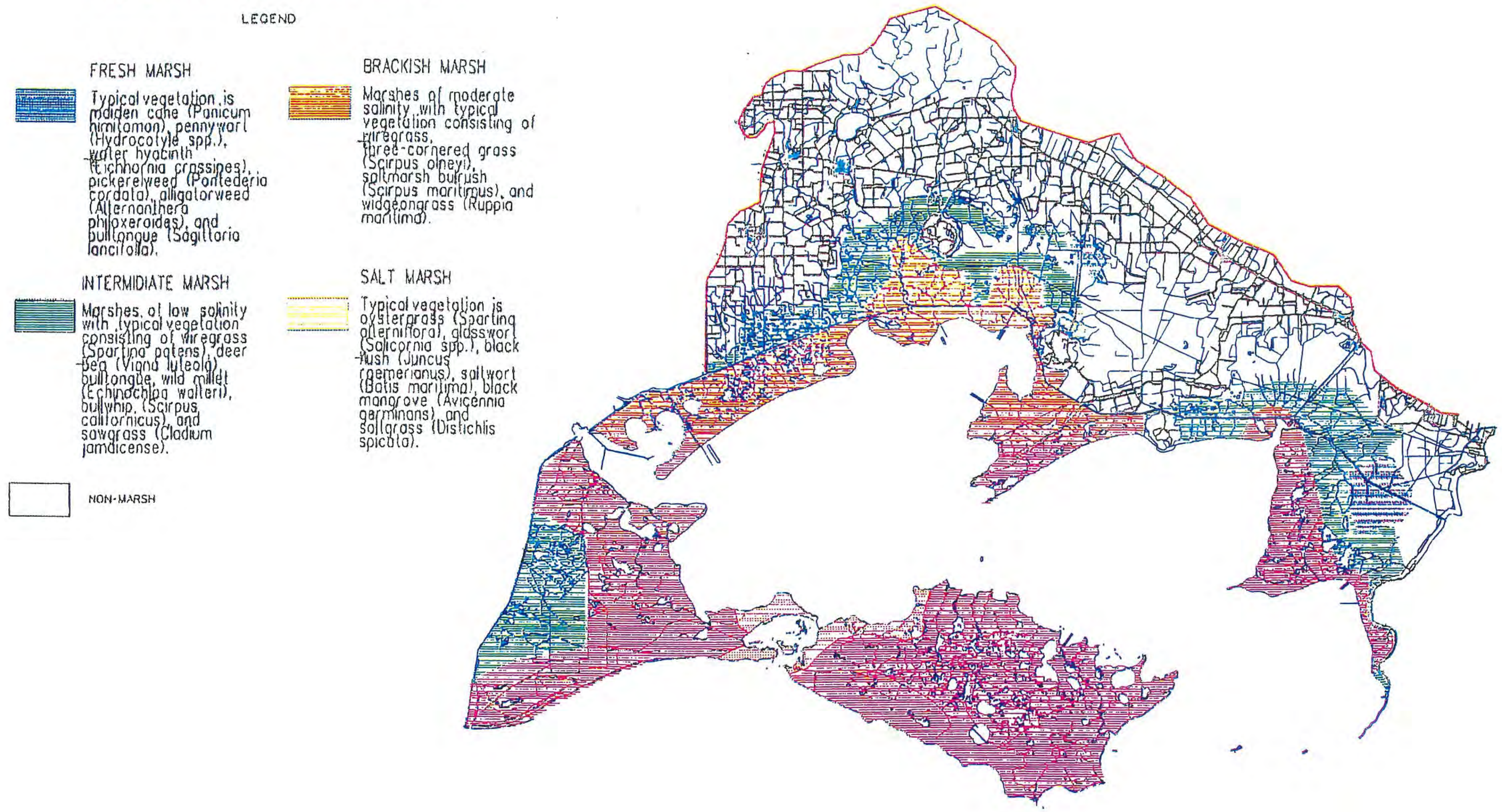
LOUISIANA COASTAL MARSH VEGETATIVE TYPE MAP 1968

