natural areas significance study

august 1980

MISSISSIPPI RIVER DELTA REGION



LOUISIANA

Publication of this document should not be construed as representing either the approval or disapproval of the secretary of the interior. This document has been prepared in compliance with section 910 of Public Law 95-625, and provides information to the secretary of the interior for his consideration in making his recommendation to the Congress.

United States Department of the Interior / National Park Service

natural areas significance study



mississippi river delta region

LOUISIANA

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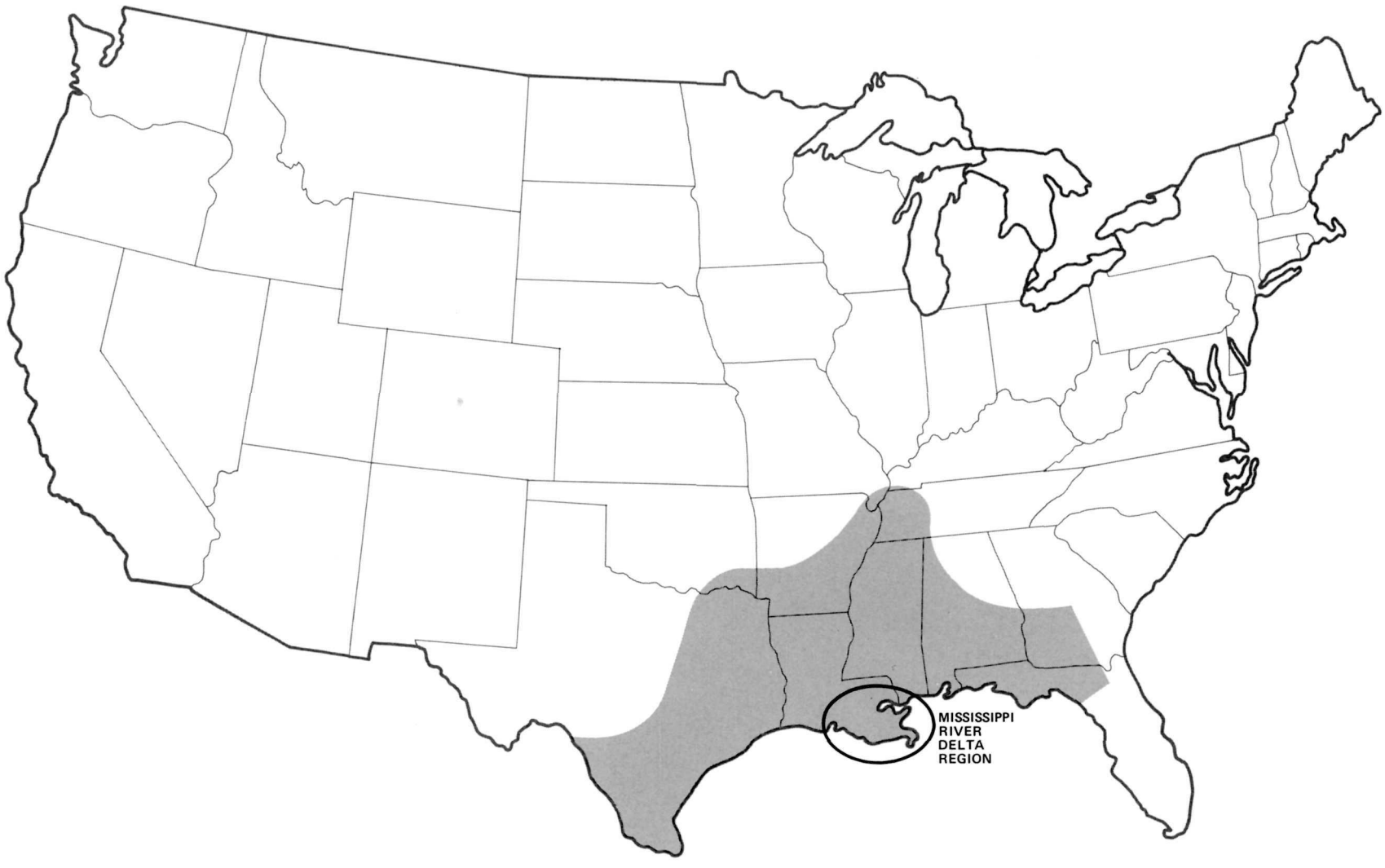
PURPOSE AND SCOPE OF THIS STUDY

The directive for this study is contained in Public Law 95-625, the National Parks and Recreation Act of 1978. Title IX of this act (appendix A) authorizes the creation of Jean Lafitte National Historical Park and Preserve, and section 910 directs the secretary of the interior to submit to Congress by September 20, 1980, a "report with recommendations as to sites within the Mississippi River Delta Region which constitute nationally significant examples of natural resources within the region."

This report is divided into two parts. The first part presents an overview of the natural resources of the Mississippi River Delta Region and a general analysis of socioeconomic trends that might potentially cause disruptions in the natural environment. Part two describes the methodology used to determine nationally significant examples of natural resources and presents an inventory of the nationally significant natural areas identified by this study. Each area is described by approximate size, location, ownership, site description, land use, and significance.

This study is intended to be a major source of information for federal, state, and local agencies, private conservation organizations, and individuals who are concerned with protection of significant natural areas in the delta region. The general descriptions of resource values and potential for resource disruption will help to focus attention on the most significant areas within the region. The identification of feasible management strategies for protecting each area is beyond the scope of this study. General guidance for considering management alternatives is contained in Preserving Our Natural Heritage, a publication prepared for the National Park Service by The Nature Conservancy (1975).

STUDY SUMMARY



GULF COASTAL PLAIN

LOCATION

MISSISSIPPI RIVER DELTA REGION

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NA/MRDR	20133
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SIGNIFICANCE OF THE REGION

The Mississippi River Delta Region (see Location map) encompasses one of the largest and most productive estuarine systems and best developed deltas in the world, and a series of dynamic barrier islands, many of them still unaltered by man. Covering approximately 11½ million acres, including all or portions of 25 parishes in southern Louisiana, this is the most extensive area of wetlands in the nation. Its drainage basin is the fourth largest in the world, comprising approximately 41 percent of the lower 48 states. The delta and offshore islands support a great variety of vegetation contained in associations ranging from upland forest to salt marsh. The highly productive wetlands are rich in valuable wildlife habitat, and the region leads the nation in shrimp, blue crab, and menhaden fisheries and wild fur production and is second in oyster production. The wetlands are also a critical wintering area for millions of birds utilizing the Mississippi Flyway and contain numerous wading bird and seabird rookeries and nesting areas. Excluding Alaska, over half the nation's proven oil and gas resources and a considerable portion of its refining and processing capacity occur in the delta and adjacent Gulf of Mexico. The region contains the nation's second largest port, New Orleans, and supports a population of more than two million people.

The continued high productivity and associated economic importance of the delta region depend upon maintenance of a healthy, viable natural environment. Consequently, the protection of natural areas is crucial to southern Louisiana and highly beneficial to the social and economic well-being of the nation.



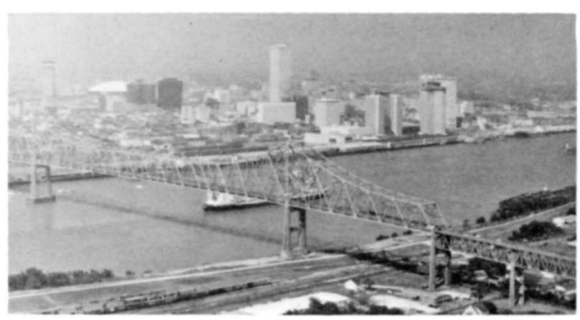












CONDITION OF THE ENVIRONMENT

The delta region, an area predominated by swamp forests and natural wetlands interlaced with numerous rivers, streams, and bayous, is being altered by man's activities. Canal dredging, levee construction, and drainage projects associated with regional development have interrupted the natural processes of the delta. Bank overflow, which historically provided freshwater, nutrients, and sediment to the wetlands and estuaries, has been eliminated in most areas. As a result, the effects of subsidence, erosion, and saltwater intrusion, which were formerly balanced by natural supplies of freshwater and sediments, have become more prominent, resulting in a net loss of land and a change in marsh composition.

Since the area depends so heavily upon waterborne transportation, and since a large percentage of the nation's proven oil and gas resources underlie the area, canal dredging for transportation and oil and gas activity is expected to continue at the same level or to increase. Likewise, levee construction and drainage projects will increase in response to growing demands for suitable urban and agricultural lands. All of these activities will contribute to subsidence and saltwater intrusion. However, recent small-scale projects to artificially reintroduce a supply of freshwater and sediments, to restore a more natural balance to the environment, have yielded encouraging results, and large-scale versions are planned.

NATIONALLY SIGNIFICANT AREAS

Fifteen natural areas have been identified as constituting nationally significant examples of the natural resources of the Mississippi River Delta Region. A map of these areas is provided at the back of this document.

The major criteria considered in determining national significance related to how well each area represents the geological phenomena, landforms, ecosystems, and wildlife values inherent in the delta region. Thirty areas were closely evaluated over the course of this study, but only those 15 areas that best represent the natural values of the region were determined to be nationally significant.

Based primarily on their natural diversity, each of these 15 areas was given a relative significance rating of 1 (highly diverse) or 2 (less diverse, generally a smaller area). Each area was also rated according to the current potential for disruption of its natural systems, as follows: A (imminently threatened with large-scale disruption), B (imminently threatened with small-scale disruption), C (disruption likely but not imminent), or D (no apparent threat). This two-part (significance/disruption potential) rating system will provide land managers and decision makers in the delta region with a basis for assigning protection priorities to the respective areas.

Using this rating system, the 15 nationally significant areas fall into the following six categories:

Nationally significant areas that are highly diverse, generally large, and seriously threatened with imminent large-scale disruption (rating 1A):

Lake Maurepas area
Atchafalaya River Basin

Nationally significant areas that are highly diverse, generally large, and imminently threatened with small-scale disruption (rating 1B):

Terrebonne Marsh
Barataria Bay area
Gheens Marsh area
Lac des Allemands area
Bayou Bois Piquant area

Nationally significant areas that are highly diverse, generally large, and in no apparent danger of disruption or already protected (rating 1D):

Marsh Island and Shell Keys
Birdfoot Delta area

Nationally significant areas that are less diverse, generally small, and seriously threatened with imminent large-scale disruption (rating 2A):

Saint Charles Marsh

Nationally significant areas that are less diverse, generally small, and where disruption is likely but not imminent (rating 2C):

Jean Lafitte Preserve and protection zone
Isle Dernieres barrier islands

Nationally significant areas that are less diverse, generally small, and in no apparent danger of disruption or already protected (rating 2D):

Cote Blanche salt dome area
Chandeleur and Breton barrier island system
Atchafalaya Delta

NATURAL AREA SIGNIFICANCE SUMMARY

VALUES	LANDFORMS OF THE PRESENT													GEOLOGIC HISTORY							LAND ECOSYSTEMS				AQUATIC ECOSYSTEMS												WILDLIFE												TOTALS		SIGNIFICANCE/DISRUPTION POTENTIAL
THEMES	PLAINS, PLATEAUS, MESAS, CUESTAS AND HOGBACKS		RIVER SYSTEMS AND LAKES							SEASHORES, LAKESHORES, AND ISLANDS					OLIGOCENE TO RECENT							EASTERN DECIDUOUS FOREST				MARINE AND ESTUARINE ENVIRONMENTS							LAKES, PONDS, AND STREAMS					ENDANGERED, THREATENED OR RARE SPECIES						PRIME WILDLIFE AREAS														
SUBTHEMES / NAME OF AREA	DELTAIC PLAIN	PLEISTOCENE PRAIRIE TERRACE	DELTAS	NATURAL LEVEES/ALLUVIAL RIDGES	CREVASSES	OXBOW LAKES	PIERCEMENT SALT DOMES	MUD LUMPS	BARRIER ISLANDS	BEACHES	CHENIERS/BEACH RIDGES	WETLAND LAKESHORES OR SEASHORES	ERODED CLIFFS	TECHE DELTA COMPLEX	ST. BERNARD DELTA COMPLEX	LAFOURCHE DELTA COMPLEX	MODERN DELTA COMPLEX	ATCHAFALAYA DELTA COMPLEX	PLEISTOCENE PRAIRIE TERRACE	PONTCHARTRAIN EMBAYMENT	CYPRESS-TUPELO GUM SWAMPS	BOTTOMLAND HARDWOODS	LIVE OAK RIDGES	UPLAND FORESTS	BEACHES	DEEP MIGRATORY TIDAL PASSES	BLACK MANGROVE	SALT MARSH	BRACKISH MARSH	INTERMEDIATE MARSH	SUBMERGENT GRASSBEDS	LARGE, SHALLOW LAKES	SMALL, SHALLOW LAKES AND PONDS	SLOW MEANDERING STREAMS AND BAYOUS	FRESH MARSH	SUBMERGENT GRASSBEDS	AMERICAN ALLIGATOR [1]	SEA TURTLES [2]	SOUTHERN BALD EAGLE (NESTS)	BROWN PELICAN (ROOKERY)	BLACK BEAR	MARSH DEER	FISH AND SHELLFISH NURSERY GROUNDS	GEESE CONCENTRATIONS	DUCK CONCENTRATIONS	SEABIRD NESTING COLONIES	WADING BIRD ROOKERIES	OYSTER AND CLAM BEDS	THEMES	SUBTHEMES	
LAKE MAUREPAS AREA	■	■	■	■		■						■			■				■	■	■	■	■	■								■	■	■	■		■						■			■	■	9	24	1A
ATCHAFALAYA RIVER BASIN	■		■	■	■	■						■		■		■					■	■	■									■	■	■			■					■						8	20	1A
TERREBONNE MARSH	■		■	■	■	■				■				■		■					■		■		■	■	■	■	■	■		■	■	■	■		■	■	■			■	■	■	■	■	■	9	30	1B
BARATARIA BAY AREA	■		■	■					■	■	■				■	■	■						■		■	■	■	■	■			■	■	■	■							■	■	■	■	■	■	9	26	1B
GHEENS MARSH AREA	■		■	■	■					■		■			■	■					■		■						■	■		■	■	■	■							■	■	■	■	■	■	9	20	1B
LAC DES ALLEMANDS AREA	■		■	■		■						■			■	■					■	■	■									■	■	■	■	■	■						■			■		8	19	1B
BAYOU BOIS PIQUANT AREA	■		■	■	■							■			■						■	■	■									■	■	■	■	■	■						■			■		8	17	1B
MARSH ISLAND AND SHELL KEYS	■		■							■	■	■		■									■		■	■	■	■	■	■			■	■	■	■		■	■	■	■	■	■	■	■	■	■	9	22	1D
BIRDFOOT DELTA	■		■	■	■			■				■					■							■				■	■	■	■			■	■	■							■			■	■	8	22	1D
ST. CHARLES MARSH	■		■	■								■			■					■	■	■	■						■			■	■	■	■	■							■					9	19	2A
JEAN LAFITTE PRESERVE AND PROTECTION ZONE	■		■	■								■			■					■	■	■							■			■	■	■	■	■												8	14	2C
ISLES DERNIERES BARRIER ISLANDS									■	■		■				■									■	■	■	■		■			■	■	■														6	13	2C
COTE BLANCHE SALT DOME AREA	■		■				■					■	■	■					■					■						■			■	■	■	■													8	12	2D
CHANDELEUR AND BRETON BARRIER ISLANDS SYSTEM									■	■		■			■										■		■	■		■			■	■	■														6	12	2D
ATCHAFALAYA DELTA			■									■						■															■	■	■			■											6	9	2D

■ SUBTHEME REPRESENTED

SUBTHEME NOT REPRESENTED

1 Peak concentrations occur in the Atchafalaya River Basin, Birdfoot Delta, Gheens Marsh, Lac des Allemands, Lake Maurepas, Marsh Island/Shell Keys, and Terrebonne Marsh areas.

2 Waters between Marsh Island and the Birdfoot Delta are prime foraging areas for the Kemp's ridley turtle. Atlantic loggerhead turtle nests on the Chandeleur Islands.

MISSISSIPPI RIVER DELTA REGION

NATURAL ENVIRONMENT

GEOLOGIC HISTORY AND FEATURES

The Mississippi River Delta Region, a portion of the Gulf Coastal Plain physiographic province, is defined as the river's modern deltaic plain. This area of approximately 11½ million acres has formed since the sea reached its present level in Recent time, about 6,000 years ago. The sediments that form this plain, estimated at 730 million tons of solid and dissolved materials annually (Fairbridge 1975), have been carried by the Mississippi River considerable distances downstream and deposited in the Gulf of Mexico, resulting in the creation of new land. Generally, the deltaic plain includes all of Louisiana south of a line from Lafayette to Baton Rouge, Hammond, and Slidell. This northern boundary generally conforms with the edge of the Pleistocene Prairie Terrace, the previous coastline prior to development of the present deltaic plain. The western boundary roughly conforms with the western bank of Vermilion Bay, and runs northward along the Vermilion River to Abbeville and Lafayette. The Chandeleur Islands form the eastern boundary, and the Gulf of Mexico delimits the southern terminus.

The geologic processes that have created the deltaic plain continue today, and it is constantly changing, growing in some areas and disappearing in others. Geologists have identified five different deltaic complexes that have been actively growing at different times as a result of the river's widely shifting course (see Geologic Features map). Chronologically, these are the Teche delta complex (6000-3500 years before present), the Saint Bernard delta complex (5000-500 BP) the Lafourche delta complex (3500-50 BP), the Modern delta complex (1000 BP to present), and the Atchafalaya delta complex (50 BP to present) (Coastal Environments 1977). The coalescing of these active and abandoned lobes produced the modern deltaic plain. Its development and expanse have been encouraged by the low wave energy environment of the gulf. Under other environmental conditions, much greater erosion from marine processes would have resulted, severely limiting the extent of the deltaic plain.

The Lake Borgne, Lake Pontchartrain, and Lake Maurepas complex, called the Pontchartrain Embayment, is actually a remnant of the Mississippi Sound that was cut off as the Saint Bernard delta complex formed around 5,000 years ago (Saucier 1963). Since that time, these lakes have become fresher as a result of persistent freshwater inflow and a more restricted connection to saltwater. Currently, Lake Maurepas is almost totally fresh, as evidenced by its surrounding cypress-tupelo gum swamp, which is intolerant of saltwater. The origin of these large shallow lakes was considerably different than the origin of the other large shallow lakes scattered throughout portions of the deltaic plain, most of which resulted principally from subsidence.

