Appendix F

BIOLOGICAL RESOURCES

January 2007

BIOLOGICAL RESOURCES

CALCASIEU RIVER AND PASS, LOUISIANA DREDGED MATERIAL MANAGEMENT PLAN

Contract No. DACW27-03-D-0005
Delivery Order No. CZ03
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Prepared for

U.S. Army Corps of Engineers
New Orleans District
New Orleans, Louisiana

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1.0 INTRODUCTION

The Calcasieu River/Ship Channel project corridor lies within the two most southwestern parishes in Louisiana. The northern portion of the project lies within Calcasieu Parish and the southern part within Cameron Parish. The parish line separating these two parishes is also the approximate transition zone between the coastal prairie habitats to the north and the marsh habitats to the south. The entire project area is within the ecosystem identified by the U.S. Fish and Wildlife Service (USFWS) as the Lower Mississippi River Ecosystem. The Louisiana Department of Wildlife and Fisheries (LDWF) places the project area within the state's Gulf Coast Prairies and Marshes Ecoregion. The project area ecosystem serves as the primary wintering habitat for mid-continent waterfowl populations, as well as breeding and migration habitat for migratory songbirds returning from Central and South America, and numerous species of resident wildlife species.

Industrialization of the northern half of the project within Calcasieu Parish began in the early 1920's with the discovery of oil and gas reserves nearby. The ease of access to the area afforded by the numerous navigable waterways, including easy access to the Gulf of Mexico, provided a network for the development of oil and gas production fields and has spurred a proliferation of major petroleum and chemical refining plants. Today, over 30 major industries producing mainly industrial chemicals, petroleum products, aggregates and commercial feedstocks are located within the watershed. (*Cameron Prairie National Wildlife Refuge Comprehensive Conservation Plan*, U.S. Fish and Wildlife Service, 2006)

2.0 GEOLOGIC HISTORY

Most of Louisiana's subsurface strata consist of geologically young sedimentary sequences that were deposited by rivers flowing through the coastal plains. As rivers corresponding to today's Mississippi drainage system flowed into the Gulf of Mexico, these sediments were deposited upon banks and deltas. During glacial episodes in the Quaternary period (two million years ago [mya]), sea level dropped and rivers began depositing sediments farther offshore. Over time, these processes slowly advanced the Louisiana coastline into the Gulf of Mexico.

Most of the surface exposures today consist of Quaternary sediments because these processes are still at work. Channel deposits are made up of gravel and sand, with the heaviest river deposits falling out first. Farther up the banks, natural levees are composed of fine sands and muddy deposits. Backswamps and coastal marshes, the lowest energy environments, contain rich mud and organic matter.

A lesser percentage of the state's surficial geology is occupied by deposits associated with Pleistocene (2 mya) terraces. These terraces, located inland of the coastal marshes, also consist of sand, gravel and mud. Sometimes sloping toward the Gulf, these surfaces are remnants of pre-existing floodplains, formed by sea level rise and fall during glacial and interglacial periods.

The remainder of the state's surface, primarily in the northwest, consists of Tertiary age (65 mya) rock exposures and a very few Cretaceous (140 mya) rocks associated with salt domes. (*Calcasieu Estuary Environment*, Coastal Protection and Restoration Division, NOAA Ocean Service, undated)

3.0 HYDROLOGY

The project area is located in southwest Louisiana in Calcasieu and Cameron parishes, in the Calcasieu River Basin. The drainage basin consists of approximately 4,105 square miles of land composed of hill and prairies in the upper portion and coastal wetlands and marshes in the lower portion and represents about eight percent of the land area of the state. Headwaters of the river are found in the hills west of the city of Alexandria. Flow is in a southerly direction for about 215 miles to the Gulf of Mexico. The study area of the basin consists of approximately 34 miles of portions of the river's main channel and the man-made ship channel from Lake Charles to the Gulf of Mexico.

The central Louisiana hills that serve as headwaters of the river are approximately 260 feet above mean sea level (msl). The river flows down gradient through the coastal prairie to the coastal marshes, which have an average elevation of 2-3 feet above msl.