Teche-Vermilion



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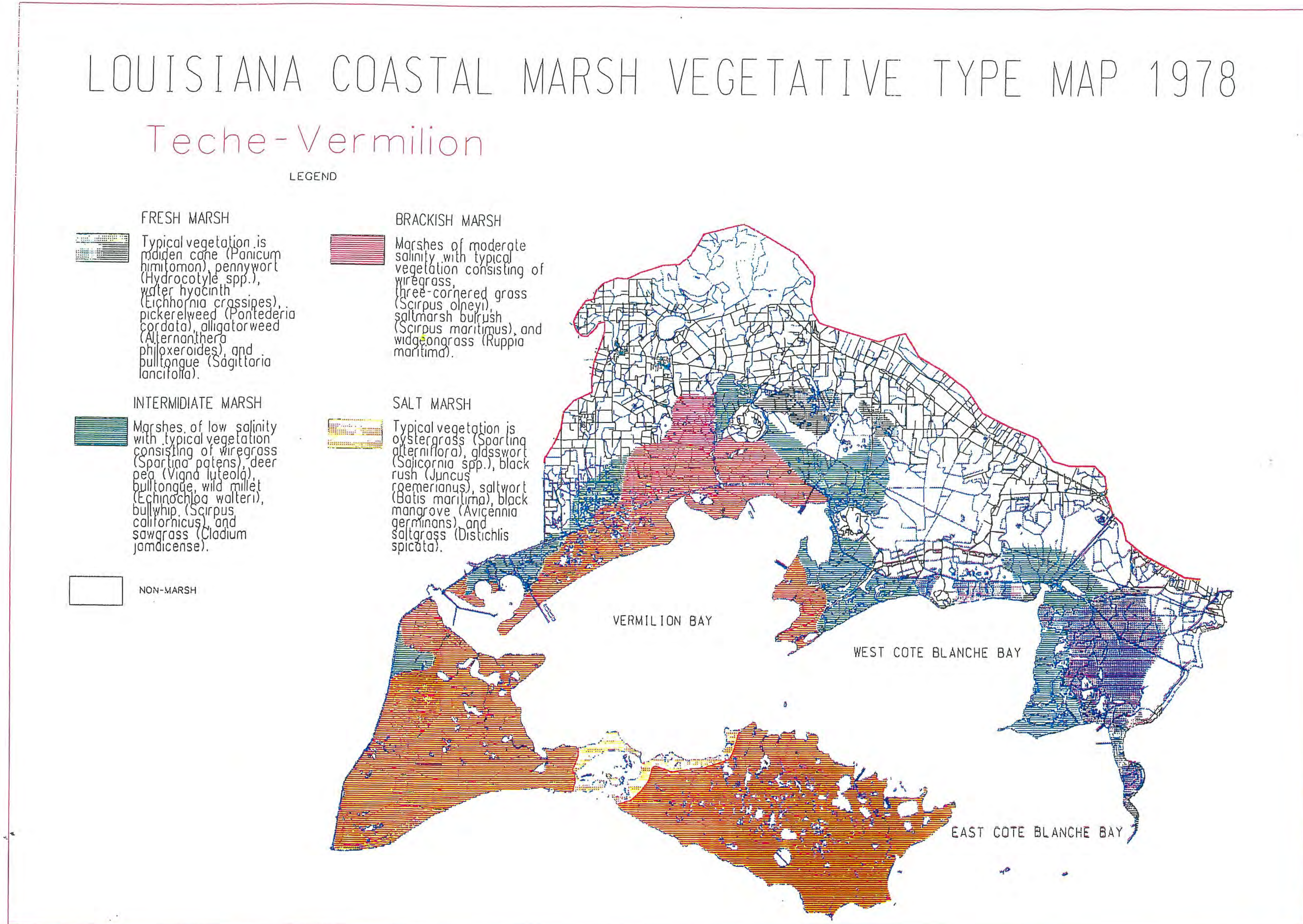
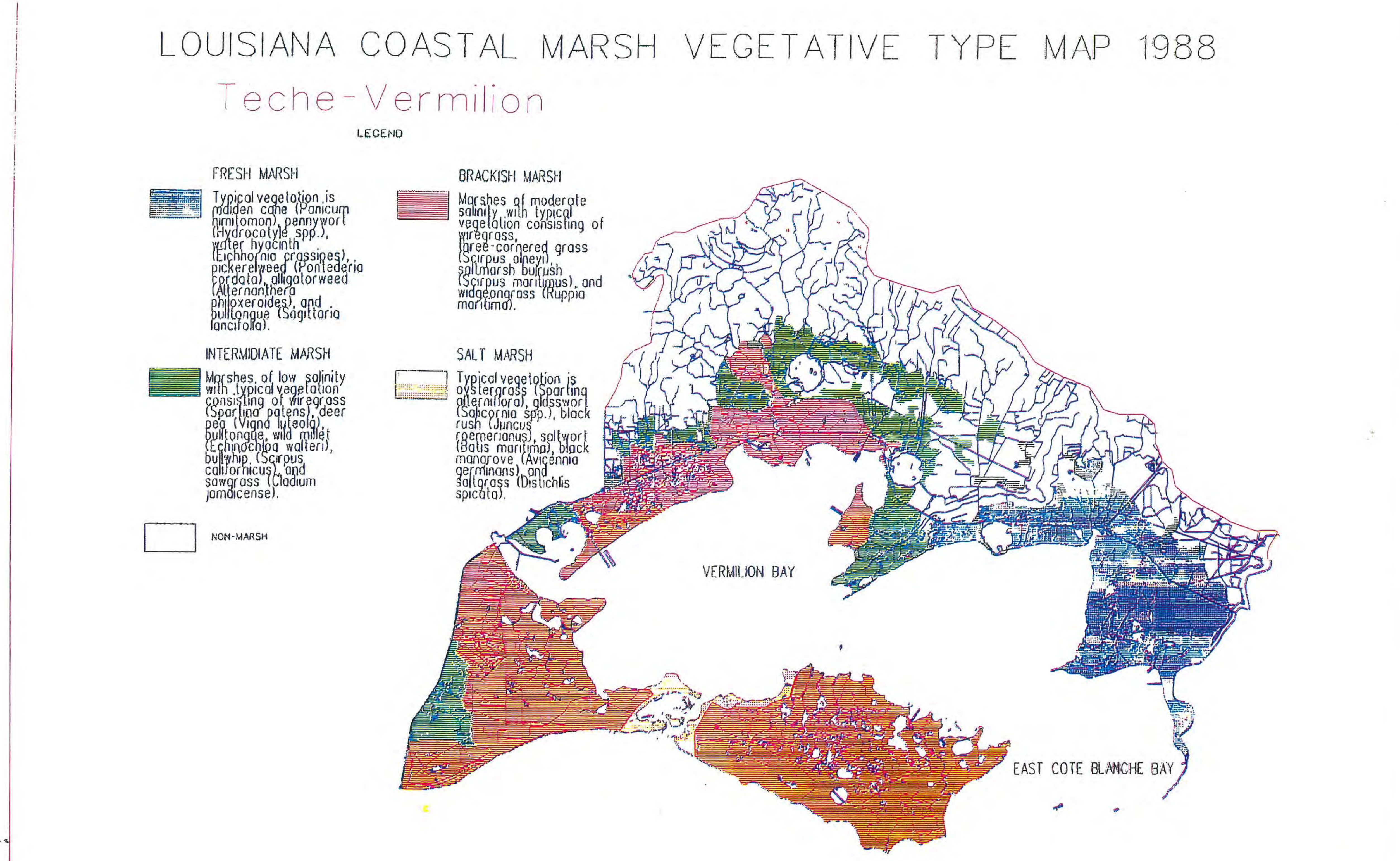