With all major stages of delta development and abandonment represented, the Mississippi River Delta is one of the world's finest examples of natural delta-building processes. But it also demonstrates man's influence on the development of delta systems. The geologic dynamics of the Mississippi River deltaic plain must be understood generally in order to appreciate

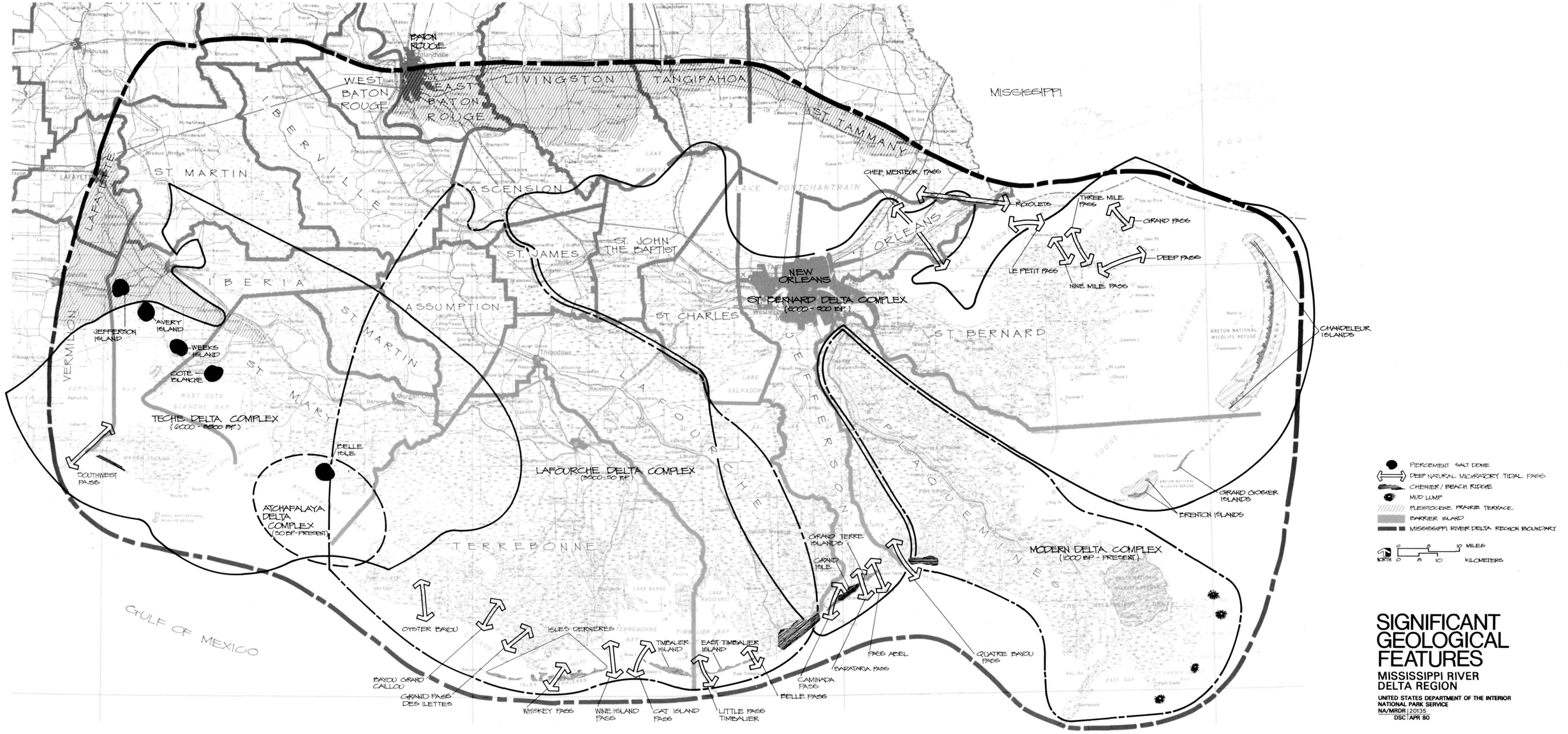
the past, present, and future of this significant natural resource. Greatly simplified, the delta can be described as the result of the interaction of four factors: (1) freshwater input by streams and rivers, with associated sediment deposition; (2) subsidence, including regional downwarping from sediment loading and more localized compaction of sediments from various causes; (3) shoreline erosion associated with the gulf; and (4) saltwater intrusion. Over the past 100 years or more, man's actions in the delta have greatly accelerated the rates of some of these processes and greatly retarded the rates of others. The results of these actions can be described in terms of their effects on the interaction of these four factors.

Most deltas have similar patterns of growth, and the Mississippi River deltaic plain is no exception. A river's size and strength determines it's maximum sediment load. The finest fractions of sediment, mostly clays, are carried considerable distances from the mouth of the river, forming a widespread submerged prodelta. The silt-sized particles are not carried as far and form what is known as the delta front. The delta front portion of the delta is also submerged but less widespread. The emergent delta is composed mainly of coarse-grained sediments. Within a short time the emergent delta usually becomes covered with vegetation, which contributes considerable organic matter to the delta and also traps sediment which would otherwise be transported farther downstream.

As more sediment is deposited, the delta grows outward, and the gradient from the river to the sea lessens. The expanse of the delta is broadened through the formation of distributaries and subdeltas. Distributaries are formed when the main channel "crevasses," or breaks through its own natural levee bank during times of high water. If the crevasse is scoured deeply enough to allow a continual flow of water, even during normal and low flow periods, a distributary will form. Often, however, the scouring is not deep enough, and water and sediment fan out from the crevasse only during high water conditions, forming a subdelta in the adjacent bay.

Occasionally, a crevasse and its resulting channel provide a shorter course, and thus a steeper gradient, to the river's outlet, and the main course of the river shifts to this channel. Such crevasses have resulted in the five deltaic complexes of the Mississippi River deltaic plain. Considerable evidence indicates that under natural conditions another major crevasse would have developed at the Atchafalaya River confluence and the main channel would have shifted to a course down the Atchafalaya Basin because the distance to the gulf is considerably shorter and thus a steeper gradient exists. In 1963, the U.S. Army Corps of Engineers constructed the Old River water control structure to prevent this predicted river course shift from occurring. This structure permits only 30 percent of Mississippi River flow to go down the Atchafalaya Basin, as well as excessive spring floodwaters which otherwise would threatened Baton Rouge and New Orleans downstream.

While the Mississippi River and its distributaries are responsible for building up the delta, subsidence and the erosive forces of the gulf destroy it. Subsidence has perhaps the most widespread detrimental effect on the delta as it exists today.



SIGNIFICANT GEOLOGICAL FEATURES

MISSISSIPPI RIVER DELTA REGION

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NA/MRDR | 20135
DSC | APR 80

An extensive system of man-made levees has been constructed along the Mississippi and its distributaries to protect the people who choose to live in the natural floodplain of these waterways. By preventing flooding, these levees cut off the supply of new sediment and freshwater, the two most important factors responsible for creating and maintaining a deltaic system. Over the past 6,000 years, the Mississippi River has created, maintained, and continually expanded the deltaic plain. Currently, however, the heavy sediment load carried by the confined Mississippi River is being deposited into deepwater areas off the Continental Shelf and is not building new delta or helping to maintain existing coastal wetlands (Craig et al. 1979).

Today, largely because of the deprivation of sediment supply to the deltaic plain, land is being lost at an estimated rate of 16.5 square miles per year (Gagliano and van Beek 1975). Widespread downwarping has been occurring in the region, apparently at about the same rate, for thousands of years. Compaction of the loose sediments deposited by the river and associated squeezing of water from between the sediments also has presumably been occurring at a constant rate. However, because inorganic sediment input into the delta has been virtually eliminated, only the production of organic matter, largely vegetation, remains to maintain an emergent delta. While biological productivity is high, it is obvious that it has not been able to keep up with the loss to subsidence. In several areas around Lake Salvador, subsidence rates of 1 to 2 inches per year have been reported (LDWF 1979).

Due to subsidence and the general lack of sediment input to the deltaic plain, a much greater shoreline-gulf interface exists. This long interface provides an expansive area for shoreline erosion to occur and that is, in fact, what is happening. It is estimated that over the past 30 years approximately 500 square miles of delta have been lost (Gagliano and van Beek 1975).

As the shoreline retreats due to erosion and subsidence, saltwater intrusion becomes more of a problem. Canal building and dredging activities produce direct passages for saltwater intrusion, making this problem significantly greater than in the past. The prevention of important freshwater sources from entering the delta because of the levee system has likewise been a significant action increasing saltwater intrusion. With less freshwater to mix with saltwater from the gulf, many estuaries have become increasingly more saline. As salinities increase, ecosystems change and the highly productive intermediate and fresh marshes change to less productive brackish and salt marshes. Saltwater intrusion and associated vegetation changes have significantly altered the Barataria Bay estuary, moving oyster seed beds further north with the retreating freshwater, and they are similarly reducing habitat and nursery areas critical to other wildlife species.

There is a natural deltaic cycle of creation, growth, and destruction; however, the leveeing of the Mississippi River has interrupted this process. Thus, a vast majority of the Louisiana coastline is retreating, experiencing sediment starvation. Only the Atchafalaya delta complex is contrary to this trend and it is controlled by man.

Several geologic features associated with the Mississippi River deltaic plain are particularly noteworthy. Near the mouths of the major Mississippi River passes are numerous unique and unstable landforms known as mudlumps. These mudlumps, apparently unique to the Modern delta complex (Morgan 1980), are random upwellings of sediment from depths as great as 400 or more feet, where sediments are being deposited into deep water. These upwellings, virtually in a liquid suspension, are created as a result of extreme pressures from overlying sediments. They erupt through weak spots in the overlying sediments and may emerge from the water as islands or remain submerged as navigational hazards. The eruption is quite sudden, and once complete the process of erosion begins to destroy them (Morgan et al 1968). While these relatively small features are temporary and rarely become vegetated before eroding away, they are unique in the world and characteristic of the Modern delta complex of the Mississippi River deltaic plain.

Salt domes, although not unique to the Mississippi deltaic plain, are abundant in the area; perhaps the five best known are the piercement salt domes known as the Five Islands. They include Jefferson Island, Avery Island, Weeks Island, Cote Blanche, and Belle Isle. They extend in a more or less straight line northwest to southeast, from Jefferson Island, about 9 miles west of New Iberia, to Belle Isle, near the mouth of the Atchafalaya River. These five large domes, roughly 1 to 2 miles in diameter, rise approximately 75 to 160 feet above the surrounding landscape, which in most instances is marshland. They were formed when salt, originally deposited in sediment beds thousands of feet beneath the surface, became plastic under pressure and was extruded upwards through weak zones in the overlying beds. The resulting cylindrical plugs, usually capped with gypsum or anhydrite, did not penetrate the surface in most instances, but they deformed subterranean strata adjacent to the upswellings. Oil has been trapped in pockets created by this deformation, and as a result, salt domes are very important sources for petroleum production and storage.

The barrier island chains flanking the delta are remnants of the maximum extent of the various delta complexes. The materials that form them are deltaic sediments which have been supplemented by marine sediments and reworked by marine processes. These are typical barrier islands and are dynamic, changing with severe storm damage and also eroding due to marine processes. Because of the low wave energy environment, the islands remain low and no large dunes occur. Forests are absent. The islands do, however, shelter the waters behind them, regulating the estuaries through tidal passes and affording significant ecological habitats.

Cheniers and beach ridges also occur in the Mississippi River Delta. These features are similar in appearance; however, they have differing origins. Cheniers, taken from the French meaning oak covered ridge, are mounds of sand or shell debris swept inland over the deltaic plain by unusually strong storm surges. They form long, narrow, continuous ridges winding across the deltaic plain. Beach ridges are formed on delta shorelines and are made of materials from the beach. Beach ridges may subsequently become stranded by delta growth. Series of parallel beach ridges have developed at a few locations along the coastline and these

graphically attest to delta growth in the past. Both types of features are covered in woody vegetation, particularly live oak and palmetto, as a result of their comparatively high topographic position and correspondingly good drainage.

One other noteworthy geologic feature occurs along the coastline in only one limited area--eroded cliffs of Pleistocene material uplifted during salt dome formation, found at Cote Blanche. These vertical cliffs, varying from 20 to 30 feet in height, are composed of fine grained sediments, principally clay. A small clay beach at the foot of the cliffs is a remnant of the same formation, illustrating the erosive force of storms. Numerous old live oaks which have been eroded off the cliff tops dot the shallow waters at the base of the cliffs.

In addition to the otherwise typical geologic features forming the coastline, the Mississippi River Delta also has coastline composed of marshland. Marshes of all types--fresh, intermediate, brackish, and salt--may be found as seashore, depending on the proximity to a freshwater source. This condition is especially true where the extent of delta is changing rapidly and little protection exists to combat the erosive forces of the gulf. In large part due to rapid subsidence and erosion, both seashores and lakeshores are commonly composed of one wetland type or another. Formed originally by various means, including localized soil compaction, burns, and animal eatouts, small ponds grow quickly due to subsidence and erosion mainly. Lakes and ponds are also formed from abandonment of small distributaries or as in oxbow lakes, a stream changing course, cutting off a meander and leaving it isolated as a crescent-shaped lake. As these small ponds grow, they commonly connect with the gulf or a bay. Once connected, both saltwater intrusion and increasingly intense erosion can drastically alter the character of that area of wetland. Seen from the air, the delta marshlands are vast and typically riddled with lakes, ponds, and bayous of all shapes and sizes.

CLIMATE

Southern Louisiana's climate is largely determined by the Gulf of Mexico, its subtropical latitude, the northern continental landmass, and the Atlantic high-pressure system. The area is most frequently affected by tropical maritime air masses, which are transported inland by prevailing winds from the southeast. Summers are consistently hot and humid, but winter conditions are more variable as the result of alterations between cold polar air masses coming from the north and warm moist air coming from the gulf.

In summer maximum temperatures rarely exceed 100 degrees Fahrenheit because of the moderating effects of rain showers and cloudiness and the uniformly high humidity of the predominating tropical air mass. July and August are the warmest months in New Orleans, with mean temperatures of 83.1 and 83.4 degrees, respectively. The winters are usually mild with short cold spells. January is the coldest month in New Orleans with a mean temperature of 55.9 degrees (U.S. Dept. of Commerce, NOAA 1974).

Precipitation patterns in southern Louisiana are largely influenced by moisture from the Gulf of Mexico and the surrounding wetlands. Normal annual precipitation ranges from about 56 to 64 inches and is distributed relatively evenly throughout the year, with slightly greater amounts occurring during winter and summer months.

Humidity levels in southern Louisiana often reach 90 percent and higher. In general, humidity is highest during the early morning hours and decreases into the afternoon.

Severe storms are common and influence the natural resources in the region. Thunderstorms may occur during any month of the year but are particularly common in July and August. Statewide, tornadoes have occurred at a rate of 12 per year since 1921 (Calhoun 1979). Hurricanes are undoubtedly the most widespread and severe weather phenomenon that occur. The hurricane season is generally July through September, but they may also occur in June and October. From 1900 to 1979, over 85 storms of hurricane or tropical storm force either occurred in or threatened the Louisiana coast. While average tidal range is slightly greater than a foot, hurricanes often create higher storm surges. These abnormally high water levels cause extensive and prolonged inundation and ponding in the marshes and resultant loss of wildlife and habitat. Other factors causing periodic water level fluctuations include precipitation, surface winds, and diurnal tides.

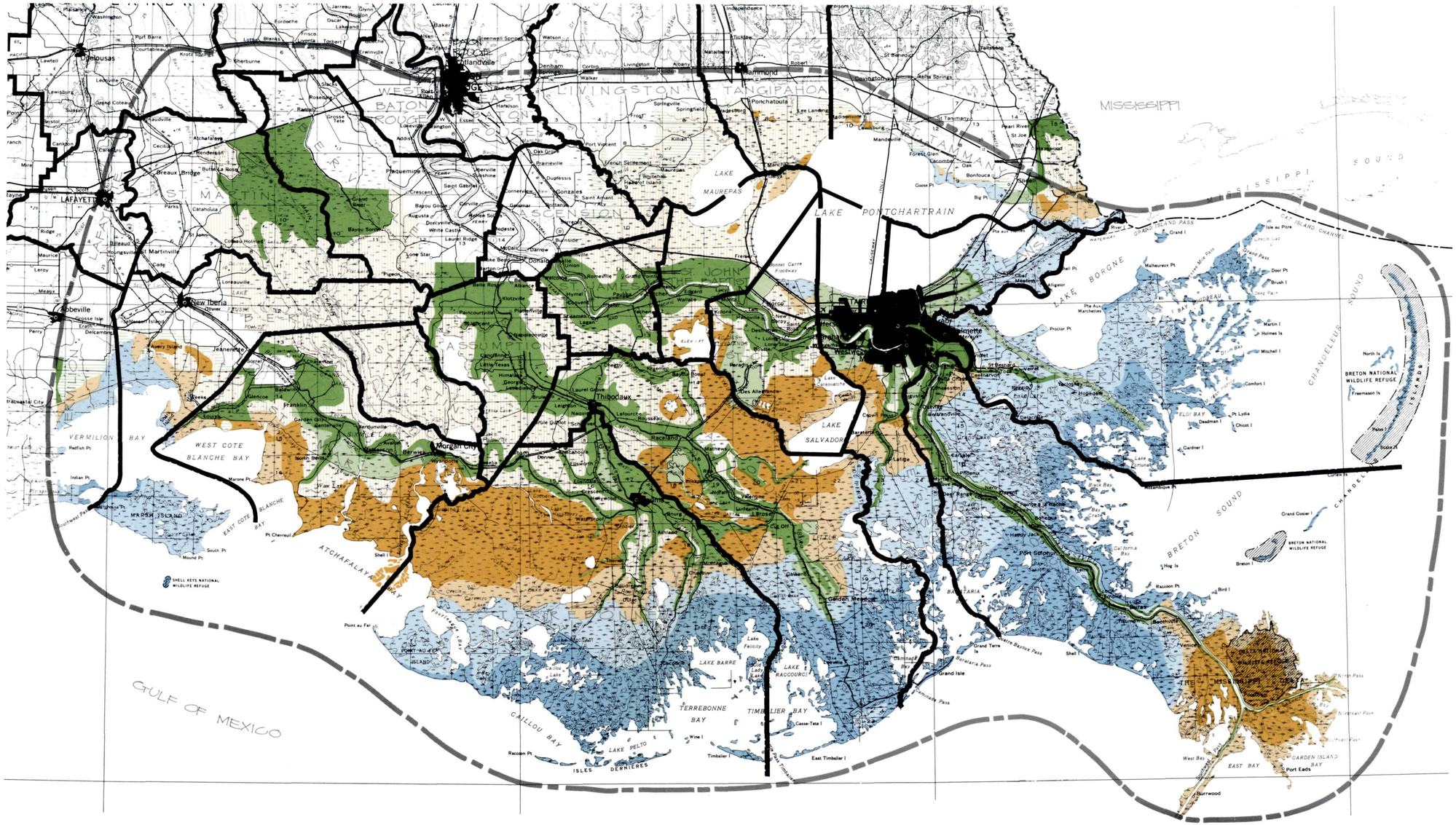
VEGETATION

The lush coastal marshes and wooded swamps of the Mississippi River Delta are one of the world's most biologically productive regions. The specific distribution of major vegetation types (see Vegetation Associations map) is largely controlled by water-related factors including degree of salinity and frequency and duration of flooding. These factors have been affected by man's actions in the delta, especially levee construction, agricultural and urban development, timber harvesting, and channel dredging. Such actions have greatly increased rates of change in vegetation patterns across the deltaic plain.

Major Vegetation Types

The native vegetation can be divided into 11 major types: submergent grass beds, salt marsh, brackish marsh, intermediate marsh, fresh marsh, cypress-tupelo gum swamp, bottomland hardwood forest, live oak ridge, pine forest, mixed forest, and upland hardwood forest. All but the last four types are influenced by regular flooding and are grouped as wetland types.

Submergent marine and estuarine grass beds are a rare but extremely important aquatic vegetation type occurring in several isolated locations centered around Terrebonne Bay and the Chandeleur Islands. The beds consist of turtlegrass, shoalgrass, manatee grass, gulf halophila, and syringodium in varying mixtures depending on the site (Burk and Associates 1976).



VEGETATION ASSOCIATIONS OF THE LOUISIANA COASTAL ZONE

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Salt marsh occurs in saline areas that lack freshwater input, and with some exceptions occupies a zone of varying width adjacent to the gulf. Predominant plants in this type are oystergrass, saltgrass, blackrush, and wiregrass. One notable, but infrequent, subtype in the salt marsh is the black mangrove shrub thicket. Black mangrove occurs in disjunct populations at several locations, particularly along the backsides of several barrier islands. These are the only areas in the northern portion of the Gulf of Mexico where this more typically tropical species occurs.

Brackish marsh, the most common marsh type in the region, occupies a broad zone just inland from the salt marsh. This marsh type exists where considerable mixing of freshwater and saltwater occurs, and it is generally termed an area of moderate salinity. Wiregrass is the major species, and three-cornered grass, coco, widgeongrass, and saltgrass are associated.

Intermediate marsh, the least common marsh type in the region, occurs in waters of low salinity. This relatively narrow band of vegetation is the transition from fresh marsh to brackish marsh and is the most productive of the coastal marshes. Typical vegetation consists of wiregrass, deer pea, bulltongue, wild millet, bullwhip, roseau, and sawgrass.

Fresh marsh generally exists in the most inland marsh areas and is not influenced by saltwater. It is comprised of the most numerous plant species of all the coastal marsh types, followed by intermediate, brackish, and finally salt marsh (Chabreck 1972). Fresh marsh, although diverse, is generally characterized by maiden cane, with important associates including bulltongue, spikerush, cattail, and pickerelweed. Two exotic species have become increasingly important, alligator weed and water hyacinth (see "Aquatic Weeds").