The river flows through four major lakes on its way to the Gulf: Lake Charles, Prien Lake, Moss Lake and Calcasieu Lake. The ship channel largely by-passes Prien Lake and although it passes through Calcasieu Lake, it is mostly isolated from the lake by dredge spoil banks. The Gulf Intracoastal Waterway (GIWW) intersects and crosses the river/ship channel at Devil's Elbow just north of Calcasieu Lake.

The Calcasieu River varies from a small, fast-flowing stream in the headwaters to a broad, sluggish estuary from Lake Charles to its entrance into the Gulf. Flows in the upper basin may range from a high of 180,000 cubic feet per second (cfs) in the winter and spring to zero cfs during the summer and fall. The lower portion of the river from the city of Lake Charles to the Gulf is subject to tidal variation. A semidiurnal tide extends approximately 65 miles upstream and has mean tidal ranges of 1.7 feet at the mouth and 0.7 feet at Lake Charles. An existing saltwater barrier across the Calcasieu River just north of Lake Charles divides the upper and lower basins and prevents saltwater intrusion from degrading this major source of irrigation water supply for rice farming. Navigation improvements have modified the Calcasieu River from its mouth approximately 52.6 miles upstream. (*Water Quality Management Plan for the Calcasieu River Basin*, R.F. Weston, Inc., 1974)

4.0 HABITATS

All three major aquatic habitat types are represented within the project study area: (1) fresh water habitat exists in the tributaries feeding into the Calcasieu River/Ship Channel and some of the fresh water marshes in the surrounding area; and, within the River/Channel itself, (2) brackish water habitat typically extends from the saltwater barrier just north of the project end (at the I-10 bridge) to about Turner's Bay near the crossing of the Gulf Intracoastal Waterway (GIWW), and (3) saltwater habitat becomes more prevalent from that point to the Gulf of Mexico. A bottom saltwater wedge in the Channel can sometimes extend all the way from the Gulf to the saltwater barrier, depending upon drought conditions in the area.

One special brackish water sub-habitat that bears mentioning in the project area because of its economic and recreational importance is the oyster reef habitat found mainly in the Calcasieu Lake area. The reefs are composed mainly of oysters (*Crassostrea virginica*), but may also contain clam shells (*Rangia* sp.), as well. Besides sustaining oyster communities, oyster reefs also support a diverse and complex biological community. Due to their commercial importance, oysters in the Louisiana estuaries have been extensively studied. One of the primary impacts on the oyster population is saltwater encroachment into the brackish water habitat. High

salinities force the oyster populations to shift inland into regions of increased predation and parasitism. (*Calcasieu Estuary Environment*, Coastal Protection and Restoration Division, NOAA Ocean Service, undated)

Essential fish habitat (EFH) as defined by the Magnuson-Stevens Fishery Conservation and Management Act (revised 2005) in the project area is discussed in a separate report as part of this study. Please see that report for details on this subject.

Terrestrial habitats within the project area consist of four major types: (1) the upper portion of the project area (i.e., mainly Calcasieu Parish) represents the southern boundary of Coastal Prairie habitat; (2) near the parish line the habitat transitions to Coastal Marshes; (3) mixed into the Coastal Prairie habitat and the northern portion of the Coastal Marshes are Forested Wetlands; and (4) at the southern end of the project, along the Gulf Coast are Cheniers. Further explanation of these terrestrial habitats is provided in the following sections.

4.1 Coastal Prairies

As recently as 100 years ago, 2.5 million acres in southwest Louisiana consisted of vast grasslands, known as coastal prairies. These great expanses were devoid of trees, except for small clusters along streams and rivers, known as "gallery forests." The lack of tall, woody foliage on the plains was attributed to the combination of heavy clay soils and frequent fires.

One unique feature that served to break up the great expanses of tall grass, as well as promote species diversity, was the presence of rounded hillocks, known as "pimple mounds." These mounds, still existing today, range from 20 to 50 feet in diameter and 3 to 7 feet in height. They are composed of coarser, better-draining sediments than the surrounding prairie sediments. However, the geologic processes that formed these mounds remain a mystery.