LOUISIANA COASTAL MARSH VEGETATIVE TYPE MAP 1978
Teche-Vermilion
LEGEND
FRESH MARSH
Typical vegetation is maiden cane (Panicum himitomon), pennywort (Hydrocotyle spp.), water hyacinth (Eichhornia crassipes), pickerelweed (Pontederia cordata), alligatorweed (Alternanthera philoxeroides), and bulltongue (Sagittaria lancifolia).
BRACKISH MARSH
Marshes of moderate salinity with typical vegetation consisting of wiregrass, three-cornered grass (Scirpus olneyi), saltmarsh bulrush (Scirpus maritimus), and widgeongrass (Ruppia maritima).
INTERMIDIATE MARSH
Marshes of low salinity with typical vegetation consisting of wiregrass (Spartina patens), deer pea (Vigna luteola), bulltongue, wild millet (Echinochloa walteri), bullwhip (Scirpus californicus), and sawgrass (Cladium jamaicense).
SALT MARSH
Typical vegetation is oystergrass (Spartina alterniflora), glasswort (Salicornia spp.), black rush (Juncus roemerianus), saltwort (Batis maritima), black mangrove (Avicennia germinans), and saltgrass (Distichlis spicata).
NON-MARSH
VERMILION BAY
WEST COTE BLANCHE BAY
EAST COTE BLANCHE BAY