In general, the coastal marshes lack distinctive relief features and appear to be only slightly above mean sea level. Occasionally, linear evidences of abandoned distributary alluvial ridges interrupt the virtually uniform landscape. The coastal marshes provide two basic landscapes. Vast expanses of marsh are common; however, as subsidence and erosion increase and more dredged channels are created, the marshlands are increasingly becoming complexes of smaller islands of marsh. Ponds and lakes are becoming more common, and submergent aquatic vegetation may inhabit them. Generally, submergent aquatic plant abundance and diversity decrease with increasing salinity (Chabreck 1972). Furthermore, as the lakes become large, these plants, when present, are limited to isolated shallows near shore. Many of the submergent aquatics are highly prized waterfowl food and thus the numerous small shallow lakes and ponds provide ideal waterfowl habitat.

Cypress-tupelo gum swamps often abut fresh marsh but also are commonly associated with riverine floodplains. Cypress-tupelo gum swamps usually occupy slightly higher ground than fresh marsh, but once established they can exist in permanently flooded, moderately deep water areas. These communities are relatively simple floristically, with two dominant species, bald cypress and tupelo gum. Either of these two may exist in pure stands or in any admixture. Commonly associated, but much less important, species include swamp red maple, green and pumpkin ash,

swamp black gum, swamp privet, and buttonbush. Another species especially characteristic of the cypress-tupelo gum swamps is Spanish moss, a species which has been declining recently for unknown reasons. Water hyacinth and alligator weed, along with various submergent aquatic plants like coontail, fanwort, water milfoil, bladderwort, and elodea, are also abundant. Additionally, duckweed and waterfern generally cover broad expanses of still water, floating on the water's surface.

Bottomland hardwood forests are also associated with river floodplains, occurring on lands that are seasonally flooded in late winter and early spring. Behind the natural levee of the river are three types of minor relief--low ridges, flats, and sloughs--which are flooded for varying lengths of time each year. Cypress-tupelo gum swamps generally dominate the sloughs and flats, while bottomland hardwood forests flourish on the higher flats and ridges, where flooding occurs only for short periods, if at all. These hardwood forests are one of the most diverse and productive forest types in the southeastern United States. As many as 30 different tree species can comprise the canopy. Such forests attain their best development on the more protected older floodplain terraces or second bottoms. Due in part to the large amount of mast produced annually by the trees, bottomland hardwood forests provide extremely valuable habitat for a variety of wildlife.

Live oak ridge communities grow along the oldest alluvial ridges of abandoned major distributaries throughout the delta region. These long narrow stands of live oak break up the expansive marshlands in the southern portion of the delta and provide important refuge, especially during high water surges, for a variety of wildlife that inhabit the coastal marshes. Live oak also occurs on the mature natural levees that parallel the active major rivers throughout the region. It is considered the climax vegetation on top of these levees. Palmetto is a common associate, and Spanish moss commonly hangs from low live oak branches. On younger alluvial ridges cottonwood and willow comprise a pioneer community. They are also commonly seen on spoil banks beside dredged canals.

Pine forests are common only along the northern fringe of the study area. They grow on the adjoining Pleistocene Prairie Terrace formation in mineral soils that are rarely flooded. These forests are almost totally coniferous, with loblolly, slash, and longleaf pines predominating. Fire is commonly used to reduce competing undergrowth, so forest stands often lack a well-developed undergrowth. In less intensively managed pine forests, an understory of hardwoods occurs.

Mixed forest is the result of successional advancement, where some of the understory hardwoods grow into the canopy, sharing it with the older pines. Sweetgum, various oaks, sweetbay, red maple, and blackgum are particularly common deciduous trees occurring with loblolly, slash, and longleaf pines in the mixed forest type. Due to the commercial interest in harvesting pine, mixed forest stands are uncommon, and timber harvest or some other form of land clearing generally occurs before pure upland hardwood stands develop.

Upland hardwood forest is the rarest forest type within the region and is limited to remnants on the piercement salt domes. Dominant trees are live oak, magnolia, sweetgum, and hickory. A conspicuous understory of dwarf palmetto, yaupon, French mulberry, and various immature trees exists, and numerous ferns and other mesic species provide a comparatively well-developed ground cover. These forests support many plants that do not otherwise occur in the delta.

Endangered and Threatened Flora

None of the flora of Louisiana has been officially listed by the U.S. Fish and Wildlife Service as threatened or endangered. Three plant species from Louisiana are currently listed as candidate endangered species; however, they are not known to occur within the Mississippi River Delta Region.

Aquatic Weeds

The exotic water hyacinth is found in all freshwater areas and easily spreads through the system of canals, waterways, and bayous. Water hyacinth decreases light penetration needed for submergent aquatic vegetation and fishes, and its decomposition lowers the already low dissolved oxygen in blackwater swamp systems to near dangerous levels for aquatic life. Many waterways become impassable when invaded by this plant, and some must be cleared by periodic chemical spraying by state or local governments. Such spraying is only a temporary solution and may have broader ecological ramifications. Considering the importance of waterways to the region's transportation system, aquatic weeds are a potential problem to industrial development, commerce, and recreation. Other exotic weeds have similarily restricted waterways and wetlands.

WILDLIFE

The Mississippi River Delta is one of the most important wildlife regions in the nation. It contains general habitat or vital nesting areas for 12 endangered or threatened species, critical wintering grounds for millions of waterfowl, 132 seabird and wading bird nesting colonies and rookeries, prime nursery areas for estuarine-dependent animals, significant furbearer habitat, and general habitat for white-tailed and marsh deer and black bear (see Significant Wildlife Areas map).

Located at the terminus of the Mississippi Flyway, the largest migratory bird route in North America, the Louisiana coastal area is one of the nation's most important wintering areas for waterfowl. An estimated 6 to 8 million waterfowl, largely represented by geese, dabbling and diving ducks, and coots, overwinter here yearly. More blue and snow geese overwinter in Louisiana than anywhere else in the world; as many as 400,000 individuals may be present during any given winter (LDWF 1978b). During spring, particularly during inclement weather, great numbers of transient passerine birds migrating northward across the gulf use the Louisiana coastal area as a critical resting place enroute to breeding territories further north (Lowery 1945, 1974b).

The numerous estuaries, being extremely productive interface areas with varying levels of salinity, are of special significance for their critical ecological role in providing breeding and nursery areas for over 100 estuarine-dependent fish and shellfish species. These include the bay anchovy, Atlantic croaker, Atlantic threadfin, Gulf menhaden, spot, blue crab, and brown and white shrimp (Burk and Associates 1976). The estuarine marshes provide ideal habitat for large populations of nutria and muskrat as well, resulting in Louisiana's ranking as the nation's top producer of wild furs.

Major Habitat Types

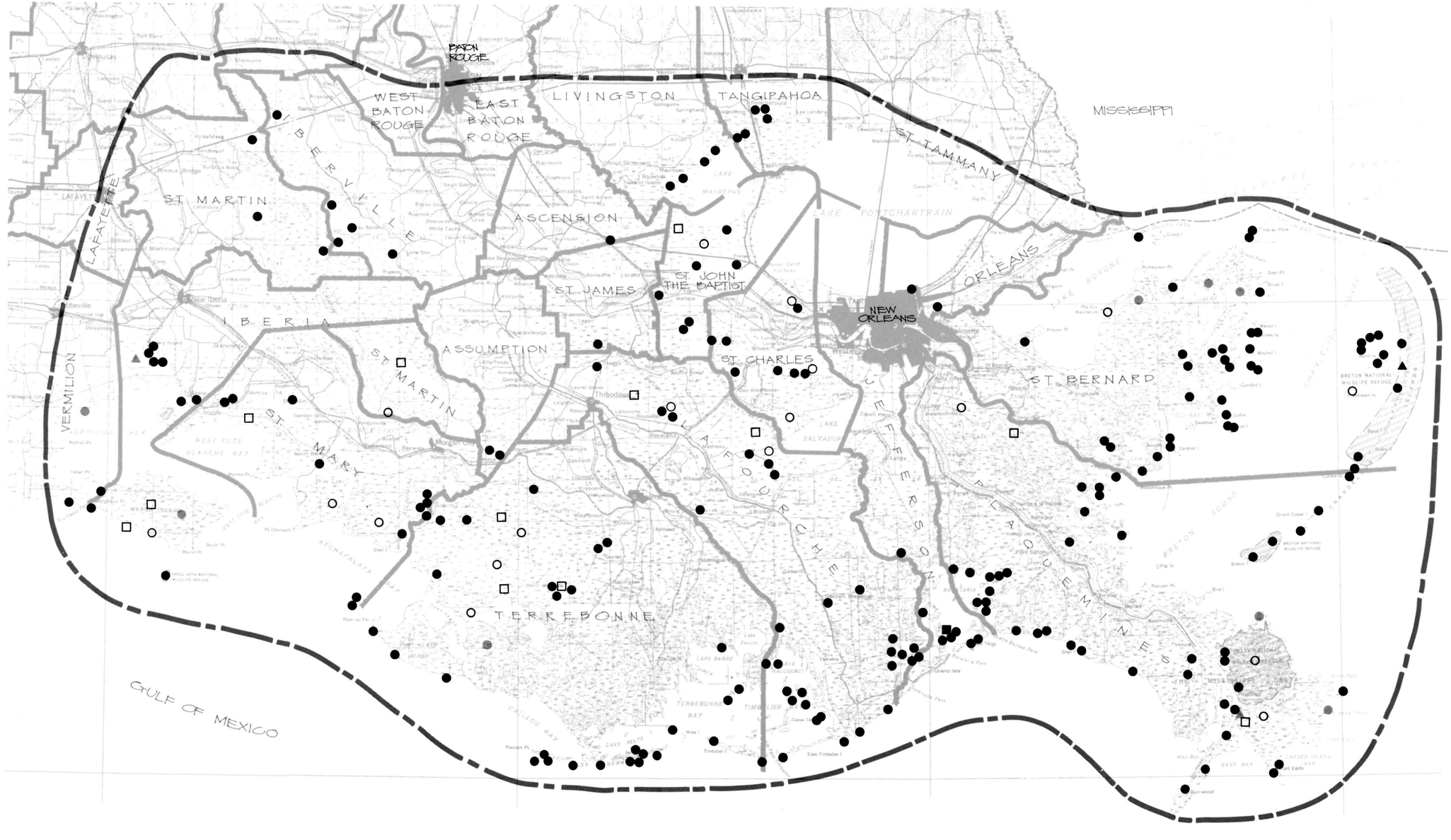
Habitats ranging from upland forests to marine environments support a great variety of wildlife. In the Barataria Basin alone, 24 species of mammals, at least 40 species of reptiles and amphibians, and 216 species of birds are known or are likely to occur in the various habitats. Some forms of wildlife occur in many or all of the habitat types in the study area. For example, the swamp rabbit, muskrat, nutria, mink, raccoon, otter, and American alligator are found in habitats ranging from forested wetlands to salt marsh (Bahr and Hebrard 1976). Agricultural areas in the region are also important to wildlife, providing habitat for species such as cottontail rabbit, fox, dove, snipe, white-tailed deer, and various waterfowl.

The following is a description of the wildlife occurring in the region by specific habitat type.

Upland forest habitat includes the pine, mixed, and upland hardwood forest types previously described. The majority of this habitat type occurs at the extreme northern edge of the region and on the piercement salt domes. In general, wildlife species diversity increases with increasing hardwood composition. Uplands provide habitat for white-tailed deer, squirrel, rabbit, fox, armadillo, bobcat, oppossum, raccoon, quail, turkey, hawks, owls, and many passerine birds. Major reptiles include rattlesnakes, copperheads, turtles, and lizards.

Bottomland hardwood forests and cypress-tupelo gum swamps are highly productive. Among the wildlife species using this habitat type are white-tailed deer, black bear, muskrat, nutria, mink, raccoon, otter, rabbit, owls, kingfishers, herons, and egrets. More species of reptiles and amphibians occur in the forested wetlands than in any other habitat type in the region (Bahr and Hebrard 1976). Swamp forest waterbodies, such as freshwater lakes and bayous, support a variety of fish and crustaceans. Among the fish species present are largemouth bass, black crappie, bluegill, bowfin, and several species of catfish, most notably the blue and channel catfish. Crawfish, a commercially significant crustacean, is also harvested from swamp forest waterbodies; within the region, the largest populations occur within the Atchafalaya River Basin.

Fresh marshes contain the greatest concentrations of alligators and nutria of all the marsh types. Furbearers such as mink, raccoon, otter, and muskrat are also found in this habitat type. Other wildlife species inhabiting fresh marsh include oppossum, water snake, cottonmouth



SIGNIFICANT WILDLIFE AREAS

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moccasin, hawks, bitterns, gallinules, red-winged blackbirds, herons, and egrets. Live oak and other natural ridges that extend into the interiors of fresh marshes provide habitat for deer, squirrels, and rabbits. The fresh marshes also provide critical feeding and wintering habitat for waterfowl.

Waterbodies associated with fresh marshes in the region include bayous, canals, and lakes, such as Salvador and Catouatche. Crustaceans include crawfish and freshwater shrimp. Among the fish species present are bluegill, largemouth bass, bowfin, black crappie, carp, pirate perch, spotted sunfish, and catfish. Blue and channel catfish, the most significant fish species caught for food in the fresh marsh waterbodies, are also harvested in quantity from the swamp forest waterbodies.

Brackish and intermediate marshes are transition areas between fresh and saltwater environments. Muskrats are most abundant in the brackish marsh habitat. Other abundant wildlife species include wading birds, small mammals, and water snakes. The brackish marshes also provide critical wintering habitat for waterfowl. Associated waterbodies provide habitat for rangia clam and blue crab and are important nursery areas for juvenile shrimp and various fish species, including flounder, speckled trout, spot, croaker, and drum.

Salt marshes are commonly inhabited by raccoon, muskrat, mink, wading birds, rails, shorebirds, diving ducks, skimmers, gulls, terns, and the gulf salt marsh snake. The salt marshes also provide habitat for such rare bird species as the brown pelican, reddish egret, osprey, and arctic peregrine falcon.

Like the brackish marsh estuaries, salt marsh estuaries are significant nursery areas for commercially important fish and shellfish. Of the marsh habitats, the salt marshes have the highest ratio of water to wetland and are most frequently flooded (Bahr and Hebrard 1976). Among the fish species present in the salt marsh estuaries are drum, pin fish, flounder, croaker, and speckled and sand trout; menhaden and mullet use this habitat as nursery areas. Shrimp is harvested in quantity from the salt marsh estuaries--two of the most productive shrimping areas in the state are the Barataria and Terrebonne estuaries, both in the delta region (Bahr and Hebrard 1976). Oysters and blue crabs are also common.

Offshore marine environments provide spawning grounds for many estuarine-dependent species, such as shrimp and menhaden. The deep tidal passes are significant migratory pathways between the estuaries and offshore areas. Besides menhaden, other important saltwater fish include drum, flounder, mackerel, redfish, speckled trout, grouper, and mullet (LDWF 1978). Major saltwater sportfish include blue marlin, bonita, wahoo, sailfish, and pompano.

The offshore barrier island systems and exposed shell reefs provide important nesting areas for colonies of seabirds including black skimmers, gulls, terns, and pelicans.

The shallow offshore waters between Marsh Island and Birdfoot Delta are one of two prime foraging areas for the endangered Kemp's ridley turtle,

the other one being near Campeche, Mexico (U.S. Dept. of Commerce, NOAA, Marine Fisheries Service 1980). The Atlantic loggerhead turtle is known to nest on the Chandeleur Islands. The leatherback sea turtle is an occasional forager and migrant through the adjacent shallow offshore waters of the region.

The coastal waters of Louisiana provide important habitat for several species of marine mammals. A total of 11 species of whales and dolphins have been documented (Lowery 1974). Of these, the only common inhabitant is the Atlantic bottlenosed dolphin.

Although quite uncommon, the West Indian manatee is considered to be a Louisiana inhabitant on the basis of two animals found dead in Cameron Parish and a live sighting recorded in Lake Saint Catherine, Orleans Parish.

Endangered and Threatened Wildlife

A total of 12 federally designated endangered and threatened species are known to occur or may exist in the region (USDI, FWS 1979).

The American alligator ranges throughout the entire region. Alligator populations reached their lowest levels near the end of the 1950s. In 1960, protective measures of a 60-day hunting season and a 5-foot minimum size limit were first established. In 1966, the alligator was officially listed as a federally endangered species, and laws prohibiting interstate shipment of poached animals were enacted in 1970. Since then the alligator has been reclassified as threatened in Ascension, Iberville, Saint Martin, Assumption, Orleans, Saint James, and Saint John the Baptist parishes and the southern portions of Livingston and Tangipahoa parishes; in Saint Mary, Iberia, Lafourche, Saint Charles, Terrebonne, Jefferson, Plaquemines, Saint Tammany, and Saint Bernard parishes, the alligator is now classifed as "threatened by similarity of appearance." As of 1977, the estimated population of alligators in coastal Louisiana was approximately 250,000 (LDWF 1977).

Sea turtle species occurring in Louisiana's coastal waters include the endangered Kemp's ridley and leatherback turtles and the threatened loggerhead. The Kemp's ridley turtle was recently designated as one of the 10 most endangered species in the United States.

Several endangered bird species may exist in the study area. The endangered southern bald eagle overwinters in southern Louisiana, and 16 active bald eagle nesting territories are known to exist in the delta region. The only nesting rookery of the endangered brown pelican, Louisiana's state bird, exists on Queen Bess Island in Barataria Bay. The red-cockaded woodpecker, which prefers to reside in pine trees, is known to exist in Tangipahoa, Saint Tammany, Livingston, and East Baton Rouge parishes. The ivory-billed woodpecker is classified as endangered but may now be extinct; it was once a resident of the bottomlands in the southern portion of the Mississippi River Delta, but the last reliable sighting in the region was recorded in 1971. If not already extinct, the endangered Bachman's warbler may also exist in the

bottomlands of the delta; no recent sightings of Bachman's warbler have been made in the region. The Eskimo curlew, an endangered shorebird, migrates from South America to the arctic tundra each spring and uses the coasts of Louisiana and Texas as stopover points along the way. The endangered arctic peregrine falcon is believed to be a winter resident in Louisiana and may feed in the inland marshes.

At one time, the endangered Florida panther ranged in the delta region. Whether the panther still exists in the region is questionable, although several unsubstantiated sitings have been reported.

Recovery of American and Snowy Egrets

A unique wildlife harvest of the late 19th century almost resulted in the extinction of American and snowy egrets in the delta region. Before 1875, wading birds were subjected to only sport shooting; but when plumed hats came into style they became highly exploitable. Adult birds were shot primarily during nesting season, when they were carrying their brilliant plummage, leaving the young to starve. A 1903 account from a single London feather auction showed that 192,960 birds had been killed at their nests, and two to three times that number of young or eggs destroyed (Grossman et al. 1969). The slaughter resulted in strong public protest and gave early conservation groups an illustrative issue. By 1914, the combination of public opinion, restrictive trade laws, and a change in fashion had saved the rookeries.

SOCIOECONOMIC ENVIRONMENT

HISTORICAL DEVELOPMENT

The historical development of the delta region has been largely dependent on the engineering of water transportation routes and on the construction of levee systems and drainage projects designed to overcome the severe development constraints posed by a natural wetland system.

The earliest focus of economic activity was agriculture. The characteristics of the southern Louisiana environment made the area a prime location for growing cotton and sugarcane. To gain access into the rich bottomlands and drain them for farmland, early settlers constructed canals that also served as waterways for moving cotton and cane to processing centers. At about the same time, early trappers, fishermen, and loggers developed additional waterway systems of canals and shallow "trainesses." With the development of these water transportation routes and the expansion of farming in the central United States, the city of New Orleans became a major trading center. Exploration for oil and gas in the wetlands spurred additional waterway development. Existing canals were expanded and new channels developed to reach potential oil and gas fields.

In 1927, after a disastrous flood, the federal government enacted a comprehensive levee and flood protection program. This project initiated the modern large-scale economic growth of the region. Since then, extensive wetland areas have been drained for development and agricultural activities, and the region has become criss-crossed with man-made and modified watercourses, facilitating transportation and natural resource exploitation.