Upon settlement in the mid-1800s, the coastal prairie's rich soil content was recognized as ideal for cultivation and cattle grazing. Rice paddies and pastures quickly overtook open grasslands, and now the original coastal prairie is considered one of the rarest habitats in Louisiana. A scant 1,000 acres remain out of the original 2.5 million (although the name "coastal prairie" is still used to describe the habitat of the region).

4.2 Coastal Marshes

The northern-most reaches of the coastal marshes in the project area are predominantly freshwater marshes. Freshwater marshes, typically never exceeding salinities greater than 2 parts per thousand (ppt), are rich in plant species, with marsh-hay cordgrass, cattail and sawgrass among the most prevalent. This marsh sustains high densities of wildlife, including migrating waterfowl. However, because of saltwater intrusion, Louisiana freshwater marshes have been dramatically reduced over the past few decades.

4.3 Forested Wetlands

Forested wetlands, located at the landward end of estuaries, are divided into two vegetation zones: bald cypress/tupelo swamps and bottomland hardwood forests. The soils are nutrient-rich and are high in organic matter. The almost year-round presence of standing water allows for the growth of aquatic and emergent plants. The diverse microhabitats that exist within the forested wetlands make this zone particularly species-rich. Because dry land is at premium in coastal Louisiana, forested wetlands are some of the only wooded areas that remain untouched

by agriculture, industry and urban use. Mapped wetlands of the project area provided by the National Wetlands Research Center (NWRC), USFWS, are shown in figures 1 through 4. However, the USGS Westlake Quadrangle mapped wetlands are not available at this time, thus, wetlands are not mapped for that quad in the extreme northern end of the project area (i.e., from about Burton Landing northward).

4.4 Cheniers

Cheniers are coastal ridges, exclusive to western coastal Louisiana, that typically have higher relief than outlying barrier islands. As a result, these ridges are historically known for supporting maritime forests dominated by live oak trees ("*chenie*r" is French for oak). Those forests that escaped the human impacts of deforestation and agriculture play an important ecological role as a temporary habitat for many migrating species. Also, because cheniers are above sea level, some by as much as 3 meters (although not within the project area), it is one of the most important continuous habitats for mammals and birds in coastal Louisiana. (*Calcasieu Estuary Environment*, Coastal Protection and Restoration Division, NOAA Ocean Service, undated)

5.0 VEGETATION

Vegetation and land use within the project area is shown on figures 5 through 8. These maps are somewhat repetitive of figures 1 through 4, but are provided by the USACE Engineer Research and Development Center (ERDC) and include more detail than that shown on the NWRC maps.