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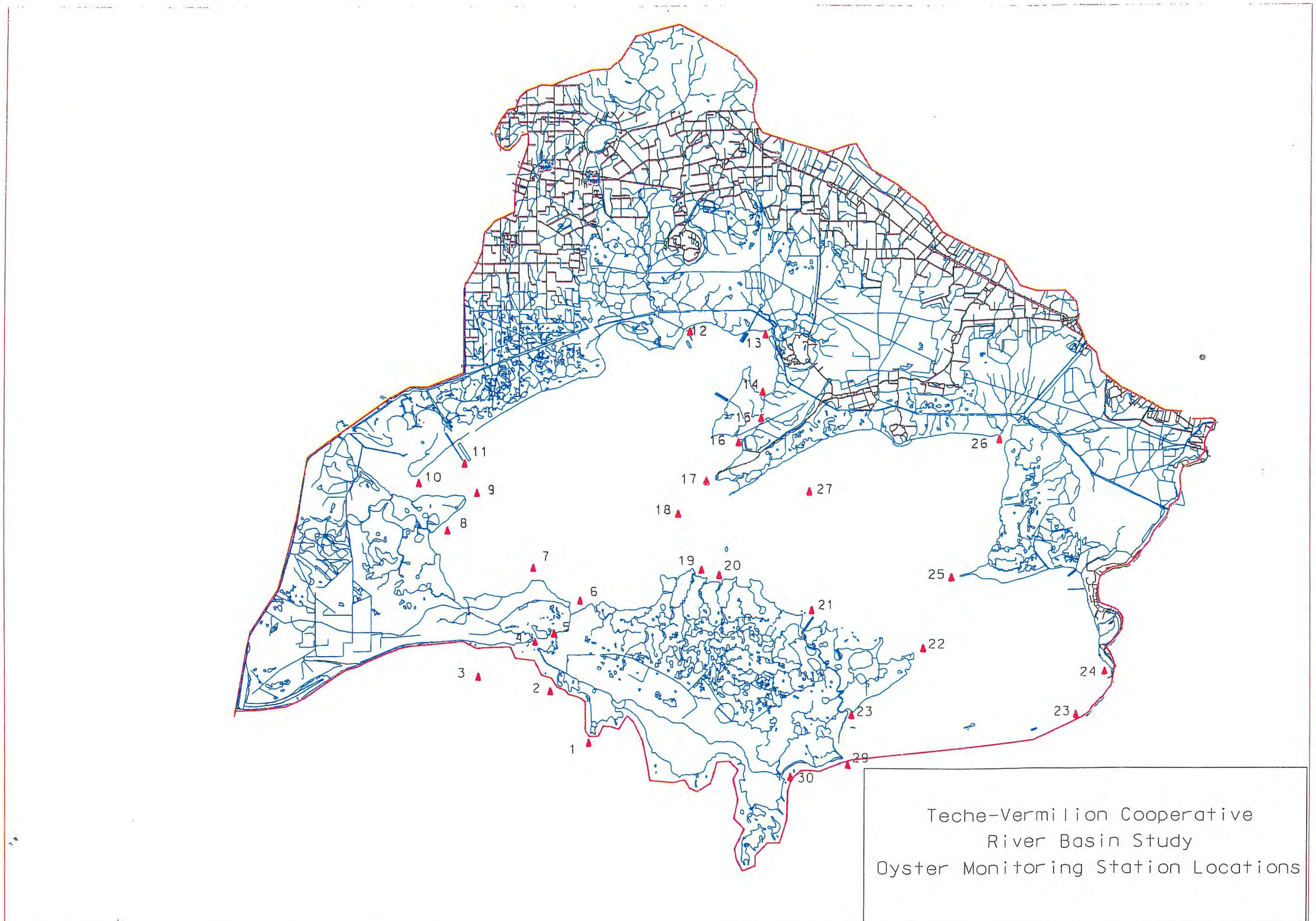