The socioeconomic growth of the region has been accompanied by considerable, and in some cases irreparable, disruptions to the natural systems of the region (see "Physiography and Geology"). Since much of the delta system is less than 1 foot above sea level, something must be done to offset the rapid effects of subsidence, or much of the system will be covered with water. In an effort to partially offset this trend, a few small-scale experimental projects are being undertaken to provide sediment nourishment and freshwater to subsiding wetlands. If successful, similar large-scale projects will hopefully be implemented.

As growth of the delta population and man's activity increase, pollution and disposal of hazardous wastes have also become potential problems. With many areas of the region being used for industry, oil and gas production, and mining activities, brines, chemicals, and other harmful and toxic substances are rapidly being transported throughout the system, resulting in potentially harmful conditions for man and natural resources. The value of wetlands in treating wastes is well documented, but wetlands are constantly decreasing in the Mississippi River Delta.

Because of the demonstrated effects of man's activities on the natural environment, trends in these activities are of particular concern to a study of remaining natural areas. The remainder of this section

summarizes these trends and their potential future effects on nationally significant natural areas.

SOCIOECONOMIC TRENDS

Oil and Gas Activity

Oil and gas exploration, development, and production activities will continue to intensify in the future as more resources are discovered and reserves proven, or as existing proven reserves become profitable to extract. Today, oil and gas production and proven reserves in the Mississippi River Delta and Gulf of Mexico comprise 51 percent of the nation's total, excluding Alaska. More than 19,000 offshore wells have been drilled near the United States in the Gulf of Mexico, and nearly 90 percent of them are south of Louisiana and the Mississippi River Delta (USDI, FWS 1979). Furthermore, the needs of the industry have spurred secondary growth in ship building, marine supply, onshore processing, transportation, and production of petroleum and petrochemical products. This has placed a severe strain on natural resources within the delta region, especially upon land with access to the area's waterways. From 1971 to 1977, there were 17,994 onshore and offshore oil and gas wells (field and wildcat) drilled in the state. Of the 2,865 onshore wells drilled in 1977, 852 (approximately 30 percent) were drilled in the districts of Houma, Lafayette, and New Orleans, an area that encompasses most of the study region. Successful completion ratios were 1:11.9 for wildcat wells and 1:1.3 for field wells (LDC 1978).

The sensitive nature of the resources of the delta region render them susceptible to disruption from any activity or development resulting from oil and gas operations. Examples of such disruptions include vegetation loss due to dredging and use of heavy equipment; loss of aquatic organisms due to turbidity, sedimentation, and oxygen depletion; blockage or alteration of natural water flows by spoil banks and canals; increased marsh drainage; lowering of the water table; saltwater intrusion; displacement of sensitive wildlife due to noise; and wetland and canal bank erosion caused by boat traffic. However, these effects can be lessened by careful planning and a knowledge of resource constraints.

The 1980 U.S. production of crude oil is expected to hold steady at the 1979 rate of 8.55 million barrels per day (down 2 percent from 1978), and natural gas production is expected to drop 0.7 percent. The total number of wells forecast to be drilled in Louisiana in 1980 is 4,621, up 1.1 percent from the estimated 4,124 drilled in 1979 (Beck 1980).

Mining

Salt and sulfur mining operations are relatively small compared with the pervasive oil and gas activities. There are currently six sulfur mining areas in coastal Louisiana including the large operation of the Freeport Sulfur Company in lower Barataria Bay. There are five operating salt mines associated with the Five Islands piercement salt domes. While sulfur production has declined in recent years, the mining of salt appears

to have remained constant, and numerous salt deposits are available for exploitation if market values and demand become favorable. These operations have relatively minor potential for significant disruption of the environment.

Water Transportation

Because the development of roads and rail systems is limited by the expanse of wetlands, the region still depends heavily upon canals and natural water courses for transportation. There are 16 major and 12 secondary transportation canals, rivers, and bayous maintained in the region today; other canals densely interlace the coastal zone. The Gulf Intracoastal Waterway, built to facilitate transportation of crude petroleum to Gulf Coast refineries, is the nation's most important inland waterway and second only to the Mississippi River in regional shipping tonnage. Because of the importance of the region's water transportation routes, canal dredging is expected to continue at existing or increased levels, with associated impacts including direct land loss from dredging, spoil deposition, and alterations in hydrology.

Agriculture

Expanding agricultural activity in the region creates continuing demand for arable land. Major field crops include sugarcane, rice, corn, soybeans, and vegetables; livestock production and dairy farming are secondary agricultural activities. During the soybean boom of the late 1960's, conversion of forests and wetlands to agricultural use increased dramatically. Between 1962 and 1968, lands were cleared at a rate of over 111,000 acres per year, reducing the woodlands to about 45 percent of their original extent (USDI, FWS 1978b). Such land clearing has had significant secondary effects on wildlife populations and water quality. Demand for agricultural land will continue, but competing demands for land for commercial, residential, and industrial purposes is forcing a move toward fewer larger farms that utilize modern mechanized farming methods.

Timber Harvesting

The forest products industry has been growing in Louisiana. Lumber production increased 25 percent and pulpwood production quadrupled between 1947 and 1969. The majority of Louisiana's 14.5 million acres of forestlands are privately owned and located outside the delta region.

At one time, there was an extensive cypress timber industry in the delta, and practically all the swamp forests were harvested. The fan-shaped logging canals developed during this period are still evident in many of the swamps in the region, but the forests have recovered and many are nearly mature again. The clearing of land may result in these forests being reharvested.

Urban Development

The climate, concentrations of resources, and other amenities of coastal Louisiana attract a constantly growing population. Population growth in the coastal zone historically followed the limited corridors of high ground, primarily natural levees; however, as this land has become increasingly scarce, residential and commercial areas are expanding into adjacent wetlands and swamp and bottomland hardwood forests. In many cases lands cleared behind artificial levees are unsuitable for development and cause severe structural problems.

Population growth in the coastal area of Louisiana is expected to reach almost 3 million by the year 2000 (LDTD 1976), with much of the impact felt in Saint Tammany, Saint Bernard, and Jefferson parishes around New Orleans and also major industrial and port cities such as Baton Rouge, Lafayette, Morgan City, and Houma. This population growth will require additional land for housing and support services. The Louisiana Coastal Resources Program (LDTD 1977) estimates that approximately 614,326 acres of land (exclusive of Plaquemines Parish) had been developed in the coastal parishes of the region by 1975. Land development activities in the region are projected to increase by 15.6 percent by 1985, reaching more than 700,000 acres. This additional development will further increase competition for suitable land to be "reclaimed" from wetlands and swamp and bottomland forests and severely challenge an already stressed natural land base.

Fish, Shellfish, and Wildlife Commerce

Hunting, trapping, and fishing are traditional commercial activities in Louisiana. The state leads the nation in annual wild fur production. Muskrat was the most important Louisiana furbearer until about 1962, when it was replaced by the nutria, an exotic species introduced from Argentina in 1938. Because nutrias prefer freshwater habitats and muskrats prefer more brackish areas, interspecific competition does not appear to have been a major factor in the rapid rise in prominence of the nutria. More likely, the muskrat declined as a result of habitat loss due to such factors as hurricanes, industrialization, and ecological succession. Since the nutria became Louisiana's major furbearer, production has never fallen below one million pelts annually. An all-time high of nearly 1.9 million nutria were harvested in 1976-77. Other commercially important furbearers include raccoon, mink, otter, fox, and beaver. The total fur harvest of the 1976-77 Louisiana trapping season was valued at nearly $25 million (LDWF 1978).

A limited hunting season on alligators is regulated by the state in the nine parishes in the region where it is classified as threatened by similarity of appearance. During the 1979 season, 16,051 hides were taken in Louisiana, valued at approximately $1.6 million (LDWF 1980).

The menhaden fishery in the Gulf of Mexico is the largest in the nation; in 1973 approximately 32 percent by weight of all the fish and shellfish landings in the United States was gulf menhaden. Of the total gulf menhaden catch for 1970 through 1977, Louisiana waters accounted for

81.3 percent (LDWF 1978). Most of the fishing occurs in offshore waters using purse seines, and the majority of the harvest is taken within 3 miles of shore. In 1976, over one billion pounds of menhaden, valued at over $46 million, were landed in Louisiana. Other commercially significant saltwater fish yielded approximately 13.5 million pounds in 1976 with a dockside value of $4.3 million. Redfish and speckled trout accounted for approximately 30 percent of the total catch of saltwater fish. The combined landings of freshwater fish in 1976 totaled nearly 17 million pounds with a dockside value of over $4 million.

Commercial crawfishing is unique to Louisiana. The largest populations occur in the Atchafalaya, Red, and Pearl river basins. An average of 15 million pounds of crawfish are harvested annually from the Atchafalaya (LDWF 1978).

Louisiana ranks first in the nation in the production of shrimp. Brown and white shrimp are the most important commercial species. Using powerboats and seagoing trawlers equipped with butterfly nets and otter trawls, Louisiana fishermen have harvested an average of 38 million pounds of shrimp a year since the late 1950s. Although the shrimp industry is second to menhaden in terms of total pounds landed, it ranks first in total value. the value of wholesale shrimp products averaged approximately $67.6 million annually during the period 1970-74 (LDWF 1978).

Louisiana usually ranks second to Maryland in oyster production. Annual yields for the past 20 years have averaged approximately 9 million pounds with a dockside value ranging from $6 million to $10 million (LDWF 1978). The primary commercial species is the American oyster. To ensure a constant supply of young oysters, the state manages designated seed grounds and transplants oysters to privately leased beds. Over this century, the number of individuals procuring private leases has decreased from 1,700 in 1913 to 1,371 in 1977; however, the total acreage of oyster beds under lease has increased from 17,000 to nearly 81,000 during this period.

Another significant commercial activity in the region is crabbing. Blue crabs are harvested the year around, in both soft-shell and hard-shell forms. Blue crab yields vary from year to year. During the past 40 years they have averaged about 13 million pounds annually, reaching a peak of 23.1 million pounds in 1973. The average dockside value of blue crab was 84 cents a pound during the period 1970-76 (LDWF 1978).

Recreation

The major recreational activities occurring in the region are hunting, sport fishing, shrimping, frogging, crabbing, crawfishing, and boating.

Recent estimates indicate that sport hunting generates over $80 million in expenditures by hunters statewide each year (LDWF 1978). Ducks and geese are the major hunted species. During the 1977-78 season, approximately 2.8 million birds were bagged statewide, of which over 60 percent were taken in the coastal zone (USDI, FWS 1979). A number of

state and federal areas have been established to aid in management of waterfowl in Louisiana. Within the region there are nine state widlife management areas, a state wildlife refuge, and three national wildlife refuges. Together, the nine state wildlife management areas total about 377,000 acres, while the state wildlife refuge and the three federal refuges total about 78,000 acres and 53,300 acres, respectively. These areas are open to the public, and hunting is permitted.

On the basis of total licenses sold, sport fishing is the most popular recreational activity in Louisiana. In addition to fishing from shore and from boats, fishermen can charter boats to take them to the offshore oil platforms, which serve as artificial reefs and attract concentrations of saltwater fish. Flounder gigging is also quite popular, occurring primarily in shallow waters. The annual estimated value of freshwater sportfishing in Louisiana is $286 million, and saltwater sportfishing is valued at $181 million (LDWF 1978).

It is estimated that the yearly recreational harvest of blue crab is four times the commercial yield. The blue crab is quite abundant and is found in nearly all the available aquatic habitats. During the summer months, a greater abundance of food in the upper reaches of the estuaries attracts blue crabs into areas where they are easily caught.

Recreational shrimping, like commercial shrimping, is allowed only during the designated season. Cast nets were once widely used to catch shrimp but they have been replaced by small motor boats equipped with shrimp trawls. No special license is required for daily harvests of up to 100 pounds of shrimp.

Frogging is extremely popular in Louisiana, which many consider to be the nation's foremost frog-catching state. Currently, this activity occurs during all months of the year except April and May. The use of firearms is prohibited--frogs may be taken only by mechanical devices that do not puncture the skin, such as frog grabs. Louisiana is currently considering a season and bag limit because overharvesting and the destruction of backwater spawning areas by clearing and draining activities threaten frog populations. Recreationists also use nets and baited traps in swamps and marshes throughout the state to catch crawfish.

Many recreationists in the Louisiana coastal zone use "fish camps" as a base for their hunting, fishing, and trapping activities. Over 10,000 of these fish camps exist in the coastal swamps and marshes, and nearly 60 percent of them are concentrated within the delta region in Terrebonne, Jefferson, Plaquemines, and Orleans parishes. Statewide, more than one-third of the camps are accessible only by water (USDI, FWS 1979).

There are eight state parks and commemorative areas in the region, all administered by the Office of State Parks of the Louisiana Department of Culture, Recreation and Tourism. A plan has been adopted to improve and expand the state park system through a number of projects, including beach restoration, development of fishing piers and trail systems, and establishment of new areas.

A state system of natural and scenic streams, administered by the Louisiana Department of Wildlife and Fisheries, is another valuable recreational resource. The system contains a total of 43 rivers, 19 of which are within or near the delta region.

It was estimated that in 1970 approximately 8 million user days were spent in resource-based activities such as hunting, fishing, crabbing, and crawfishing. As the population expands, this use is expected to exceed 10.3 million user days by 1985. Participation in other recreational activities--swimming, camping, boating, picnicking--is also expected to rise significantly by 1985, primarily in the urbanized portions of the study area (USDI, FWS 1979).

NATIONALLY SIGNIFICANT NATURAL AREAS

METHODOLOGY FOR DETERMINATION OF NATIONALLY SIGNIFICANT AREAS

Fifteen natural areas have been determined to be nationally significant examples of the natural resources of the Mississippi River Delta Region. A map of these areas is provided at the back of this document, and they are inventoried in the following section. These areas were identified using existing studies, aerial photography, consultation with regional experts, and comparative onsite analyses by the study team.

The team first consulted existing studies of the delta region. Some of the major sources of information were "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978), and the Louisiana Statewide Comprehensive Outdoor Recreation Plan (LDCRT 1977).

When all of the available information was compiled on a series of natural resource maps, they indicated 30 natural areas that might meet the criteria of national significance developed for this study. Regional experts were consulted to ensure that appropriate study areas had been identified and to establish the general boundaries for each area.

All of the 30 areas but one were then observed from the air and inspected on the ground by the study team. It was impossible to inspect the Chandeleur and Breton barrier island system because of weather; however, existing aerial photos and resource information were determined to be adequate to evaluate the significance of this area.

A number of criteria were considered in evaluating and ranking each of the 30 areas identified as having potential for national significance. The major criteria related to how well each area represents the delta region. The natural history themes and subthemes listed in Part Two of the National Park System Plan: Natural History (USDI, NPS 1972) were expanded and refined to create a comprehensive listing of the geological phenomena, landforms, ecosystems, and wildlife values inherent in the Mississippi River Delta Region (see Natural Area Significance Summary chart). Only the areas that best represent these themes were considered to be nationally significant. The criteria used for evaluation were

number of themes and subthemes represented

quality of theme representation

uniqueness of subtheme to the delta region

site protectability, particularly as it relates to large size and presence of natural boundaries

degree and extent of existing disturbance

Based on these criteria, each area was given one of the following significance ratings:

1 Area is nationally significant, highly diverse, with many themes and subthemes represented, and generally large.

2 Area is nationally significant, less diverse, with fewer themes and subthemes represented, and generally smaller; area may contain best remaining example of a single subtheme.

3 Area is not considered nationally significant.

Fifteen of the study areas were rated as nationally significant examples of the natural resources of the delta region. These areas are described in the following inventory. The remianing 15 areas, which were not considered to be nationally significant, are listed in appendix B, along with a brief rationale for each determination. While determined to be less than nationally significant examples of the delta region, all of these areas are important parts of the delta system and contribute to its overall productivity and value.

Each of the 15 nationally significant areas was further evaluated to determine the potential for resource disruption. Two criteria were used for this evaluation:

type, scale, and imminence of man-caused disruption

level or degree of existing protection

Based on these criteria, each nationally significant area was given a disruption potential rating, as follows:

A Area is seriously threatened with imminent large-scale disruption.

B Area is imminently threatened with small-scale disruption.

C Disruption of area is likely but not imminent.

D Area is in no apparent danger of disruption or is presently protected.

These disruption potential ratings may change quickly if current land use plans are modified.

In the following inventory, the nationally significant areas are listed in order of their two-part ratings. All of the significance-1 areas are listed first, followed by the significance-2 areas, in order of their descending disruption potentials (A through D).

INVENTORY OF NATIONALLY SIGNIFICANT NATURAL AREAS

The following section describes 15 natural areas that typify the major characteristics of the delta region and are considered to be nationally significant.* These areas are identified on the Study Areas map in the back of this report.

Each area has been inventoried for its significant natural resource qualities and other considerations that may contribute to its overall value, such as proximity to an urban area, utility for education and scientific study, value as a baseline area due to a past research record, recognition of significance from other studies or experts, recreational significance, and scenic value.

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*One area that is not listed in the inventory but which the team felt to be of national significance is the Pearl River Wildlife Management Area in Saint Tammany Parish. This state-owned area, sometimes known as Honey Island Swamp, is a complete river swamp system with bottomland hardwood forest and cypress-tupelo gum swamp, leading downstream into intermediate and brackish marsh. The area is not included in this inventory because it is situated almost totally outside the delta region study boundary.

LAKE MAUREPAS AREA

Rating: 1 A

Size: 279,750 acres

Location: This area is centered approximately 32 miles northwest of New Orleans and approximately 44 miles east-southeast of Baton Rouge. It comprises portions of Saint John the Baptist, Saint James, Ascension, Livingston, and Tangipahoa parishes. Interstate 10 traverses the southern portion of the area and Interstate 55 approximates the eastern boundary.

Ownership: State and multiple private

Description: Lake Maurepas, a remnant of the Pontchartrain Embayment, is a large shallow, virtually freshwater lake. Three principal rivers flow into the lake--the Blind, Amite, and Tickfaw--and Pass Manchac and North Pass connect it with Lake Pontchartrain to the east. Surrounding Lake Maurepas is one of the finest expansive cypress-tupelo gum swamps remaining in the region. Dominant trees include bald cypress, tupelo gum, swamp red maple, swamp tupelo, and green ash. The slightly higher ground is vegetated in a bottomland hardwood forest of water oak, laurel oak, sweetgum, water locust, bitter pecan, and many other species. The area abuts the higher Pleistocene Prairie Terrace to the north and west, and some portions of that terrace, which are vegetated in upland pine forest dominated by loblolly and slash pine, are included within the study area boundary. A few restricted areas of freshwater marsh, including an old lake bed, are also present. They are characterized by various rushes, cattail, pickerelweed, bulltongue, maidencane, water hyacinth, penny wort, alligatorweed, and water plantain.

The area is extremely important for fauna as well. It is known for harboring peak concentrations of American alligators and also duck and white-tailed deer populations. Ten separate wading bird rookeries have been identified within the area (USDI, FWS 1977). Most of these rookeries contain great blue herons, great egrets, and cattle egrets; one has been estimated to contain 60,000 white ibis, many times more than any other white ibis rookery in coastal Louisiana, Mississippi, or Alabama. One of the 16 active southern bald eagle nesting territories in the region occurs within the cypress-tupelo gum swamp. The eastern portion of the lake and Pass Manchac are considered prime fish and shellfish nursery grounds, and North Pass supports several submerged aquatic grass beds, dominated by horned pond weed. The lake also supports a significant population of rangia clams, which serve as a major component in the diet of many estuarine fish, crustaceans, and waterfowl.

Land Use: The Lake Maurepas area is an expansive essentially natural wetland complex. The entire swamp was logged during the late 1880s and early 1900s, when cypress logging flourished in Louisiana. Old railroad grades, canals, and other evidences of that logging activity are still visible in certain portions of the swamp, especially from the air. Since



Bald cypress trees line the shore of Lake Maurepas, an area of extensive cypress-tupelo gum swamp.



The Ponchatoula Marsh, an excellent small freshwater marsh, is located in the northeastern portion of the Lake Maurepas area.