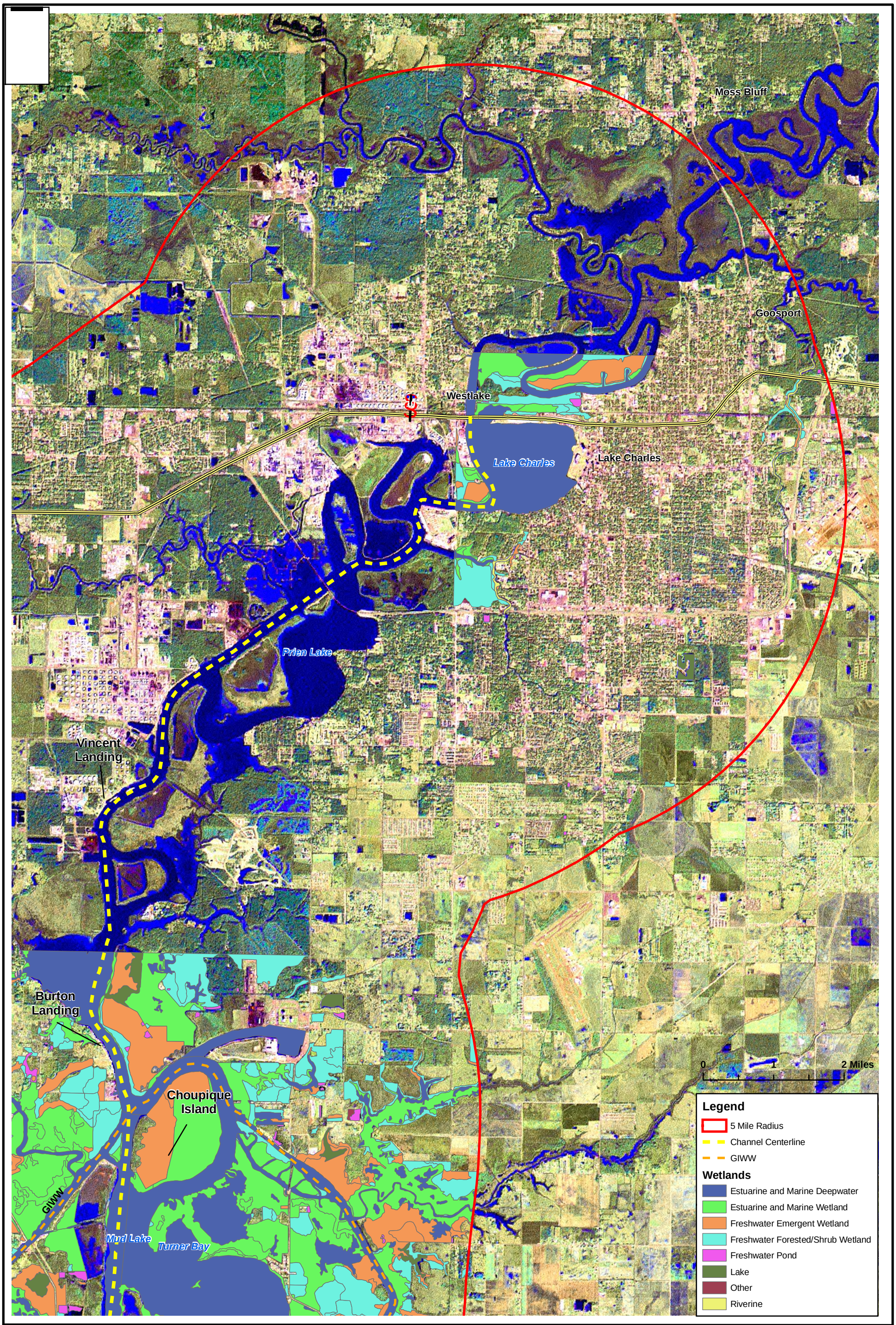
6.0 ECOSYSTEM THREATS

6.1 Comprehensive Wildlife Conservation Strategy

The Louisiana Department of Wildlife and Fisheries has initiated a Conservation Habitats & Species Assessments program as part of its Comprehensive Wildlife Conservation Strategy (CWCS). The following conservation strategies have been established to guide the Department in preserving the unique and important ecosystem of the Calcasieu River basin:

1. Support current initiatives and develop new programs where necessary that help reduce siltation and sedimentation throughout the Calcasieu Basin.
2. Work with the Louisiana Aquatic Nuisance Species Task Force (LANSTF) to identify and address threats related to invasive species.
3. Develop partnerships with regulatory agencies to share data on habitat threats and to ensure compliance of existing regulations.
4. Develop an internal procedure to distribute information on proposed reservoirs to LDWF fisheries biologists to solicit their input into LDWF comments on these proposed documents.