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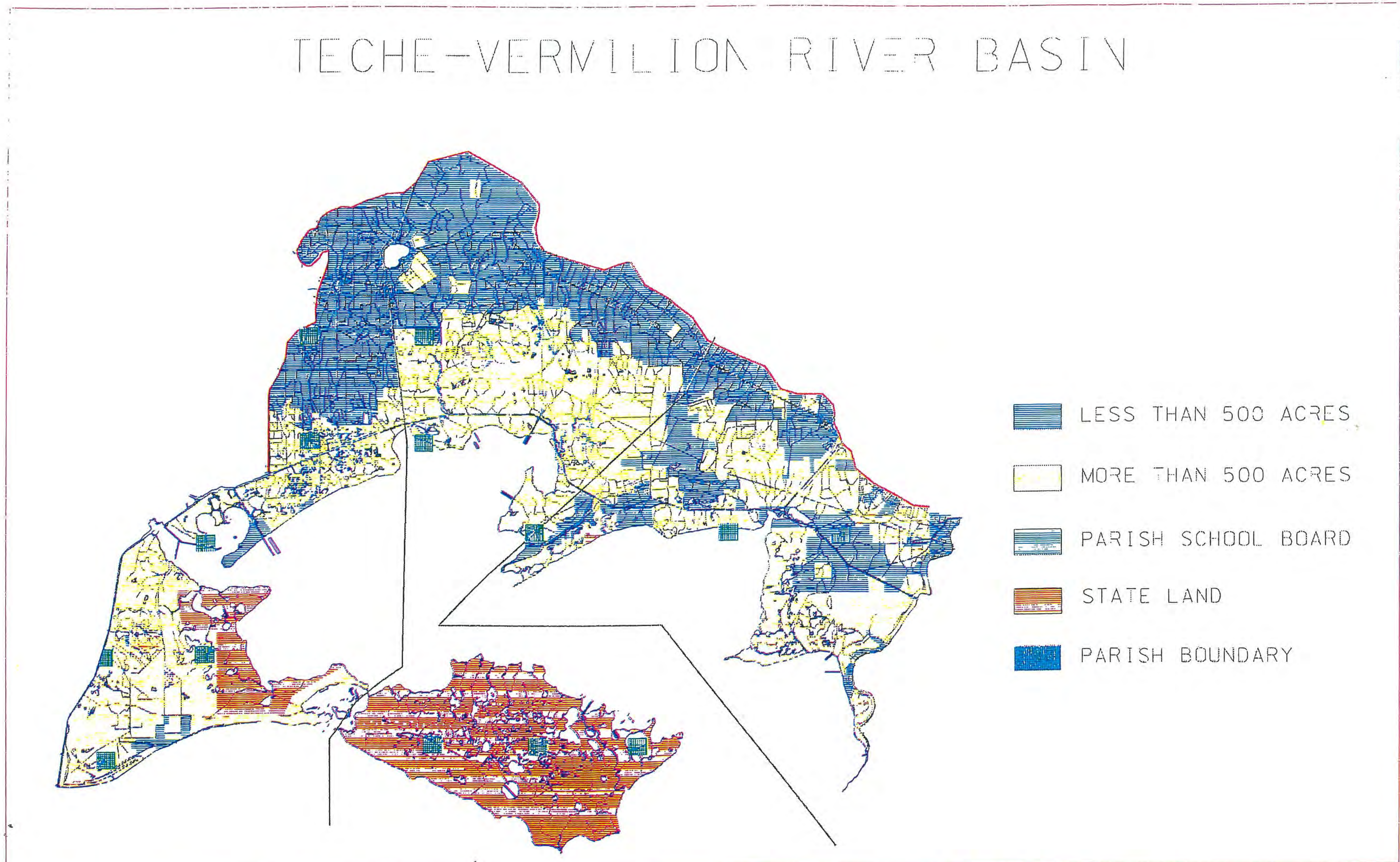