The Blind River, one of three state natural and scenic streams in the area, flows through the McElroy Swamp, a recommended natural landmark.

that time, the swamps have grown back and are approaching a mature condition. Currently, recreation is the major use of the area, especially fishing and hunting. Isolated fish camps are widely scattered throughout the swamp. Commercial dredging for rangia clam shells also occurs in Lake Maurepas. The Amite River Diversion Canal, the most prominent of several dredged canals in the swamp, created as a part of the hurricane flood control plan for the region, connects the Amite and Blind rivers. Residential development and agricultural expansion threaten the limited upland areas in the swamp. Residential development is also occurring along the Tickfaw River. Extremely limited access, coupled with typically flooded conditions, has limited development, but there is a high potential for drainage and subsequent development because the area is midway between New Orleans and Baton Rouge and is surrounded by interstate highways.

Significance: The Lake Maurepas area is an outstanding example of a cypress-tupelo gum swamp and also contains examples of freshwater marsh, bottomland hardwood forest, upland pine forest, and riverine and lacustrine ecosystems. The diversity and expansiveness of habitat provides prime conditions for many forms of wildlife, especially deer, alligators, waterfowl, wading birds, fish, and shellfish. The largest white ibis rookery in Coastal Louisiana, Mississippi, and Alabama is located in the area, and an active southern bald eagle nesting territory is also within the area.

The Blind River has been designated by the state as a natural and scenic stream; it is described as a classic example of a riverine swamp system in Louisiana and will be used as the standard for evaluating other areas for similar designation. The McElroy Swamp has been identified as a potential state park. Large portions of the area have been recommended for national natural landmark designation. Manchac Swamp, located in the southeastern portion of the area, has been recommended as a unique and/or nationally significant wildlife ecosystem. It plus four other areas, the Blind, Amite, and Tickfaw rivers and Ponchatoula Marsh, have also been recommended as preservation areas.

There are 9 natural history themes and 24 subthemes represented in this area.

References: "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Inland Wetlands of the United States Theme Study (Goodwin and Niering 1975), Natural and Scenic Streams System (LWFC 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978)

ATCHAFALAYA RIVER BASIN

Rating: 1 A

Size: 620,600 acres

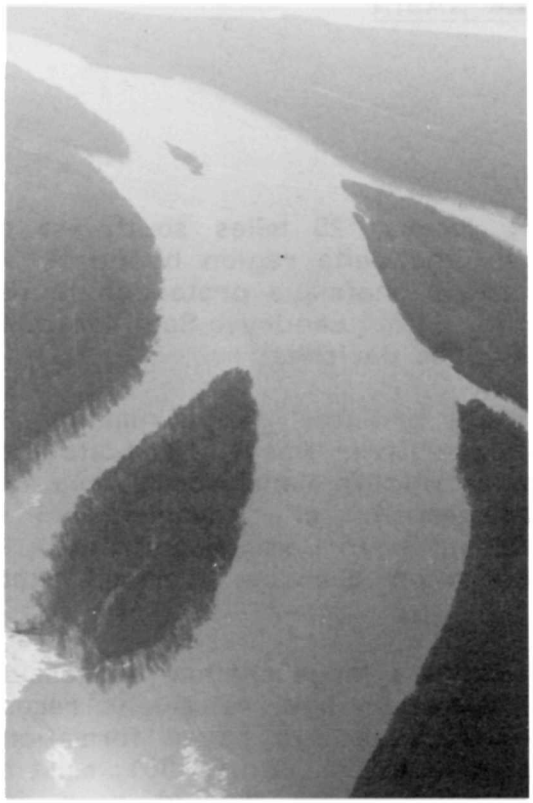
Location: The Atchafalaya River Basin, located 25 miles southwest of Baton Rouge, is defined approximately by the delta region boundary on the north, U.S. 90 on the south, and the Atchafalaya protection levees on the east and west. It is located in Saint Landry, Saint Martin, Iberville, Iberia, Saint Mary, and Point Coupee parishes.

Ownership: Federal, state, and multiple private. Approximately 30 owners control 90 percent of the Atchafalaya River Basin. The state of Louisiana controls the 25,500-acre Attakapas Wildlife Management Area and an additional 100,000 acres. Management of the basin is multi-jurisdictional, involving the Atchafalaya Basin Commission, the U.S. Army Corps of Engineers, Soil Conservation Service, various state agencies, and private owners.

Description: The Atchafalaya River Basin is a large shallow depression created by a long history of delta formation and relatively recent manipulation by man. The basin contains ridge and bayou formations from both the Teche and Lafourche delta complexes. Until 1881, most of the basin was occupied by swamps and lakes, as it had been for thousands of years. That year, the raft of debris that had blocked the basin was cleared, and the network of sluggish streams, extensive swamps and marshes, and large lakes began to change, as the Atchafalaya River enlarged and became a major distributary of the Mississippi River. Heavy sediment progressively filled the large lakes within the basin, including the Grand, Six Mile, and Flat. In about 1950, these lakes became filled. Since then, the majority of sediment has been carried into Atchafalaya Bay, creating the Atchafalaya Delta.

The basin system contains a diversity of habitats ranging from bottomland hardwood forest in the north to cypress-tupelo gum swamps, coastal marshes, and estuaries in the south. Its 20-mile-wide floodplain is the largest overflow swamp and river system in North America. The basin contains threatened and endangered wildlife, including American alligator, southern bald eagle, and possibly the ivory-billed woodpecker. It also supports one of the last popultions of black bear in the state and one of the few populations remaining in the bottomland forests of the Gulf Coast. The area contains 9 shorebird nesting colonies and 18 wading bird rookeries supporting 100,000 egrets, herons, and ibis. In winter, it supports the largest concentration of woodcocks in the nation and is a key waterfowl wintering area, supporting 25,000 geese, over a million ducks, and 250,000 coots. The basin also provides the prime habitat for the Louisiana crawfish, and approximately 25 million pounds of crawfish are harvested annually from this area.

Land Use: The Atchafalaya River Basin is a manipulated system, acting in part as a flood relief mechanism for Mississippi River overflows. There are two extensive flood control and navigation projects and eleven



Grand Lake, a major distributary of the Atchafalaya River. The swamp surrounding the river is the largest river overflow swamp system in the nation.



Catahoula Forks, an excellent bottomland hardwood forest is a recommended natural landmark.

drainage projects currently affecting the area. Approximately 167,000 acres of the basin have been cleared for agricultural lands, and additional bottomland hardwood forests are being cleared for farmland at a rate of about 20,000 acres annually (USDI, FWS 1978b). Oil and gas activity and timber harvesting also occur in the basin. Although most of the basin has been cut over, a few locations contain remnants of undisturbed cypress-tupelo gum swamp. Some of the most noteworthy sites include Buffalo Cove, Bayou Sorrel, and Bayou Mallet.

Significance: The Atchafalaya River Basin contains geologic features, habitat composition, and diversity of wildlife that are unequaled by any other overflow swamp in the United States. It provides prime habitat for significant populations of birdlife, including the largest wintering population of woodcocks in the nation and concentrations of ducks and geese. It also supports important populations of large mammals, including one of the few remaining black bear populations in the Gulf Coast region. Habitat for the threatened American alligator and possibly the ivory-billed woodpecker exists in the basin. The economic productivity of the basin makes it valuable to the regional economy, and its relationship to the forming delta in Atchafalaya Bay makes it important to larger delta processes.

The basin has been recommended as a potential natural landmark, a unique wildlife ecosystem, and a potential preservation area. The area has also been proposed as a fish, wildlife, and multiple use area by the U.S. Fish and Wildlife Service.

There are 8 natural history themes and 20 subthemes represented in this area.

References: "Environmental Base and Management Study--Atchafalaya Basin, Louisiana" (Gagliano and van Beek 1975), "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associations 1977), The Atchafalaya--America's Greatest River Swamp (USDI, FWS 1978), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978)

TERREBONNE MARSH

Rating: 1 B

Size: 603,500 acres

Location: The Terrebonne Marsh is centered approximately 20 miles southeast of Morgan City in Terrebonne Parish. It is bordered on the north by U.S. 90, on the east by Bayou Grand Caillou, on the south by the Gulf of Mexico, and on the west by the Atchafalaya Delta.

Ownership: State and multiple private

Description: The Terrebonne Marsh is a large marsh complex traversed by major bayous and canal systems. In addition to a complete range of marsh types and small lakes and ponds, this area contains several large lakes, including Lost Lake, Lake Mechant, Lake de Cade, Lake Theriot, and Caillou Lake. Freshwater from the Atchafalaya River Basin, Lake Palourde, and other drainages gradually increases in salinity as it nears the Gulf of Mexico, creating zones of fresh, intermediate, brackish, and salt marsh. Isolated areas of virgin bald cypress are scattered through the fresh marsh. The area also contains two ecologically important deep migratory tidal passes, Oyster Bayou near Point Au Fer Island and Bayou Grand Caillou. Shell reefs are located near Point Au Fer Island, which also contains a small narrow sand and shell beach.

The Terrebonne Marsh is an important wildlife area, especially for birdlife. Lost Lake, Carencro Bayou, and Bayou Penchant provide habitat for peak duck concentrations, and Canada geese utilize the lower marsh areas. The area contains the greatest nesting concentration of southern bald eagles on the Gulf Coast, at least five pairs. It also contains five wading bird rookeries and a seabird nesting colony, which is located on Point Au Fer Island. Caillou Lake serves as a state-designated oyster seed bed, and Caillou Bay is a public oyster-bed lease area. Threatened American alligators are found throughout the area, and so are white-tailed deer. Prime foraging habitat for the endangered Kemp's ridley turtle exists in adjacent shallow offshore waters.

Land Use: The major land use in the Terrebonne Marsh is recreation, especially hunting and fishing. Oil and gas exploration and development activities are occurring throughout the area. The Intracoastal Waterway and several other canals associated with oil and gas activity cross the northern part of the area. Louisiana 90, proposed for improvement and realignment, is located on the northern boundary. Oyster harvesting occurs in the state lease areas in Caillou Bay. A U.S. Army Corps of Engineers navigation project for the Atchafalaya River and Bayous Chene, Boeuf and Black is under construction along the northwestern boundary.

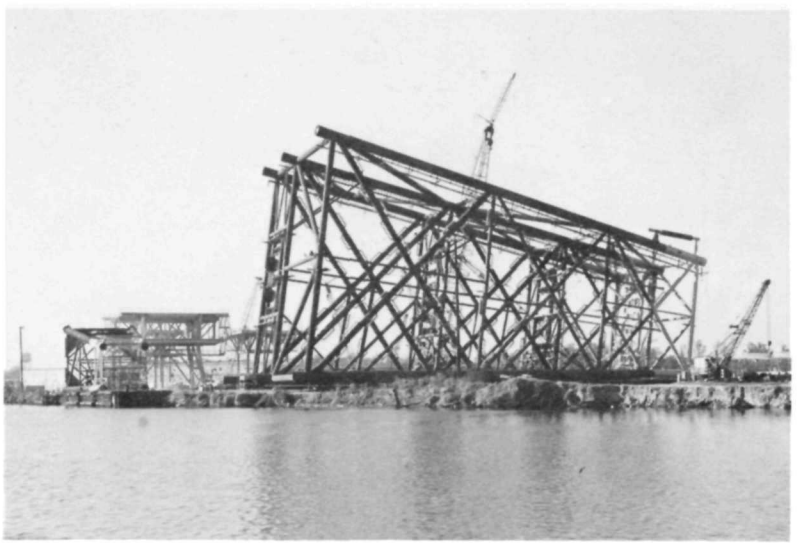
Significance: The Terrebonne Marsh is the only area in the study region where large areas of all four marsh types--fresh, intermediate, brackish, and salt--are represented. The marsh system provides important habitat for estuarine dependent species that migrate through



Fresh, intermediate, brackish, and salt marshes are distributed through the Terrebonne Marsh.



Bayou Penchant, a state natural and scenic stream, traverses much of the Terrebonne Marsh.



Construction of offshore drilling platforms at Amelia. They are moved by barge through the Intracoastal Waterway to the gulf.

deep tidal passes between inland nursery areas and the gulf. It also contains peak concentrations of threatened American alligators, ducks, and geese, and the greatest concentration of southern bald eagles on the Gulf Coast. Prime foraging habitat for the endangered Kemp's ridley turtle exists in adjacent shallow offshore waters.

The area has been recommended as a unique and/or nationally significant wildlife ecosystem. Bayou Penchant Fresh Marsh, Bay Wallace Swamp, Creole Bayou Fresh Marsh, and Bayou Maurais Bois Ridge have been recommended as potential preservation areas. Bayou Penchant, a major watercourse traversing the Terrebonne Marsh system, is a state-designated natural and scenic stream.

There are 9 natural history themes and 30 subthemes represented in the area.

References: Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978)

BARATARIA BAY AREA

Rating: 1 B

Size: 353,100 acres

Location: The Barataria Bay area is located in the southern portion of Lafourche, Jefferson, and Plaquemines parishes. New Orleans is approximately 35 miles to the north, and the Gulf of Mexico defines the southern boundary.

Ownership: State and multiple private

Description: Barataria Bay is a large estuarine system sheltered by a barrier island complex at the lower end of Barataria Basin. Consisting primarily of broad expanses of open water interspersed with coastal marshes and black mangrove islands, it is one of the world's most productive natural areas; however, it is presently in a mature stage of development, and biological productivity is beginning to decline (Bahr and Hebrard 1976). More than 100 species of fish and invertebrates, including the commercially important gulf menhaden and brown and white shrimp, are dependent upon the estuaries as nursery grounds.

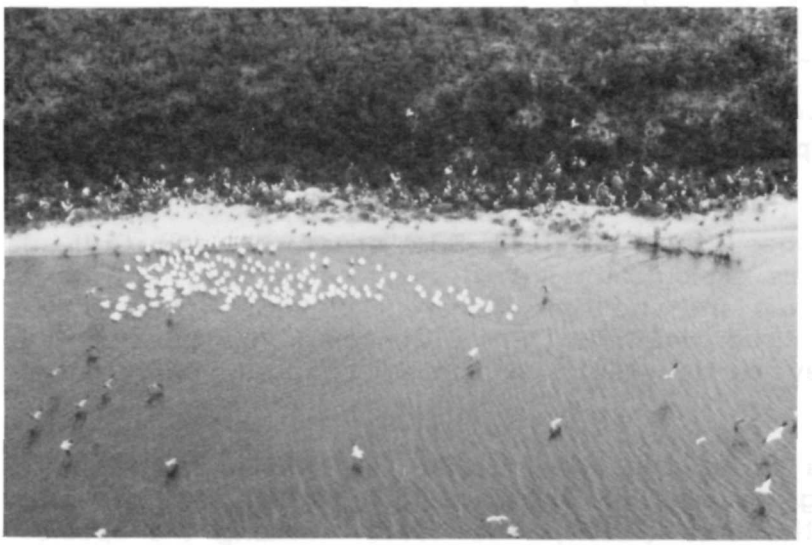
Four deep tidal passes, Caminada Pass, Barataria Pass, Pass Abel, and Quatre Bayou Pass, connect the Barataria Bay area with the Gulf of Mexico. These passes are ecologically significant as migratory pathways for estuarine-dependent fish and shellfish and are important feeding areas for the Atlantic bottle-nosed dolphin. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in the adjacent shallow offshore waters.

The Barataria Bay area is at the terminus of the Mississippi Flyway. Twenty separate nesting colonies of approximately 90,000 seabirds and wading birds occur in the area (USDI, FWS 1977). Among the species present are the Louisiana heron, snowy and great egrets, white ibis, black-crowned night heron, black skimmer, Forster's tern, and the rare reddish egret. Two of the colonies are used by more than 33,000 Louisiana herons.

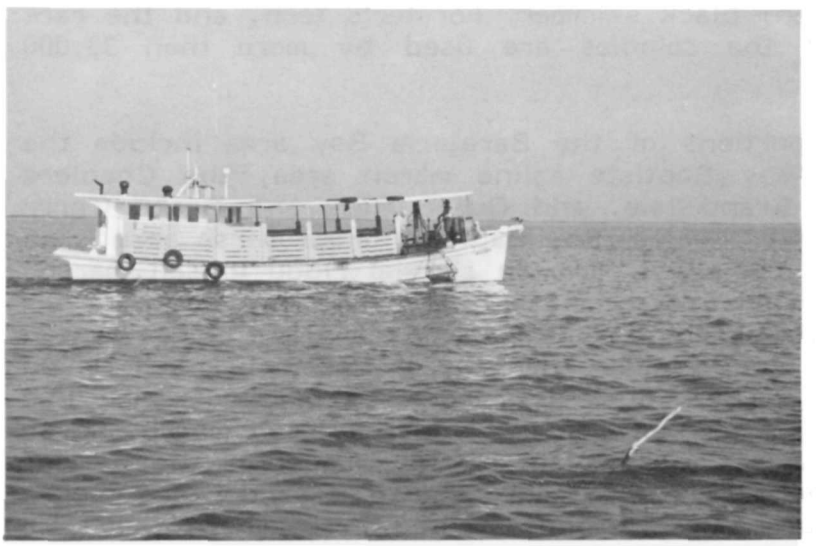
Particularly noteworthy portions of the Barataria Bay area include the Bayou Grande Cheniere/Bay Baptiste saline marsh area, the Cheniere Caminada beach ridges, Grand Isle, and Queen Bess and Grand Terre islands. The Bayou Grand Cheniere/Bay Baptiste saline marsh area is an excellent example of the transition from an alluvial ridge to salt marsh. It is expansive, in excellent condition, and a prime nursery area for estuarine dependent species. The Cheniere Caminada beach ridges are an unusual geologic feature that parallels the Gulf of Mexico between Bayou Moreau and Grand Isle. The ridges are vegetated primarily with live oaks and various shrubs, while between the ridges are salt marsh, linear lagoons, and grassy swales. Grand Isle is the largest of the barrier islands protecting Barataria Bay. A 7-mile expanse of sand beach occurs along its gulf side. Queen Bess Island, located in southern Barataria Bay, provides nesting and roosting habitat for Louisiana's only nesting



Caminada beach ridge complex at the southwestern end of Grand Isle, one of the barrier islands guarding Barataria Bay.



Pelicans at Queen Bess Island, the only nesting area in Louisiana for the brown pelican, the official state bird.



An oyster boat at work in a private lease area of Barataria Bay. The estuary produces almost half of Louisiana's seafood harvest.

colony of brown pelicans. The island is about 102 acres in size and is covered by black mangrove and salt marsh, with a shoreline of sand and oyster sells. Grand Terre Island, a 949-acre barrier island located at the mouth of Barataria Bay, is flanked by two natural deep tidal passes, Barataria Pass and Pass Abel. The gulf side of Grand Terre Island is sand beach, while the bay side is vegetated with black mangrove and salt marsh. The island is heavily .used by shorebirds and brown pelicans.

Land Use: Present uses of the Barataria Bay area include recreational hunting and fishing, commercial fishing, waterborne commerce, residential development, and oil and gas activities. The area is served by Louisiana 1, which leads to the community of Grand Isle and Grand Isle State Park, a popular center for recreation and commercial activities. Oil and gas activity is evident in the area, and it is crossed by many pipelines and oil and gas canals. Onshore development and activity associated with the construction of the Louisiana Offshore Oil Port will affect the southwestern portion of the area. The Barataria Waterway, a dredged channel connecting Lake Salvador with the Gulf of Mexico, runs through the center of the bay. The bay is a bountiful source of gulf menhaden, shrimp and oysters. Approximately 20 million pounds of shrimp, over 4 million pounds of oysters (nearly half the state's total), and about 333 million pounds of menhaden (one-third of the state's total) are harvested here annually. The State Marine Research Laboratory is located on Grand Terre Island.

Land loss from erosion and subsidence is a serious problem in the Barataria Bay area. Grand Terre and Grand Isle have been designated as areas of "critical erosion" (U.S. Army Corps of Engineers 1971).

Significance: The Barataria Bay estuary is one of the world's most productive natural areas, and production from the bay averages 44 percent of Louisiana's total annual fish and shellfish harvest. The four deep tidal passes that connect the bay with the gulf are significant migratory pathways for estuarine-dependent fish and shellfish and important feeding areas for the Atlantic bottle-nosed dolphin. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in the adjacent shallow offshore waters. Nesting habitat for the endangered brown pelican and two of the largest Louisiana heron rookeries in coastal Louisiana, Mississippi, and Alabama occur in the area. The Cheniere Caminada beach ridges are unique in the region.