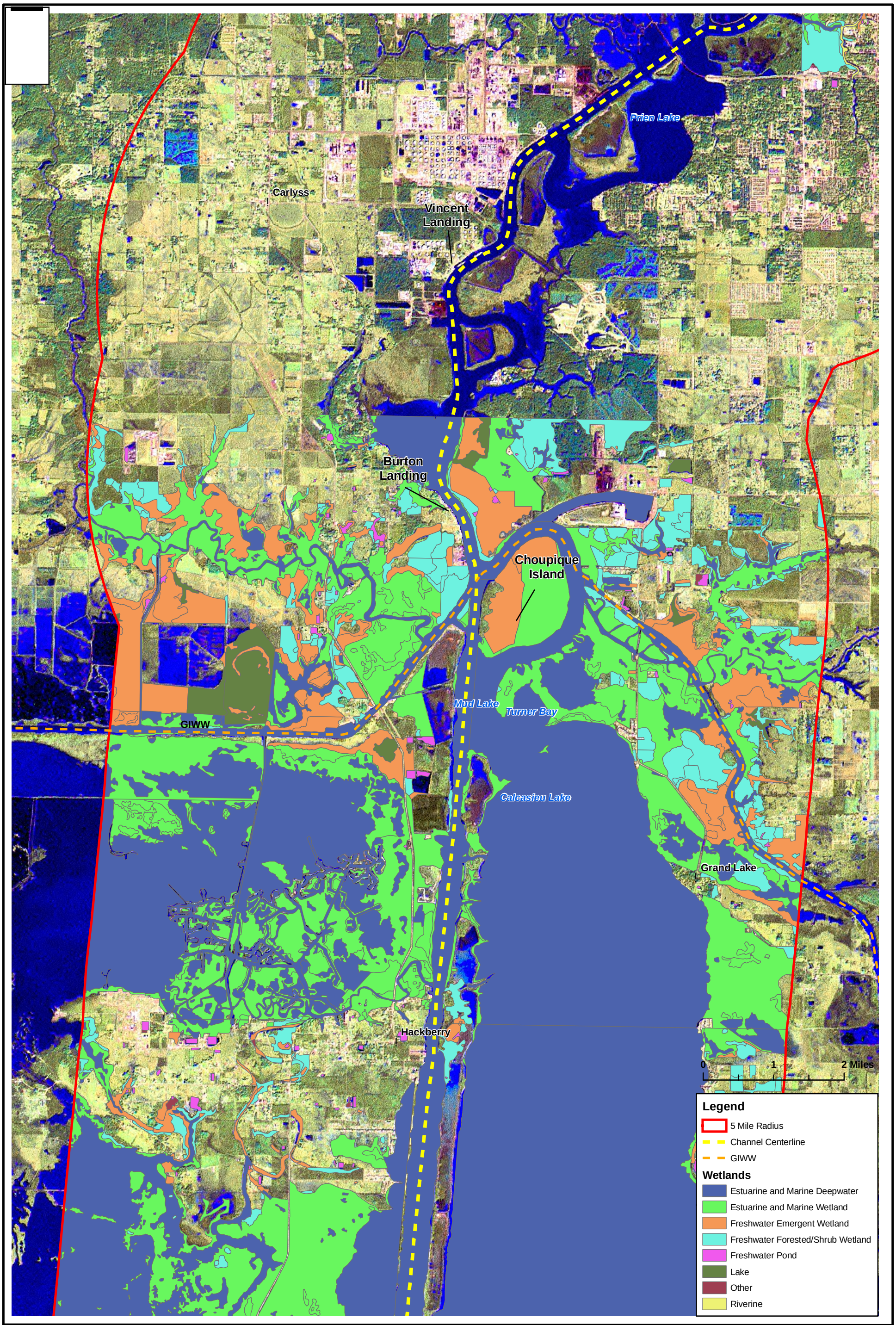
Also, included in this initiative is the identification of specific threats to the Calcasieu River basin and the sources of these threats. Table 1 illustrates these threats and their sources.