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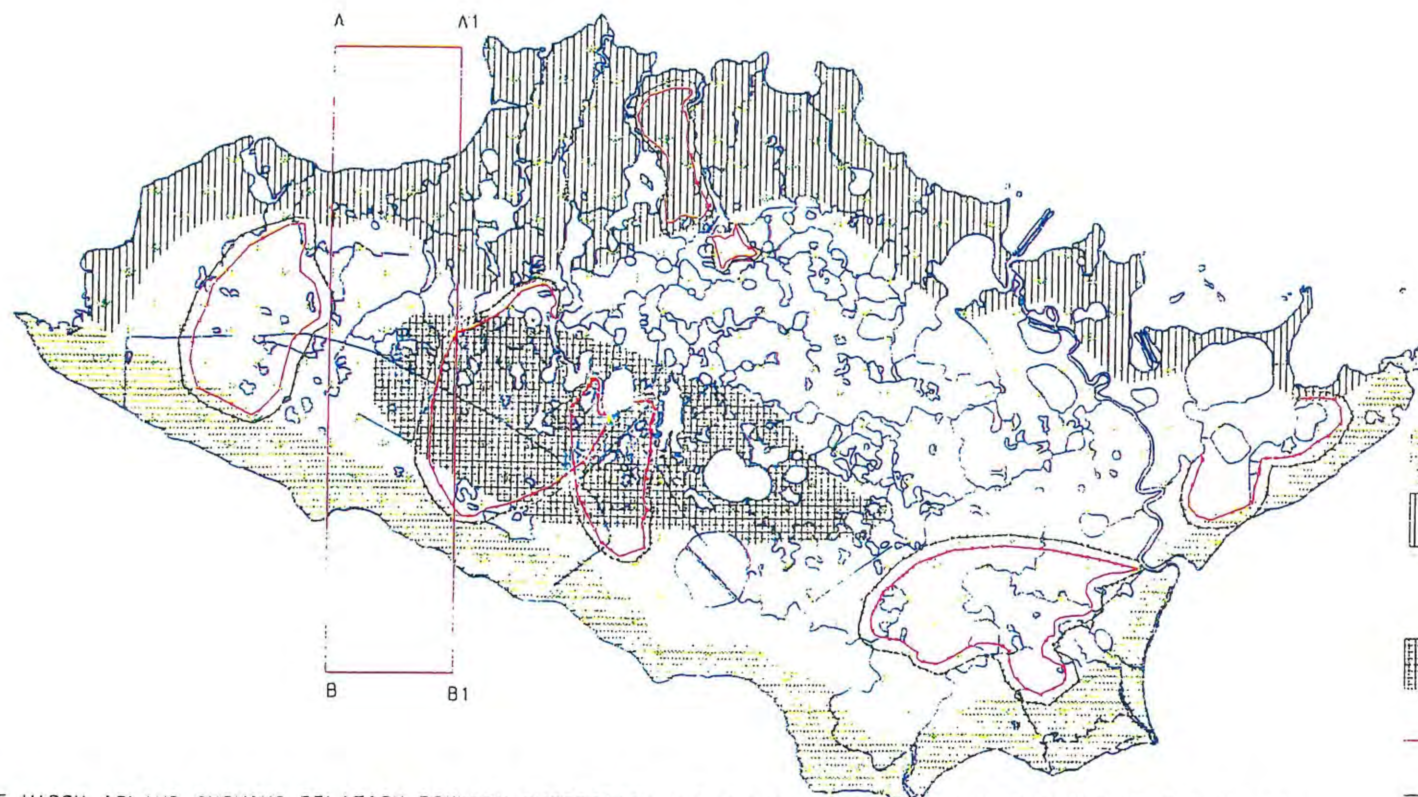
MARSH ISLAND

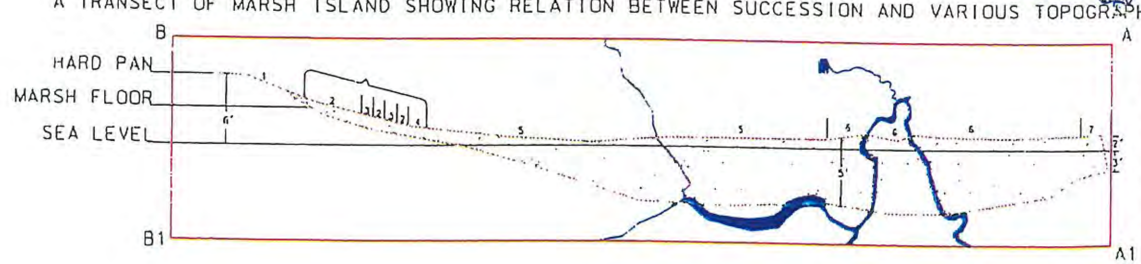


Census routes in relation to vegetation types.

- Sea-rim or goose and cattle marsh. dominated by wiregrass (Spartina patens) and salt-grass (Distichlis spicata).
- Blackrush (Juncus romerianus) dominated marsh.
- Three-cornered grass (Scorpus olneyi) and robustus) marsh. Good muskrat land.
- Wiregrass (S. patens) and three-cornered grass (S. olneyi) marsh eaten out by an excessive 'rat population. Many of the three-cornered grass areas are completely denuded.
- Fifty mile census trip taken in 1941; each circle represents 20 'rat houses.
- Fifty mile census trip taken in 1942; each circle represents 20 'rat houses.

(Each house averages 5 'rats)

A TRANSECT OF MARSH ISLAND SHOWING RELATION BETWEEN SUCCESSION AND VARIOUS TOPOGRAPHIC CONDITIONS OF THE ISLAND.



1. Sea-rim saltgrass and wiregrass
2. Coco
3. Roseau cane } Coco grass primary type; Roseau cane clumps and
4. Hog cane } Hog cane patches scattered over area.
5. Three-cornered grass
6. Blackrush
7. Oystergrass

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