Queen Bess Island and Bayou Moreau Marsh are recommended national natural landmarks. Four sites within the area have been recommended as potential preservation areas. A portion of the south unit of the Wisner State Wildlife Management Area lies along the beach ridges. One existing and one proposed state park attest to the significance of the barrier beaches on Grand Isle, which is Louisiana's major seaside recreational area.

There are 9 natural history themes and 26 subthemes represented in the area.

References: Barataria Basin: Biological Characterization (Bahr and Hebrard 1976), "Gulf Coastal Plain Natural Region Theme Study"

(Montgomery 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Statewide Comprehensive Outdoor Recreation Plan (LDCRT 1977), The Value of Wetlands in the Barataria Basin (LDTD 1978), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976)

GHEENS MARSH AREA

Rating: 1 B

Size: 38,900 acres

Location: The Gheens Marsh area is located approximately 25 miles southwest of New Orleans in Lafourche Parish. The area lies north of the Intracoastal Waterway and is roughly defined as the area bounded by Godchaux Canal, Bayou des Allemands, Lake Salvador, Canal Tisamond Foret, and Louisiana 654.

Ownership: State and private

Description: The Gheens Marsh area, consisting of Gheens Fresh Marsh, Bayou Matherne, and Temple Bay, is an area that has experienced very little alteration. Gheens Marsh is a typical freshwater marsh and is in excellent condition. It has a rich diversity of fauna, provides excellent habitat for waterfowl, and is heavily used by the American alligator. Bayou Matherne is an abandoned distributary that has formed a lacustrine delta (Grosse Point) in southern Lake Salvador. The vegetation along Bayou Matherne consists primarily of bald cypress (in the abandoned channel) interspersed with live oaks. Submergent grass beds, primarily water celery, occur abundantly in Temple Bay. Between Lake Salvador and Bayou Matherne is additional undisturbed fresh marsh.

Land Use: The Gheens Marsh area appears to be used primarily for fishing and hunting, particularly on the tract owned by Golden Ranch. The Company Canal provides major access through the area, and a complex of oil and gas canals are concentrated in the adjacent northeastern portion of the area along Bayou des Allemands. Several fish camps are located in the vicinity of Bayou des Allemands where it empties into Lake Salvador and along the west side of Temple Bay. A proposed pipeline and petroleum storage facility associated with the development of the Louisiana Offshore Oil Port is planned for the area.

Significance: The Gheens Marsh area is an excellent example of a large and relatively undisturbed freshwater marsh and abandoned distributary/lacustrine delta system. Submergent aquatic beds of water celery are common in Temple Bay and attract significant numbers of waterfowl. The area has a high concentration of American alligators and three wading bird rookeries.

The Gheens Marsh and Bayou Matherne/Temple Bay areas have each been recommended as potential preservation areas. Additionally, Gheens Marsh has been identified as a unique and/or nationally significant wildlife ecosystem. Bayou des Allemands is a unit of the state's natural and scenic streams system.

There are 9 natural history themes and 20 subthemes represented in the area.



Gheens Marsh, an expansive freshwater marsh that is relatively undisturbed.



Freshwater marsh vegetation in Gheens Marsh provides excellent waterfowl habitat.



Aerial view of Bayou Matherne and Gross Point, a lacustrine delta formed in Lake Salvador.

References: Natural and Scenic Streams System (LWFC 1976), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978)

LAC DES ALLEMANDS AREA

Rating: 1 B

Size: 128,600 acres

Location: The Lac des Allemands area is located approximately 25 miles west of New Orleans in Saint John the Baptist, Saint Charles, Saint James, and Lafourche parishes.

Ownership: State and multiple private

Description: The Lac des Allemands area encompasses Lac des Allemands and Lake Boeuf, two large shallow naturally formed lakes typical of the delta, surrounded by broad expanses of fresh marsh and cypress-tupelo gum swamp. The area is of special significance to birdlife, since it supports rookeries for about 48,000 wading birds. These rookeries are used most heavily by the little blue heron, snowy and cattle egrets, Louisiana heron, white ibis, white-faced ibis, glossy ibis, and great egret, in that order. The area also contains one of the 16 active southern bald eagle nesting territories in the region. Lake Boeuf, connected to Lac des Allemands by Bayou Boeuf, contains important submergent aquatic vegetation and is a prime waterfowl feeding area. The Rathborne Swamp, comprising the southwest portion of the area, contains a peak concentration of American alligators.

Land Use: Fishing, hunting, and trapping are important uses in the area. The cypress-tupelo gum swamps have been cut over in the past, but little evidence remains as the trees are approaching maturity. Oil and gas production occurs in the area; the Lac des Allemands oil field is located on the east shore of the lake. The southern portion of the Lac des Allemands area will be disrupted by the installation of pipeline facilities associated with the Louisiana Offshore Oil Port. Louisiana 307 bisects the area.

Significance: This area is an excellent example of a large shallow lake system with associated fresh marsh and cypress-tupelo gum swamp characteristic of the delta region. The natural intermixing of unaltered lake, bayou, marsh, and swamp creates a highly scenic landscape. It is an important nesting area for numerous bird species, including the endangered southern bald eagle. It also harbors a peak concentration of the threatened American alligator. Lac des Allemands is a proposed state park and is the source of Bayou des Allemands, a state-designated natural and scenic stream.

There are 8 natural history themes and 19 subthemes represented in this area.

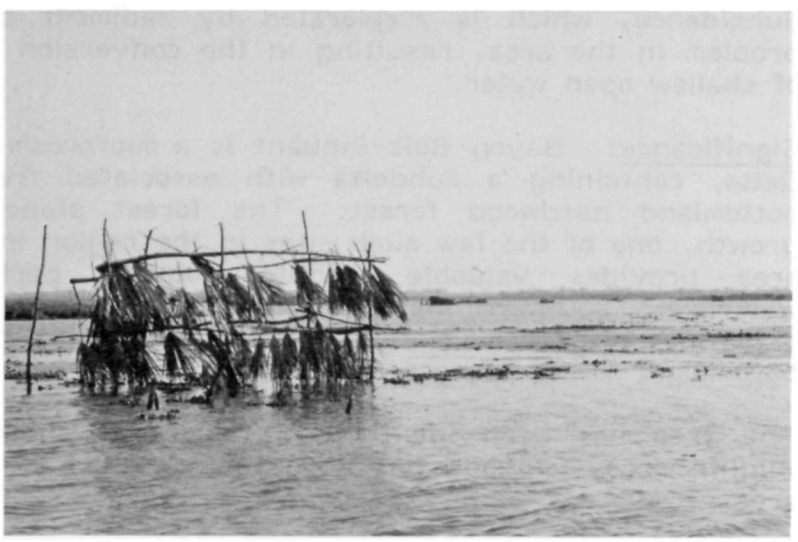
References: "Gulf Coastal Plain Natural History Theme Study" (Montgomery 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977)



The southern shoreline of Lac des Allemands displays cypress-tupelo gum swamp and freshwater marsh vegetation.



A lakeshore of cypress-tupelo gum swamp along Lac des Allemands.



Numerous duckblinds occur at Lake Boeuf, a popular hunting area that provides good habitat for wintering waterfowl.

BAYOU BOIS PIQUANT AREA

Rating: 1 B

Size: 13,850 acres

Location: The Bayou Bois Piquant area is located in Saint Charles Parish approximately 15 miles southwest of New Orleans. The area is bounded by Lake Cataouatche on the east and U.S. 90 on the north.

Ownership: State and multiple private

Description: The Bayou Bois Piquant area is a forest and fresh marsh mosaic that resulted from a break or crevasse in the natural levee of the Mississippi River. The forests have experienced very little physical alteration to date and are characterized by a distinctive pattern of alluvial ridges and bayou swales. Cypress-tupelo gum swamps, bottomland hardwood forests, and live oak ridge communities occur within the area. Wildlife habitat is diverse and supports such species as white-tailed deer, nutria, rabbit, squirrel, armadillo, river otter, great egret, and various waterfowl species. The area is of special importance to birdlife, providing rookeries for over 16,000 wading birds, wintering habitat for large numbers of migratory waterfowl, and an active southern bald eagle nesting territory.

Land Use: Bayou Bois Piquant is used primarily for hunting and fishing. It has remained relatively undisturbed due to limited access. A portion of its eastern half is in the Salvador Wildlife Management Area owned and administered by the state. The Louisiana Cypress Lumber Canal approximates the southern boundary of the area, and the southern half of the area is crossed by a pipeline canal. Potential activities that could adversely affect the area include expanding urban development, construction of Interstate 410, construction of a high-voltage electric transmission line associated with a proposed nuclear power plant in Taft, and development associated with potential oil and gas activities. Subsidence, which is accelerated by sediment starvation, is a serious problem in the area, resulting in the conversion of fresh marsh to areas of shallow open water.

Significance: Bayou Bois Piquant is a microcosm of the Mississippi River Delta, containing a subdelta with associated fresh marsh, swamp, and bottomland hardwood forest. The forest stands appear to be virgin growth, one of the few such sites in the region in such a condition. The area provides valuable wildlife habitat, particularly for migratory waterfowl, southern bald eagle, and American alligator. The broad expanses of fresh marsh interspersed with fingers of swamp and bottomland forest possess high scenic values.

The area has been identified as a unique and/or nationally significant wildlife ecosystem and has been recommended as a potential preservation area.



Fingerlike ridges of old distributaries extend into fresh marsh and ponds in the Bayou Bois Piquant area.



Bald cypress trees line a quiet bayou west of the fresh marsh in the Bayou Bois Piquant area, which was formed by a crevasse in the Mississippi River.

There are 8 natural history themes and 17 subthemes represented in this area.

References: Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), "Unique Wildife Ecosystems of Louisiana" (USDI, FWS 1976)

MARSH ISLAND AND SHELL KEYS

Rating: 1 D

Size: 118,200 acres

Location: Marsh Island, located in the Gulf of Mexico, is bounded on the north by Vermilion and East Cote Blanche bays in Iberia Parish. Shell Keys is located approximately 5 miles south of Marsh Island in the Gulf of Mexico.

Ownership: Federal and state

Description: Marsh Island, primarily covered with brackish marsh, is a state wildlife refuge and game preserve. Typical vegetation consists of wiregrass, three-cornered grass, coco, saltgrass, and blackrush. The western edge of the island, adjacent to Southwest Pass, supports salt marsh vegetation consisting of oyster grass, glasswort, blackrush, saltgrass, saltwort, and black mangrove. A 17,000-acre portion of the island is intensively managed for waterfowl and other wildlife. The island supports an abundance of seabirds and wading birds, American alligators, nutria and muskrat, and a small population of deer inhabit the canal levees and cheniers (live oak ridges) to the southwest.

Shell Keys, a national wildlife refuge, is an 8-acre exposed oyster shell reef which provides important seabird nesting habitat.

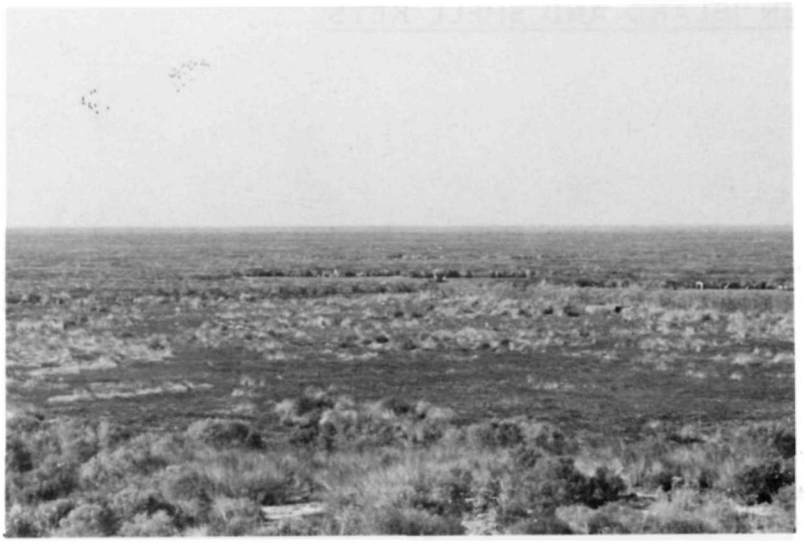
Land Use: Wildlife management is the predominant activity on Marsh Island and Shell Keys. Although there has been state-regulated oil and gas activity on Marsh Island in the past, there have been no new discoveries in recent years.

Significance: Marsh Island is a large wetland system that provides protected habitat for large numbers of waterfowl, seabirds, and wading birds, as well as other species. It harbors peak concentrations of American alligators, ducks, and geese. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in adjacent shallow offshore waters. The island is a designated state wildlife refuge and game preserve. Cheniers along the southern edge of Marsh Island are unique in the study area but are more often associated with the Chenier Plains Region to the west.

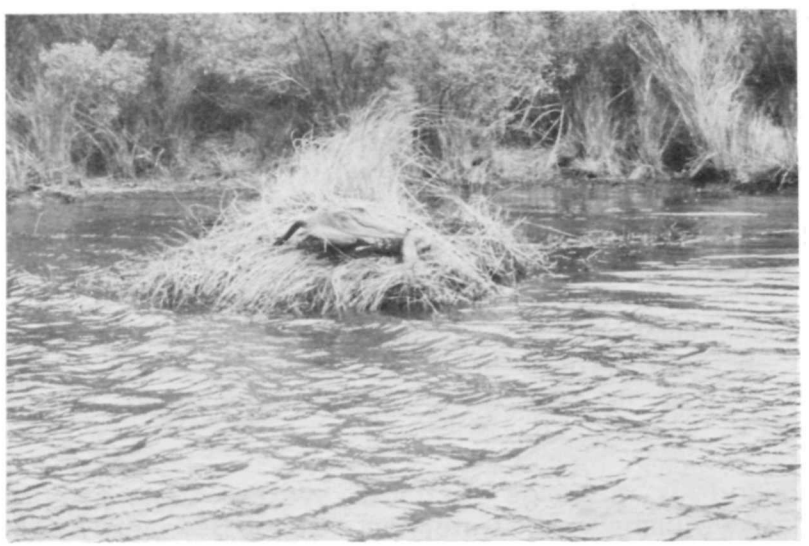
Shell Keys is a national wildlife refuge established to protect significant seabird nesting colonies.

There are 9 natural history themes and 22 subthemes represented in Marsh Island and Shell Keys.

References: Iberia Parish Coastal Zone Management Report (Evangeline Economic Development District 1978), Operation of the National Wildlife Refuge System, Draft Environmental Impact Statement (USDI, FWS 1975), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976)



Marsh Island provides a large brackish marsh area that is protected by surrounding open water.



Brackish marsh habitat supports large numbers of American alligators.



Large numbers of birds utilize Marsh Island and Shell Keys.

BIRDFOOT DELTA AREA

Rating: 1 D

Size: 303,000 acres

Location: The Birdfoot Delta area is located at the mouth of the Mississippi River in Plaquemines Parish, approximately 65 miles southeast of New Orleans.

Ownership: Federal, state, and multiple private

Description: The Birdfoot Delta is at the terminus of the Modern delta complex. Its unique form is the result of natural delta-building processes, its location at the edge of the continental shelf, and modifications by man. Three major distributaries radiate from Head of Passes, including Southwest Pass, the principal navigation channel between the Mississippi River and the Gulf of Mexico. Mudlumps, unique geologic features, occur at the mouths of the principal passes.

The area is covered primarily by fresh marsh with outer fringes of intermediate marsh. The marshes are continually changing as a result of tides, sedimentation, and freshwater influx, and a high rate of subsidence is forming large lagoons over much of the area. The Birdfoot Delta provides significant wildlife habitat for the American alligator and a substantial herd of marsh deer, an endemic subspecies of the white-tailed deer. The area also receives heavy use by waterfowl. It contains a total of ten nesting colonies of seabirds and wading birds, used by more than 28,000 breeding birds, including 12,000 snowy egrets and also great egrets, little blue herons, ibises, least terns, and black skimmers. The area also provides critical wintering habitat for blue and lesser snow geese. In addition, seasonal concentrations of geese are known to occur in the mud flats at the mouths of Main Pass and Northeast Pass. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in adjacent shallow offshore waters.

Land Use: The Birdfoot Delta area contains the Delta National Wildlife Refuge and the Pass-a-Loutre State Wildlife Management Area. Sport fishing is particularly popular at the mouths of the major passes and around the mudlumps. The area is criss-crossed by numerous oil and gas canals, and offshore oil platforms are common in West, East, and Garden Island bays and other offshore areas. Southwest Pass, maintained as a deep draft channel, provides an important shipping corridor through the area. The area also contains privately leased oyster beds.

Significance: The area has been identified as a prime fish and shellfish nursery ground and also supports a substantial herd of the endemic marsh deer and a peak concentration of American alligators. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in adjacent shallow offshore waters. Waterfowl are heavily dependent upon the area, and it is a critical wintering habitat for blue and lesser snow geese. The snowy egret rookery in this area is the largest in coastal Louisiana, Mississippi, and Alabama. The area contains the Delta National



Areas of marsh and open water dominate the Birdfoot Delta.



Canal cuts and channels surrounded by marsh are abundant in the Birdfoot Delta.

Wildlife Refuge and the Pass-a-Loutre State Wildlife Management Area and is recommended in part as a potential preservation area.

The mudlumps are unique geologic features and have been recommended as a potential natural landmark. Delta building processes are better understood today as a result of scientific studies that have documented the dynamics of the Birdfoot Delta.

There are 8 natural history themes and 22 subthemes represented in the area.

References: Barataria Basin: Geological Processes and Framework (Adams et al. 1976), "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976)

SAINT CHARLES MARSH

Rating: 2 A

Size: 20,600 acres

Location: The Saint Charles Marsh, located directly west of New Orleans, extends along the southwestern shore of Lake Pontchartrain, west to the east levee of the Bonnet Carre Spillway, east to the Jefferson Parish line, and south to U.S. 61.

Ownership: Multiple private

Description: The Saint Charles Marsh is a transitional wetland area between the Mississippi River and Lake Ponchartrain. It contains fresh, intermediate, and brackish marsh that grades into cypress-tupelo gum swamp. In the fresh marsh, maidencane, water hyacinth, bulltongue, pickerelweed, pennywort, alligatorweed, and cattail predominate. The intermediate marsh contains wiregrass, saltgrass, bullwhip, bulltongue, and wild millet. Bottomland hardwood forests are found along the alluvial ridge. Wildlife diveristy is high, and the area is important as a nursery ground for fish and shellfish and contains a wading bird rookery. The area attracts approximately 25,000 ducks and 7,500 coots in the winter.

Land Use: The site is largely in its natural condition, except for the activities associates with the Good Hope oil and gas field and a petroleum storage area near Norco to the south. Several power lines and canals, the Illinois Central Gulf Railroad, and Interstate 10 cross the area. The Saint Charles Marsh area is an approachway for the Moisant International Airport. It is adjacent to New Orleans and has high potential for drainage and subsequent development. The area is popular for hunting and fishing.

Significance: The marsh is of prime importance as a fishery nursery ground adjacent to Lake Pontchartrain. The area has been recommended as a unique ecosystem, is being considered for establishment as a national wildlife refuge, and has been recommended as a potential preservation area. Bayou Trepagnier and Bayou LaBranche are two units of the state natural and scenic streams system.

There are 9 natural history themes and 19 subthemes represented in this area.

References: Natural and Scenic Streams System (LDWF 1976), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1978)



The Saint Charles Marsh is an important nursery ground for fish and shellfish adjacent to Lake Pontchartrain.



Cypress-tupelo gum swamp in a portion of the Saint Charles Marsh near I-10.



The marsh provides a rookery and feeding ground for a multitude of birdlife, including great egrets.