NATIONAL WETLAND RESEARCH CENTER MAPPED WETLANDS

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

Figure: 1
Date: October 2006
Scale: 1:80,000
Source: NWRC/GEC
Map Author: C. Perez



NATIONAL WETLAND RESEARCH CENTER MAPPED WETLANDS

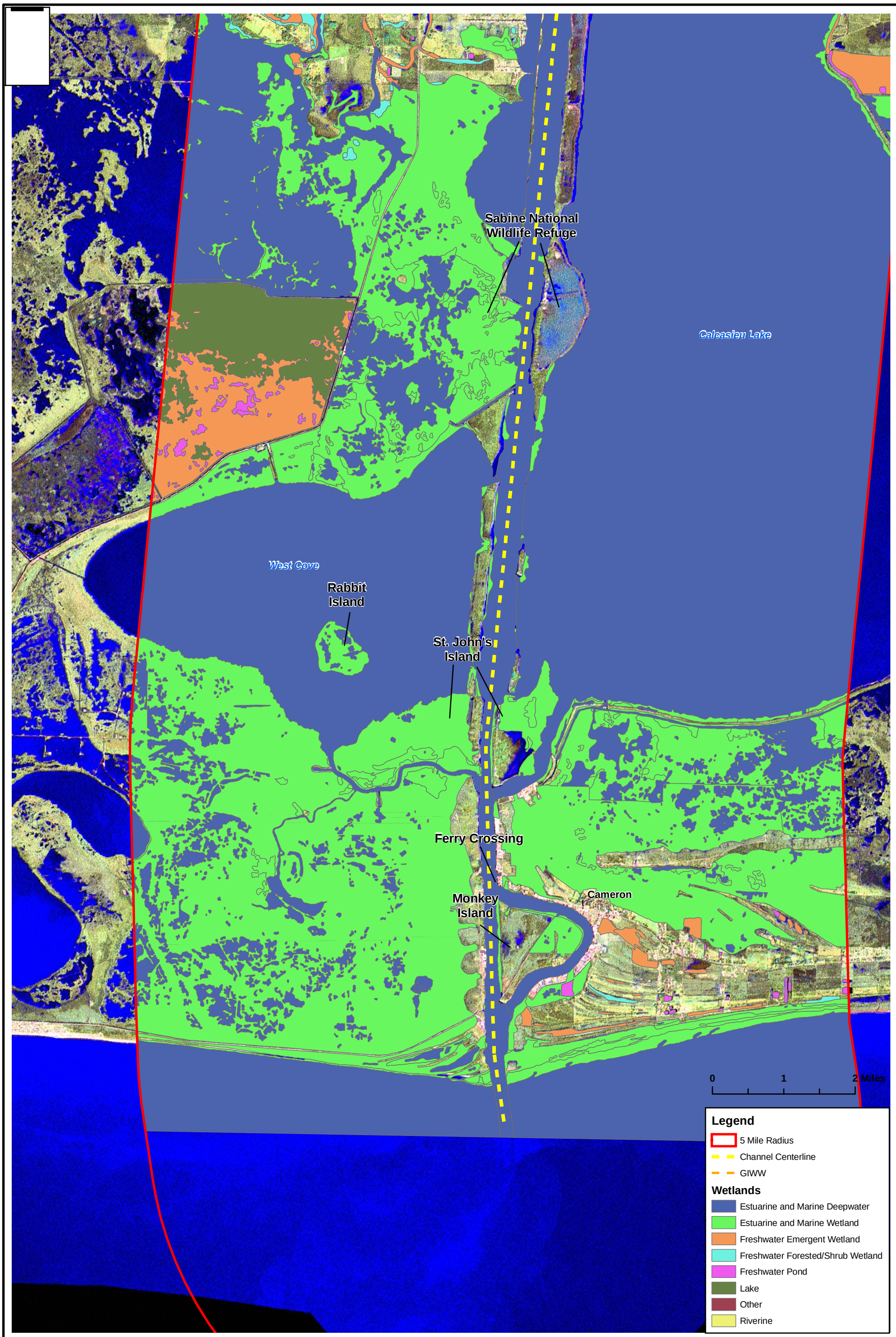
Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

Figure: 2
Date: October 2006
Scale: 1:80,000
Source: NWRC/GEC
Map Author: C. Perez