JEAN LAFITTE PRESERVE AND PROTECTION ZONE

(Barataria Marsh unit of Jean Lafitte National Historical Park and Preserve)

Rating: 2 C

Size: 20,000 acres

Location: The Jean Lafitte Preserve and protection zone is located approximately 10 miles south of New Orleans in Jefferson Parish. It is bounded roughly on the east by Louisiana 45, on the west by Lakes Salvador and Cataouatche, on the south by Bayou Barataria, and on the north by the hurricane protection levee and the town of Westwego.

Ownership: Federal, state, and multiple private

Description: The 12,000-acre protection zone, located in the northern portion of the study area, contains freshwater marsh with cattail, delta duck potato, alligator weed, panic grass, and water hyacinth; this fresh marsh grades into intermediate marsh in the preserve portion of the area. Typical associations in the preserve are cypress-tupelo gum swamp, live oak ridge, and mixed bottomland hardwood forest with oak, sycamore, willow, sweetgum, hackberry, red maple, and southern magnolia. The area contains valuable breeding and feeding habitat for egrets, herons, ibis, and redwing blackbirds. The threatened American alligator and numerous other reptile and amphibian species also inhabit the preserve and protection zone. White-tailed deer and small mammals, such as otter, bobcat, weasel, shrew, rabbit, nutria, muskrat, raccoon, beaver, opposum, and mink, are also found here.

Land Use: The area is generally unaltered, with the exception of numerous fish camps located along the Tarpaper Canal and the Segnette Waterway. Oil and gas activities are extant in the protection zone and to the north. As a result, collection and storage facilities, pipelines and access canals, and production well "christmas trees" are evident along the northern portion of Bayou Segnette, Bayou Boeuf, and the Tarpaper Canal. Heavy use is made of the area for hunting, fishing, trapping, and boat recreation. The area is threatened by sewage outfall into the Millaudon Canal from the town of Marrero and by expanding urban development of the greater New Orleans area.

Significance: In November of 1978, Public Law 95-625 authorized the establishment of the Jean Lafitte National Historical Park and Preserve, formally recognizing the national significance of the natural resources of the Barataria Marsh unit (preserve and protection zone). The area encompasses examples of diverse, highly productive natural wetland vegetation only 10 miles from metropolitan New Orleans. Habitat for the threatened American alligator is also contained in the area.

There are 8 natural history themes and 14 subthemes represented in this area.



Bayou Segnette Waterway and Lake Salvador adjacent to park protection zone. Couba Island is in the background.



The Kenta Canal, an old cypress logging canal, connects the Jean Lafitte Preserve with the protection zone to the north. During the summer, water hyacinth clogs the watercourse.

References: Potential Preservation and Restoration Areas of the Louisiana Wetlands (Burk and Associates 1977), National Park Service memorandum dated December 20, 1972

ISLES DERNIERES BARRIER ISLANDS

Rating: 2 C

Size: 26,200 acres

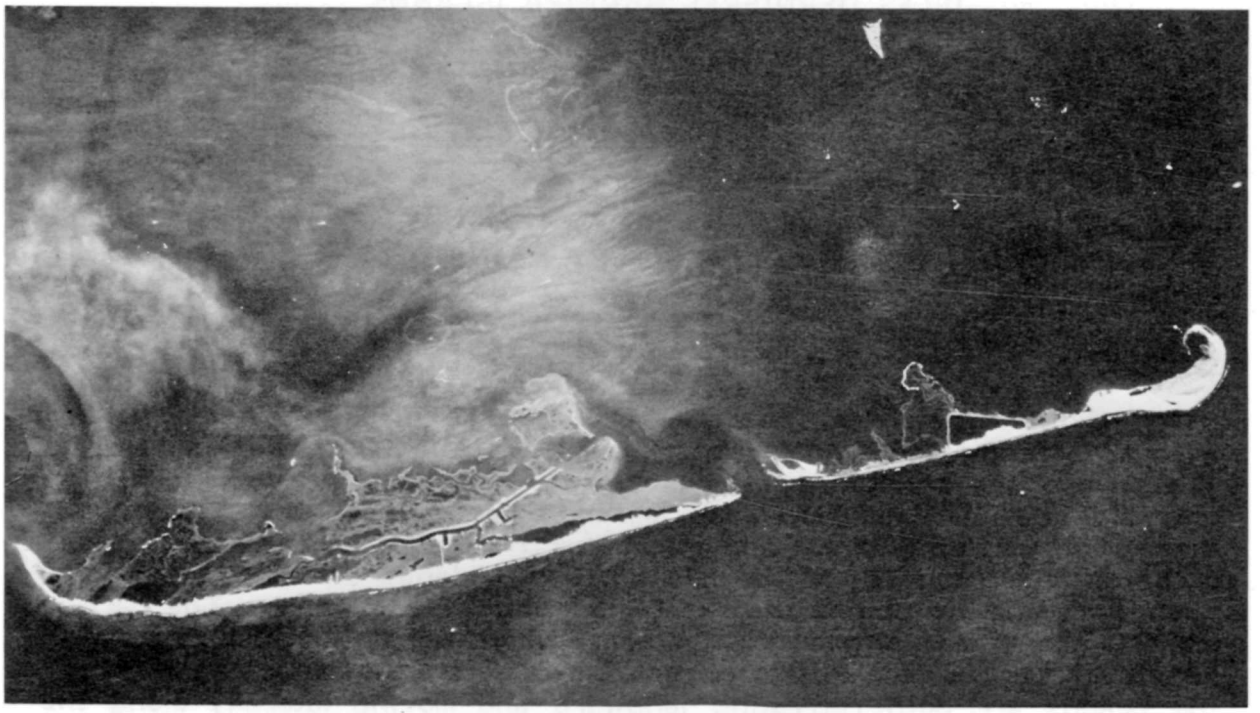
Location: The Isles Dernieres are remote barrier islands separating Lake Pelto and Caillou Bay from the Gulf of Mexico in southern Terrebonne Parish.

Ownership: Private

Description: The Isles Dernieres are a major group of seven barrier islands, extending in a chain approximately 24 miles long and ½ mile wide. The islands are oriented along an east-west axis and are fronted on the gulf side by 100-foot-wide sand beaches backed by 3 to 5 foot sand dunes. Black mangrove, salt marsh, and beds of submergent grasses occur on the backsides of the islands. The islands are heavily used for nesting habitat by shorebirds, seabirds, and wading birds. The barrier islands are dynamic geologic features whose existence depends on a supply of sediments to offset continual erosion by the gulf. As a result, the islands are both retreating landward and moving laterally along the coast due to the littoral transport of sediments.

Land Use: The Isles Dernieres are remote and completely natural except for the presence of an oil and gas access canal in the eastern portion of the salt marsh. While there are no oil or gas wells on the islands, production wells exist in nearby waters. They are also a potential site for support facilities associated with the proposed Louisiana Offshore Oil Port (USDI, FWS 1978a). Limited recreational activities include boat camping and surf fishing.

Significance: The Isles Dernieres are an excellent example of barrier islands and are essentially undisturbed. As barrier islands, the Isles Dernieres perform a valuable function in reducing destructive wave action on the inland marshes, especially during storms. The islands also have a vital role in the regulation and maintenance of water exchange and saltwater balance between the Gulf of Mexico and the estuarine bays behind them. Whiskey Pass, which divides the chain, and Wine Island Pass, which flanks the east side of the chain, are deep tidal passes that are ecologically significant as migratory pathways for estuarine-dependent species of fish and shellfish. The islands receive heavy use as feeding and nesting habitat by several species of shorebirds, seabirds, and wading birds. A total of five seabird and wading bird colonies, used by nearly 73,000 breeding birds, exist on the Isles Dernieres. One colony alone is used by approximately 35,000 laughing gulls, and another supports 18,000 Louisiana herons, the largest and second largest nesting colonies, respectively, in coastal Louisiana, Mississippi, and Alabama. The rare reddish egret also nests on the Isles Dernieres. The occurrence of black mangrove on the islands is also significant. Prime foraging habitat for the endangered Kemp's ridley turtle occurs in adjacent shallow offshore waters.



Isle Dernieres, a barrier island complex protecting eastern Terrebonne Parish and Lake Pelto.



Large areas of black mangrove along backshore of Isle Dernieres.

The area has been recommended as a potential preservation area and a unique and/or nationally significant wildlife ecosystem. The Isles Dernieres have also been identified as a potential site for a state park.

There are 6 natural history themes and 13 subthemes represented in the area.

References: "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Shoreline Erosion in Coastal Louisiana: Inventory and Assessment (LDTD 1978), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976), Unique Wildlife Ecosystems of Louisiana (USDI, FWS 1978)

COTE BLANCHE SALT DOME

Rating: 2 D

Size: 3,050 acres

Location: The salt dome is located east of Cypremort Point on the north side of Cote Blanche Bay, approximately 30 miles west of Morgan City in Saint Mary Parish.

Ownership: Private

Description: There are five piercement salt dome "islands" in Saint Mary and Iberia parishes--Belle Isle, Cote Blanche, Weeks Island, Avery Island, and Jefferson Island. Cote Blanche Island, located on the northern edge of the Atchafalaya/Vermilion Bay estuarine complex, was formed from a salt dome that rose from a source several miles below sea level to within 400 feet of the island's existing maximum elevation of approximately 100 feet. Several hundred feet of sediment were displaced upward and overlie the salt deposit; this sediment is from the Prairie Terrace formation, which is typically found outside the delta region. The island is approximately 1 mile wide and 1.5 miles long and reaches a maximum elevation of 92 feet. It is separated from the mainland by the Intracoastal Waterway.

Cote Blanche has gently rolling slopes often interspersed with deep ravines and is covered primarily with second growth deciduous forest dominated by live oak, magnolia, and hickory, with an understory of yaupon, French mulberry, and unusual species of mosses and ferns. The wetlands associated with the salt dome are fresh and intermediate marsh. Naturally occurring freshwater lakes are found in depressions on the island. A wave-cut bluff approximately 30 feet high forms the southern border of the island.

The upland forest habitat made possible by the atypical elevation supports an unusual fauna not normally occurring near the Louisiana coast, including hawks and numerous passerine bird species, deer, fox, squirrel, armadillo, and numerous rattlesnakes, cottonmouths, and copperheads. A few black bears reportedly occur on Cote Blanche. The marsh supports nutria, muskrat, and other furbearers, and also alligators.

Land Use: Of all the Five Islands, Cote Blanche is the least physically altered by human activities, although evidence of man's presence is readily apparent. A resort was once located on the island. The Cote Blanche area contains three mineral resources of economic importance: salt, oil, and gas. The Cote Blanche Salt Mine is owned and operated by Domtar Chemicals Incorporated, Sifto Salt Division, which has a 99-year lease on the island and all mineral rights, which expires in 2072. The mine has been in operation since 1965 and currently produces 1-1.25 million tons of rock salt per year from its underground mining operation. Surface facilities at the mine encompass approximately 20 acres. Access to the mine is by unimproved road from Louisiana 83, and



Aerial view of western Cote Blanche Island, showing salt mine and canal to Intracoastal Waterway. The majority of the piercement salt dome is undisturbed.



Eroded cliffs along east Cote Blanche Bay.



Mature upland forests occur on the piercement salt domes.

transfer by ferry across the Intracoastal Waterway. Public access to the island is restricted.

Currently there are 29 producing oil wells on the island. An extensive oil and gas field lies just south of the island in West Cote Blanche Bay. Bayous and canals in the immediate vicinity are used extensively by the oil and gas industry and for coastal barge and ship traffic. The salt dome has been investigated by the Department of Energy for inclusion in the National Strategic Petroleum Reserve Program. It has an estimated storage capacity of 27 million barrels of oil.

No active farming or agricultural land is on the island, but approximately 300 cattle and several sheep graze on the cleared and wooded areas.

Significance: Cote Blanche is the best remaining example of a piercement salt dome in the region because of its isolation and relative lack of disturbance. The island supports the only upland hardwood forest in any of the study areas. It also has the only example of eroded cliffs. The unique range of habitats on the island supports vegetation that is strikingly different from that typical of the Louisiana coast. Associated with this unique vegetation is an unusual diversity of fauna. Due to its elevation, it provides a rare perspective of the surrounding coastal area and bays. Cote Blanche has been recommended as a potential preservation area.

There are 8 natural history themes and 12 subthemes represented in the area.

References: Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Final Environmental Impact Statement for Cote Blanche Mine (U.S. Federal Energy Administration 1977), Unique Ecological Features of Louisiana (Burk and Associates 1976)

CHANDELEUR AND BRETON BARRIER ISLAND SYSTEM

Rating: 2 D

Size: 190,300 acres

Location: This barrier island chain is located in the Gulf of Mexico approximately 60 miles east of New Orleans in Saint Bernard and Plaquemines parishes.

Ownership: Federal and multiple private

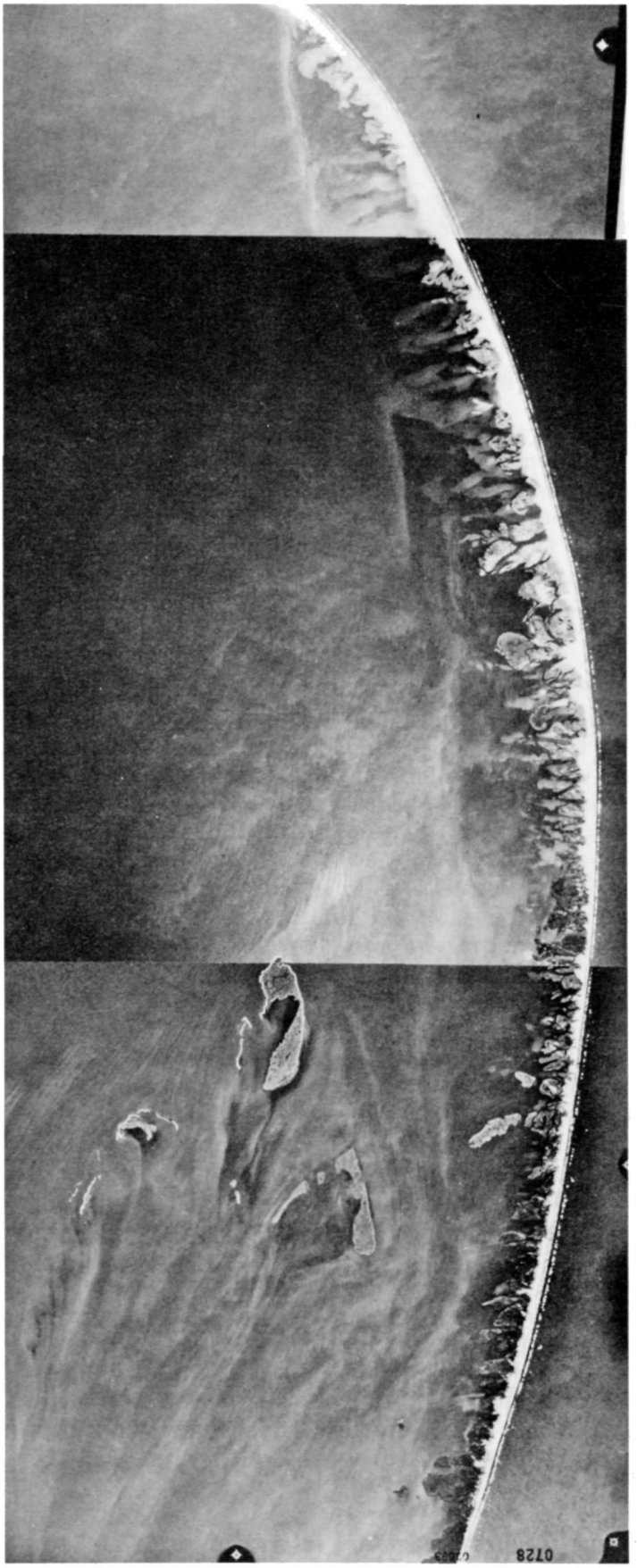
Description: The Chandeleur and Breton barrier islands form an arc in the Gulf of Mexico approximately 50 miles long. The area extends from the Chandeleur lighthouse on the north to Breton Island on the south. Geologically, it represents the maximum extent of the Saint Bernard Delta Complex into the Gulf of Mexico. During severe storms, these barrier islands undergo rapid changes, sometimes being breached or washed away. However, by absorbing storm energy they provide protection to the Chandeleur Sound and Saint Bernard wetlands to the west.

Unlike most of the coastal areas in Louisiana, the area has exceptionally clear waters and miles of white sandy beaches backed by low-rising dunes. Vegetation consists primarily of shrub thickets of black mangrove, wax myrtle, and blackrush, and wiregrass salt marsh. On the bay side of many of the islands is a zone of salt marsh, with numerous ponds and inlets. A zone of submergent turtle and manatee grasses extends to the Freemasons. The area provides important nesting habitat for the threatened Atlantic loggerhead turtle and is a vital spawning area for many species of fish. An abundance of small crustaceans, mollusks, other invertebrates, and fish exist immediately west of the Chandeleurs; this assemblage of organisms is unique because it includes both nothern gulf species and species from the tropical West Indies.

The Chandeleur and Breton barrier islands provide extremely vital nesting habitat for a variety of seabirds. The area has a total of ten nesting colonies that are used by nearly 80,000 breeding birds. One colony contains 57,000 birds, including 41,000 sandwich terns and over 14,000 royal terns. Another colony supports 20 sooty terns, the only nesting population in coastal Louisiana, Mississippi, and Alabama. Other species include laughing gulls, black skimmers, and Caspian, least, and gull-billed terns.

Land Use: Most of this remote and essentially undisturbed barrier island chain is included in the Breton National Wildlife Refuge. Surf-fishing is a popular recreational activity. Oil and gas activity occurs in nearby waters. The Chandeleur Islands are separated from the Breton Islands by the Mississippi River Gulf Outlet Canal, an important shipping channel connecting the Intracoastal Waterway with the Gulf of Mexico.

Significance: The Chandeleur and Breton barrier island system is the longest and best protected barrier island chain in the region. It contains



Central portion of the Chandeleur Islands. Freemason Islands to the west and the bay side of the barrier island chain contain submergent grasses and subtropical plant species.

large areas of undisturbed black mangrove thickets, natural beaches, marshes, and lagoons, and provides important habitat for shorebirds, waterfowl, sea turtles, and other wildlife. Specifically, it supports the largest nesting colonies of sandwich and royal terns and the only nesting colony of sooty terns on the Louisiana, Mississippi, and Alabama coasts. The assemblage of aquatic organisms inhabiting the Chandeleurs is a unique combination of species typical of the tropical West Indies and northern Gulf of Mexico. The Chandeleur Islands support the only nesting area for the threatened Atlantic loggerhead sea turtle in the Mississippi River Delta Region.

The Breton National Wildlife Refuge is Louisiana's only unit of the National Wilderness Preservation System. The entire barrier island system has been recommended as a potential natural landmark and a potential preservation area.

There are 6 natural history themes and 12 subthemes represented in this system.

References: "Gulf Coastal Plain Natural Region Theme Study" (Montgomery 1976), Nesting Colonies of Seabirds and Wading Birds, Coastal Louisiana, Mississippi, and Alabama (USDI, FWS 1977), Potential Preservation and Restoration Areas in the Louisiana Wetlands (Burk and Associates 1977), Unique Ecological Features of the Louisiana Coast (Burk and Associates 1976)

ATCHAFALAYA DELTA

Rating: 2 D

Size: 123,900 acres

Location: The Atchafalaya Delta is located in Terrebonne and Saint Mary parishes at the southernmost portion of the Atchafalaya Basin, in the bay between Point Au Fer and East Cote Blanche Bay.

Ownership: State

Description: The Atchafalaya Delta is the result of a dynamic land formation process that began to affect the Atchafalaya Bay environments in the 1950s. Before this date, most sediments and silts that had been diverted from the Mississippi River through the Atchafalaya Basin floodway had settled into the basin's large lakes. But as these lakes filled, increasing amounts of sediment reached the bay through the Atchafalaya River and Wax Lake outlet.

Coarse sediments quickly accummulated, and rapid shoaling of Atchafalaya Bay followed. The result has been the continual formation of new land near the mouth of the river. By about 1970, the 170,000 cubic feet per second annual flow from the Mississippi River to the Atchafalaya floodway had produced a forming delta area of about 20,000 acres in the bay. It is estimated that sediment is building the new delta in Atchafalaya Bay at an annual rate of about seven square miles, or 4,480 acres, of emerging lands. Much more land building is occurring beneath the water surface through prodelta and delta front formation and growth.