NATIONAL WETLAND RESEARCH CENTER MAPPED WETLANDS

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

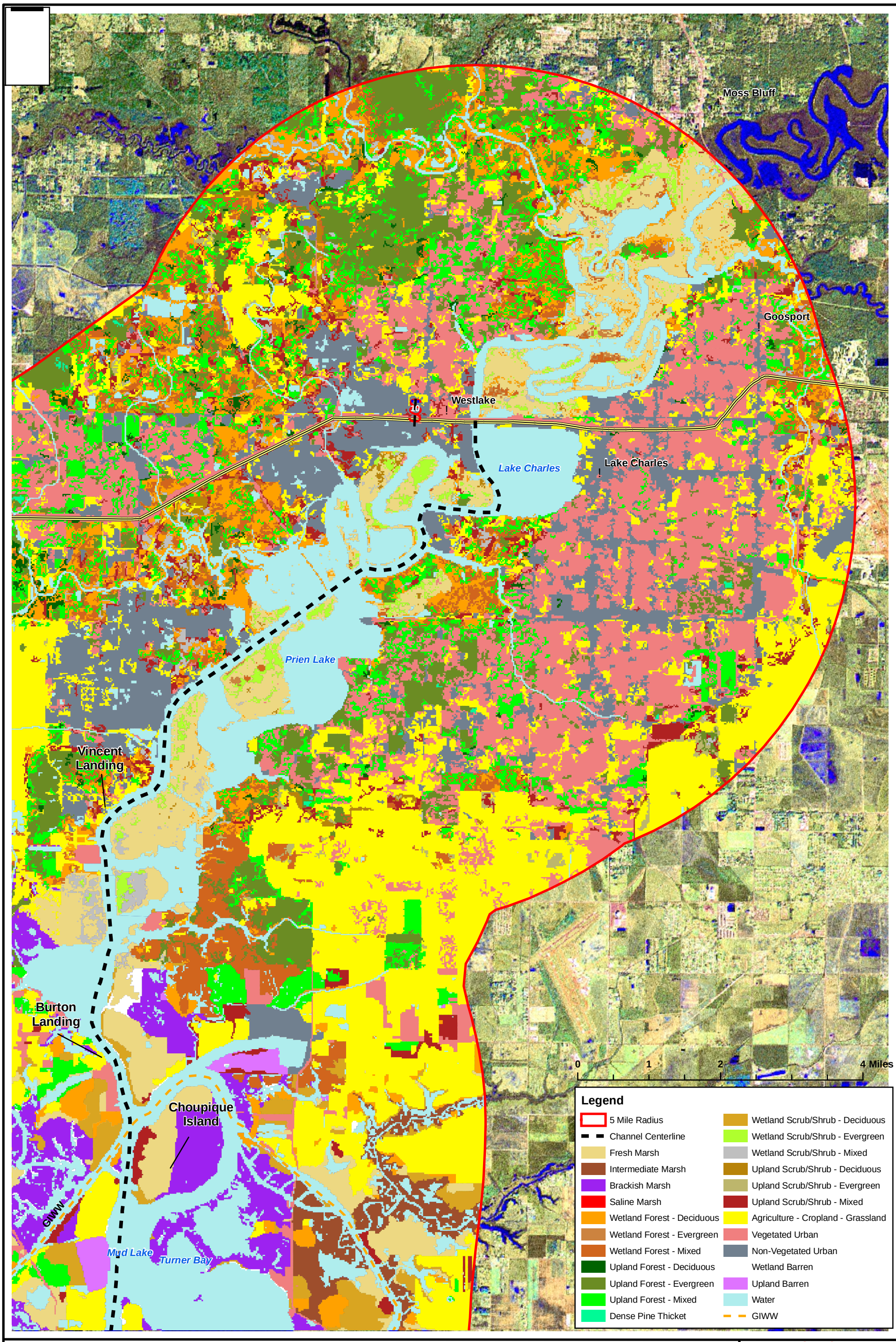
Figure: 3
Date: October 2006
Scale: 1:80,000
Source: NWRC/GEC
Map Author: C. Perez