A great variety of pioneer plant species compete for the emergent lands and vegetation patterns develop rapidly. Two seabird rookeries supporting approximately 2,400 birds, including black skimmers, least, Forster's, and gull-billed terns, are located in the delta.

The area contains prime fish and shellfish nursery grounds and oyster beds. Freshwater marsh dominates in tidal flats. Fish and wildlife patterns are changing with the maturing delta. Ideal habitat for waterfowl, furbearers, and freshwater and estuarine fish is developing, and eventually an emergent freshwater delta with distributaries will evolve. Although this process of delta building was characteristic of past geologic history, the Atchafalaya Delta is unique because it is the only Louisiana coastal area where accretion or land building is occurring.

Land Use: The Atchafalaya River and Bayous Chene, Boeuf, and Black Project is currently under construction by the U.S. Army Corps of Engineers, which is also responsible for maintaining a navigation channel through the area into the gulf. The Atchafalaya Delta is a state wildlife management area.

Significance: The Atchafalaya Delta is the largest active delta in the United States and is the only area of active delta building on the Louisiana coast. It is thus the sole example of the process that is



Newly-formed lands in the Atchafalaya Delta. Shallow waters and an ever-changing channel make the area hazardous for water traffic.



Atchafalaya Delta lands are quickly covered with willow and other pioneer species. The emergent lands will provide wildlife habitat in a state-designated management area.

responsible for creating the Mississippi River Delta and provides an excellent opportunity for the study of this delta-building process.

Prime foraging habitat for the endangered Kemp's ridley turtle occurs in adjacent shallow offshore waters.

There are 6 natural history themes and 9 subthemes represented in this area.

References: "A Jetty from Point Chevreuil: Evaluation of a Proposal to Reduce Sedimentation in the Cote Blanche Bays and Vermilion Bay" (Coastal Environments 1977), "Unique Ecological Features of the Louisiana Coast" (Burk and Associates 1976), "Unique Wildlife Ecosystems of Louisiana" (USDI, FWS 1976)

APPENDIXES

TITLE IX—JEAN LAFITTE NATIONAL HISTORICAL PARK

Establishment. 16 USC 230.

SEC. 901. In order to preserve for the education, inspiration, and benefit of present and future generations significant examples of natural and historical resources of the Mississippi Delta region and to provide for their interpretation in such manner as to portray the development of cultural diversity in the region, there is authorized to be established in the State of Louisiana the Jean Lafitte National Historical Park and Preserve (hereinafter referred to as the "park").

Description.

The park shall consist of (1) the area of approximately twenty thousand acres generally depicted on the map entitled "Barataria Marsh Unit-Jean Lafitte National Historical Park and Preserve" numbered 90,000B and dated April 1978, which shall be on file and available for public inspection in the office of the National Park Service, Department of the Interior; (2) the area known as Big Oak Island; (3) an area or areas within the French Quarter section of the city of New Orleans as may be designated by the Secretary of the Interior for an interpretive and administrative facility; (4) the Chalmette National Historical Park; and (5) such additional natural, cultural, and historical resources in the French Quarter and Garden District of New Orleans, forts in the delta region, plantations, and Acadian towns and villages in the Saint Martinville area and such other areas and sites as are subject to cooperative agreements in accordance with the provisions of this title.

Lands, waters and interests, acquisition. 16 USC 230a.

SEC. 902. (a) Within the Barataria Marsh Unit the Secretary is authorized to acquire not to exceed eight thousand acres of lands, waters, and interests therein (hereinafter referred to as the "core area"), as depicted on the map referred to in the first section of this title, by donation, purchase with donated or appropriated funds, or exchange. The Secretary may also acquire by any of the foregoing methods such lands and interests therein, including leasehold interests, as he may designate in the French Quarter of New Orleans for development and operation as an interpretive and administrative facility. Lands, waters, and interests therein owned by the State of Louisiana or any political subdivision thereof may be acquired only by donation. In acquiring property pursuant to this title, the Secretary may not acquire right to oil and gas without the consent of the owner, but the exercise of such rights shall be subject to such regulations as the Secretary may promulgate in furtherance of the purposes of this title.

Guidelines or criteria, consultation.

(b) With respect to the lands, waters, and interests therein generally depicted as the "park protection zone" on the map referred to in the first section of this title, the Secretary shall, no later than six months from the date of enactment of this Act, in consultation with the affected State and local units of government, develop a set of guidelines or criteria applicable to the use and development of properties within the park protection zone to be enacted and enforced by the State or local units of government.

Values, preservation and protection.

(c) The purpose of any guideline developed pursuant to subsection (b) of this section shall be to preserve and protect the following values within the core area:

(1) fresh water drainage patterns from the park protection zone into the core area;

(2) vegetative cover;

(3) integrity of ecological and biological systems; and

(4) water and air quality.

Authority, ceding.

(d) Where the State or local units of government deem it appropriate, they may cede to the Secretary, and the Secretary is authorized to accept the power and authority to confect and enforce a program or set of rules pursuant to the guidelines established under subsection (b) of this section for the purpose of protecting the values described in subsection (c) of this section.

Acquisitions.

(e) The Secretary, upon the failure of the State or local units of government to enact rules pursuant to subsection (b) of this section or enforce such rules so as to protect the values enumerated in subsection (c) of this section, may acquire such lands, servitudes, or interests in lands within the park protection zone as he deems necessary to protect the values enumerated in subsection (c) of this section.

Boundaries, revision.

(f) The Secretary may revise the boundaries of the park protection zone, notwithstanding any other provision of law, to include or exclude properties, but only with the consent of Jefferson Parish.

Use and occupancy right, retention.
16 USC 230b.

SEC. 903. Within the Barataria Marsh Unit, the owner or owners of improved property used for noncommercial residential purposes on a year-round basis may, as a condition of the acquisition of such property by the Secretary, elect to retain a right of use and occupancy of such property for noncommercial residential purposes if, in the judgment of the Secretary, the continued use of such property for a limited period would not unduly interfere with the development or management of the park. Such right of use and occupancy may be either a period ending on the death of the owner or his spouse, whichever occurs last, or a term of not more than twenty-five years, at the election of the owner. Unless the property is donated, the Secretary shall pay to the owner the fair market value of the property less the fair market value of the right retained by the owner. Such right may be transferred or assigned and may be terminated by the Secretary, if he finds that the property is not used for noncommercial residential purposes, upon tender to the holder of the right an amount equal to the fair market value of the unexpired term. As used in this section, the term "improved property" means a single-family, year-round dwelling, the construction of which was begun before January 1, 1977, which serves as the owner's permanent place of abode at the time of its acquisition by the United States, together with not more than three acres of land on which the dwelling and appurtenant buildings are located which the Secretary finds is reasonably necessary for the owner's continued use and occupancy of the dwelling.

"Improved property."

Cooperative agreements.
16 USC 230c.

SEC. 904. In furtherance of the purposes of this title, and after consultation with the Commission created by section 7 of this title, the Secretary is authorized to enter into cooperative agreements with the owners of properties of natural, historical, or cultural significance, including but not limited to the resources described in paragraphs (1) through (5) of the first section of this title, pursuant to which the Secretary may mark, interpret, restore and/or provide technical assistance for the preservation and interpretation of such properties, and pursuant to which the Secretary may provide assistance including management services, program implementation, and incremental financial assistance in furtherance of the standards for administration of the park pursuant to section 906 of this title. Such agreements shall contain, but need not be limited to, provisions that the Secretary, through the National Park Service, shall have the right of access at all reasonable times to all public portions of the property covered by such agreement for the purpose of conducting visitors through such properties and interpreting them to the public, and that no changes or alterations shall be made in such properties except by mutual agreement between the Secretary and the other parties to such agreements. The agreements may contain specific provisions which outline in detail the extent of the participation by the Secretary in the restoration, preservation, interpretation, and maintenance of such properties.

Hunting, fishing, and trapping.
16 USC 230d.

SEC. 905. Within the Barataria Marsh Unit, the Secretary shall permit hunting, fishing (including commercial fishing), and trapping in accordance with applicable Federal and State laws, except that within the core area and on those lands acquired by the Secretary pursuant to section 902(c) of this title, he may designate zones where and establish periods when no hunting, fishing, or trapping shall be permitted for reasons of public safety. Except in emergencies, any regulations of the Secretary promulgated under this section shall be put into effect only after consultation with the appropriate fish and game agency of Louisiana.

Consultation.

SEC. 906. The Secretary shall establish the park by publication of a notice to that effect in the Federal Register at such time as he finds that, consistent with the general management plan referred to in section 908, sufficient lands and interests therein (i) have been acquired for interpretive and administrative facilities, (ii) are being protected in the core area, and (iii) have been made the subject of cooperative agreements pursuant to secton 904. Pending such establishment and thereafter the Secretary shall administer the park in accordance with the provisions of this title, the Act of August 25, 1916 (39 Stat. 535), the Act of August 21, 1935 (49 Stat. 666), and any other statutory authorities available to him for the conservation and management of natural, historical, and cultural resources.

Notice, publication in Federal Register. 16 USC 230e.

Administration.

16 USC 1 *et seq.* 16 USC 461 note.

SEC. 907. (a) There is established the Delta Region Preservation Commission (hereinafter referred to as the "Commission"), which shall consist of the following:

Delta Region Preservation Commission, establishment and membership. 16 USC 230f.

(1) two members appointed by the Governor of the State of Louisiana;

(2) two members appointed by the Secretary from recommendations submitted by the President of Jefferson Parish;

(3) two members appointed by the Secretary from recommendations submitted by the Jefferson Parish Council;

(4) two members appointed by the Secretary from recommendations submitted by the mayor of the city of New Orleans;

(5) one member appointed by the Secretary from recommendations submitted by the commercial fishing industry;

(6) three members appointed by the Secretary from recommendations submitted by local citizen conservation organizations in the delta region; and

(7) one member appointed by the Chairman of the National Endowment for the Arts.

(b) Members of the Commission shall serve without compensation as such. The Secretary is authorized to pay the expenses reasonably incurred by the non-Federal members of the Commission in carrying out their duties.

Compensation and expenses.

(c) The function of the Commission shall be to advise the Secretary in the selection of sites for inclusion in the park, in the development and implementation of a general management plan, and in the development and implementation of a comprehensive interpretive program of the natural, historic, and cultural resources of the region. The Commission shall inform interested members of the public, the State of Louisiana and its political subdivisions, and interested Federal agencies with respect to existing and proposed actions and programs having a material effect on the perpetuation of a high-quality natural and cultural environment in the delta region.

Functions.

(d) The Commission shall act and advise by affirmative vote of a majority of its members: *Provided*, That any recommendation of the Commission that affects the use or development, or lack thereof, of property located solely within a single parish or municipality shall have the concurrence of a majority of the members appointed from recommendations submitted by such parish or municipality.

(e) The Directors of the Heritage Conservation and Recreation Service and the National Park Service shall serve as ex officio members of the Commission and provide such staff support and technical services as may be necessary to carry out the functions of the Commission.

SEC. 908. (a) There is authorized to be appropriated, to carry out the provisions of this title, not to exceed $50,000,000 from the Land and

Appropriation authorization. 16 USC 230g.

Water Conservation Fund for acquisition of lands, waters, and interests therein and such sums as necessary for the development of essential facilities.

General management plan, submittal to congressional committees.

(b) Within three years from the date of enactment of this title, the Secretary, after consultation with the Commission, shall submit to the Committee on Interior and Insular Affairs of the House of Representatives, and the Committee on Energy and Natural Resources of the Senate a general management plan for the park indicating—

(1) transportation alternatives for public access to the park;

(2) the number of visitors and types of public use within the park which can be accommodated in accordance with the protection of its resources;

(3) the location and estimated cost of facilities deemed necessary to accommodate such visitors and uses; and

(4) a statement setting forth the actions which have been and should be taken to assure appropriate protection, interpretation, and management of the areas known as Big Oak Island and Couba Island.

Chalmette Unit, redesignation. 16 USC 230h.

SEC. 909. The area described in the Act of October 9, 1962 (76 Stat. 755), as the "Chalmette National Historical Park" is hereby redesignated as the Chalmette Unit of the Jean Lafitte National Historical Park. Any references to the Chalmette National Historical Park shall be deemed to be references to said Chalmette Unit.

Report to congressional committees. 16 USC 230i.

SEC. 910. By no later than the end of the first full fiscal year following the date of enactment of this section, the Secretary shall submit to the Committee on Interior and Insular Affairs of the House of Representatives and the Committee on Energy and Natural Resources of the Senate, a comprehensive report with recommendations as to sites within the Mississippi River Delta Region which constitute nationally significant examples of natural resources within that region.

APPENDIX B

Areas Investigated but Determined To Be Less Than Nationally Significant (Priority 3)

Area Name	Parish	Comments
Avery Island	Iberia	Considerable disruption is evident, and piercement salt dome is better represented by Cote Blanche.
Bayou aux Carpes	Jefferson	Bayou is blocked from natural flow; system is better represented in adjacent Jean Lafitte Preserve and protection zone.
Bayou Citamon area	Saint James	Bayou is polluted; cypress-tupelo gum swamp theme is better represented in Lake Maurepas area and Atchafalaya River Basin.
Belle Isle	Saint Mary	Considerable disruption is evident, and piercement salt dome is better represented by Cote Blanche.
Big and Little Oak Island area	Orleans	Physical site disturbance and considerable exotic vegetation; national significance as an archeological site established in P.L. 95-625
Brusle Lake area	Lafourche	Brackish marsh is better represented in Terrebonne Marsh and Marsh Island; considerable disruption is evident.
Catahoula Forks	Saint Martin	Bottomland hardwood forest is better represented in the Atchafalaya River Basin; area is small.

Grassy Lake and Lake Verret area	Saint Martin/ Assumption	Cypress-tupelo gum swamp is better represented in Atchafalaya River Basin and Lake Maurepas area; area is less diverse.
Jefferson Island	Iberia	Considerable disruption is evident, and piercement salt dome is better represented by Cote Blanche.
Saint Bernard Marsh	Saint Bernard	Marsh types are better represented in several areas, particularly Marsh Island and Terrebonne Marsh; considerable disruption has resulted from the Mississippi River Gulf Outlet Canal.
Saint Tammany submergent grassbeds	Saint Tammany	Submergent grassbeds are better represented in the Temple Bay portion of Gheens Marsh area and Lac des Allemands area; area is less diverse.
Spanish Lake Marsh	Plaquemines	Marsh types are better represented in several areas, particularly Marsh Island and Terrebonne Marsh.
Spanish Lake Swamp	Ascension	Area disturbance has resulted from modifications of water levels.
Terrebonne/Timbalier Bays	Terrebonne/ Lafourche	Intensive oil and gas activity is evident; marine and estuarine environments are better represented in Barataria Bay area.
Weeks Island	Iberia	Considerable disruption is evident, and piercement salt dome is better represented by Cote Blanche.

APPENDIX C

Consultation/Coordination

The following individuals and representatives of agencies, institutions, and companies were consulted during the preparation of this document.

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Federal Agencies

Department of the Army
- Corps of Engineers

Department of Commerce
- National Marine Fisheries Service
- Office of Coastal Zone Management

Department of the Interior
- Geological Survey
- Bureau of Land Management
- U.S. Fish and Wildlife Service
- Heritage Conservation and Recreation Service

Environmental Protection Agency

State Agencies

Louisiana Department of Culture, Recreation and Tourism
- Office of State Parks

Louisiana Department of Natural Resources
- Office of Conservation

Louisiana Department of Urban and Community Affairs

Louisiana Department of Wildlife and Fisheries
    Environmental Section
    Water Pollution Control Division
    Seafood Division
Louisiana Coastal Resources Program
Louisiana State Planning Office
Louisiana State University
    Center for Wetland Resources

Local Agencies

Regional Planning Commission for Jefferson, Orleans, Saint Bernard and Saint Tammany Parishes
Evangeline Economic Development District
Orleans Parish Planning Department

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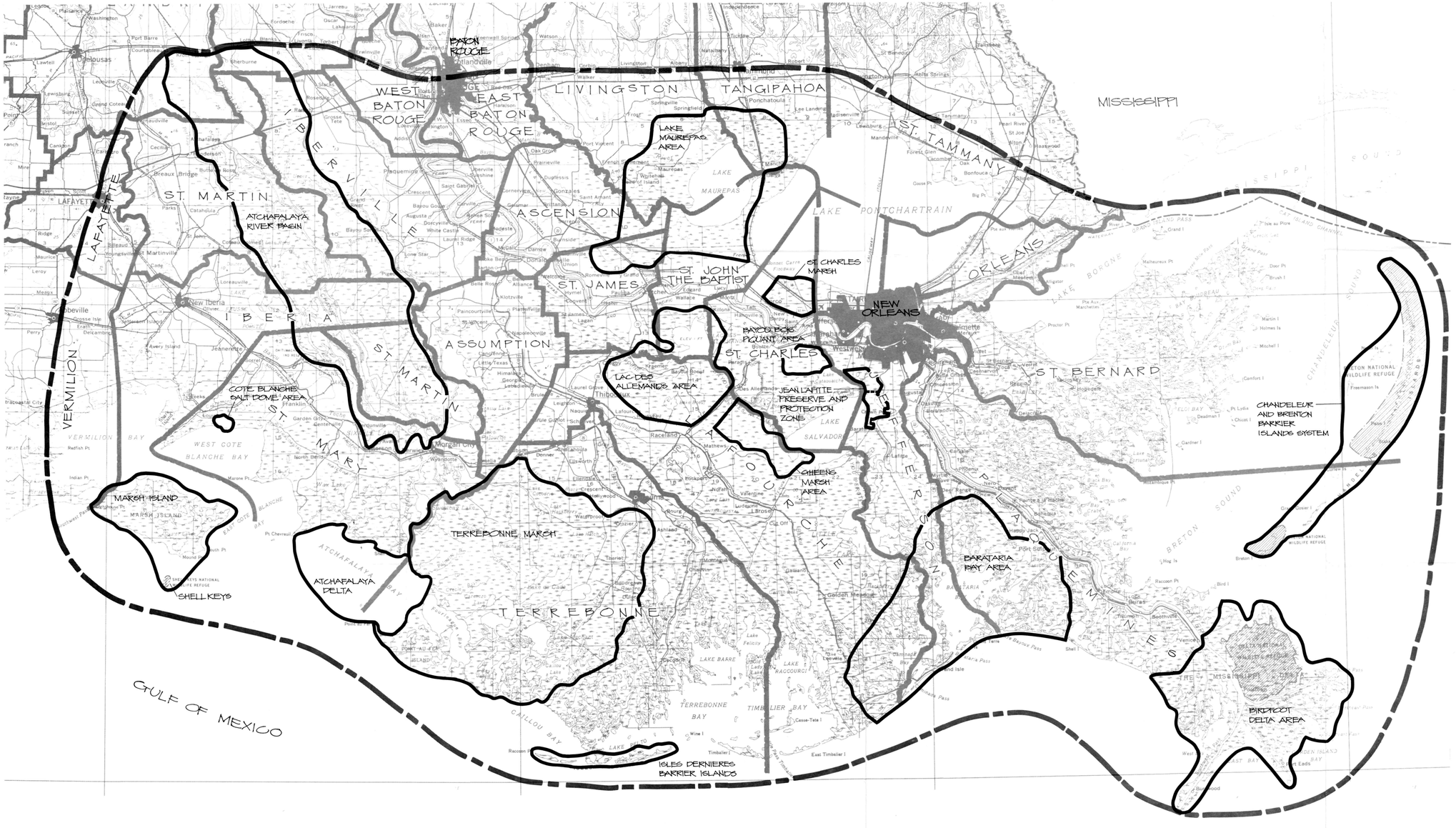
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Publication services were provided by the graphics and editorial staffs of the Denver Service Center. NPS 1632



STUDY AREAS

MISSISSIPPI RIVER DELTA REGION

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NA/MRDR | 20134
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As the nation's principal conservation agency, the Department of the Interior has basic responsibilities to protect and conserve our land and water, energy and minerals, fish and wildlife, parks and recreation areas, and to ensure the wise use of all these resources. The department also has major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980—677-120/36