NATIONAL WETLAND RESEARCH CENTER MAPPED WETLANDS

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

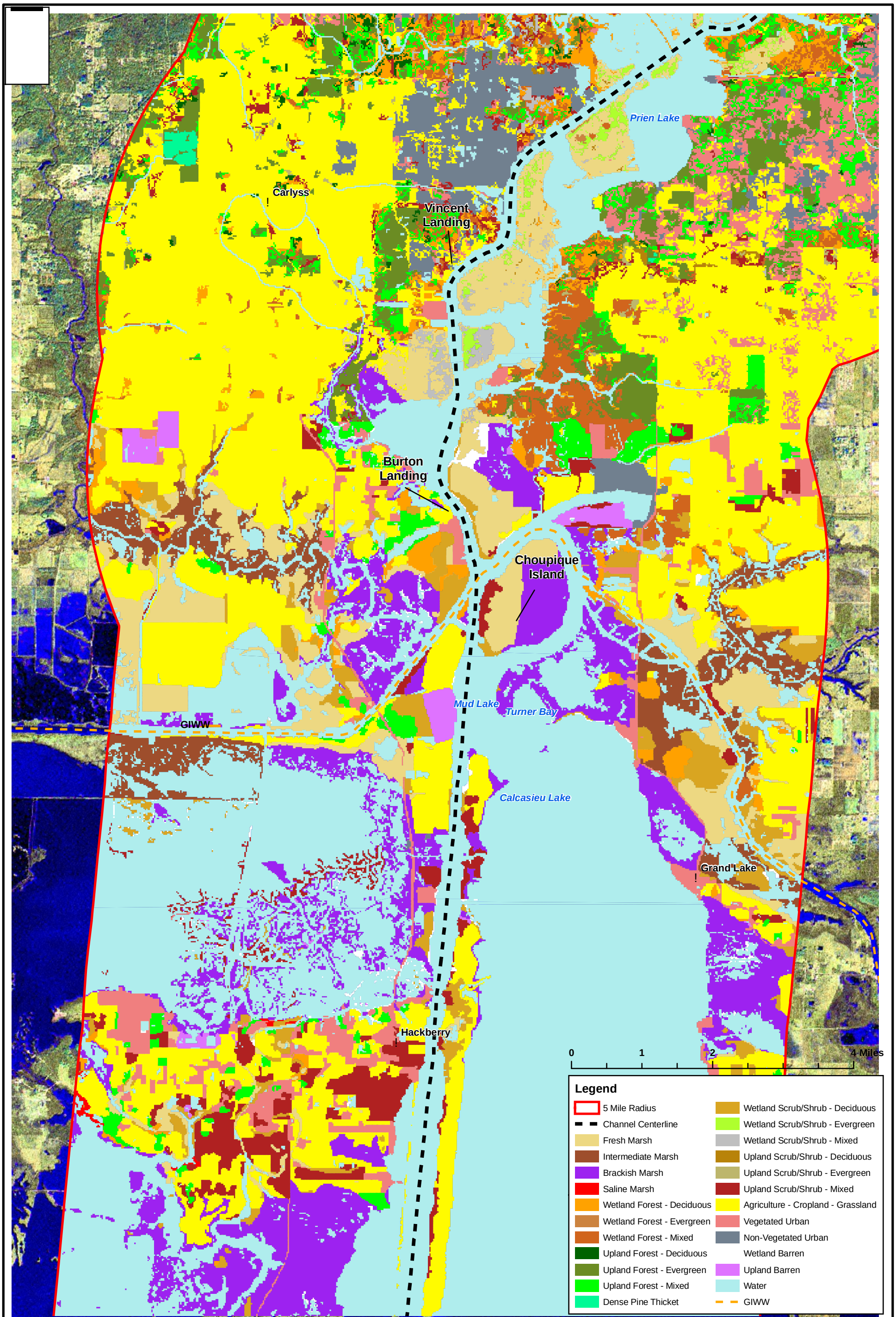
Figure: 4
Date: October 2006
Scale: 1:80,000
Source: NWRC/GEC
Map Author: C. Perez



VEGETATION/LAND USE

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

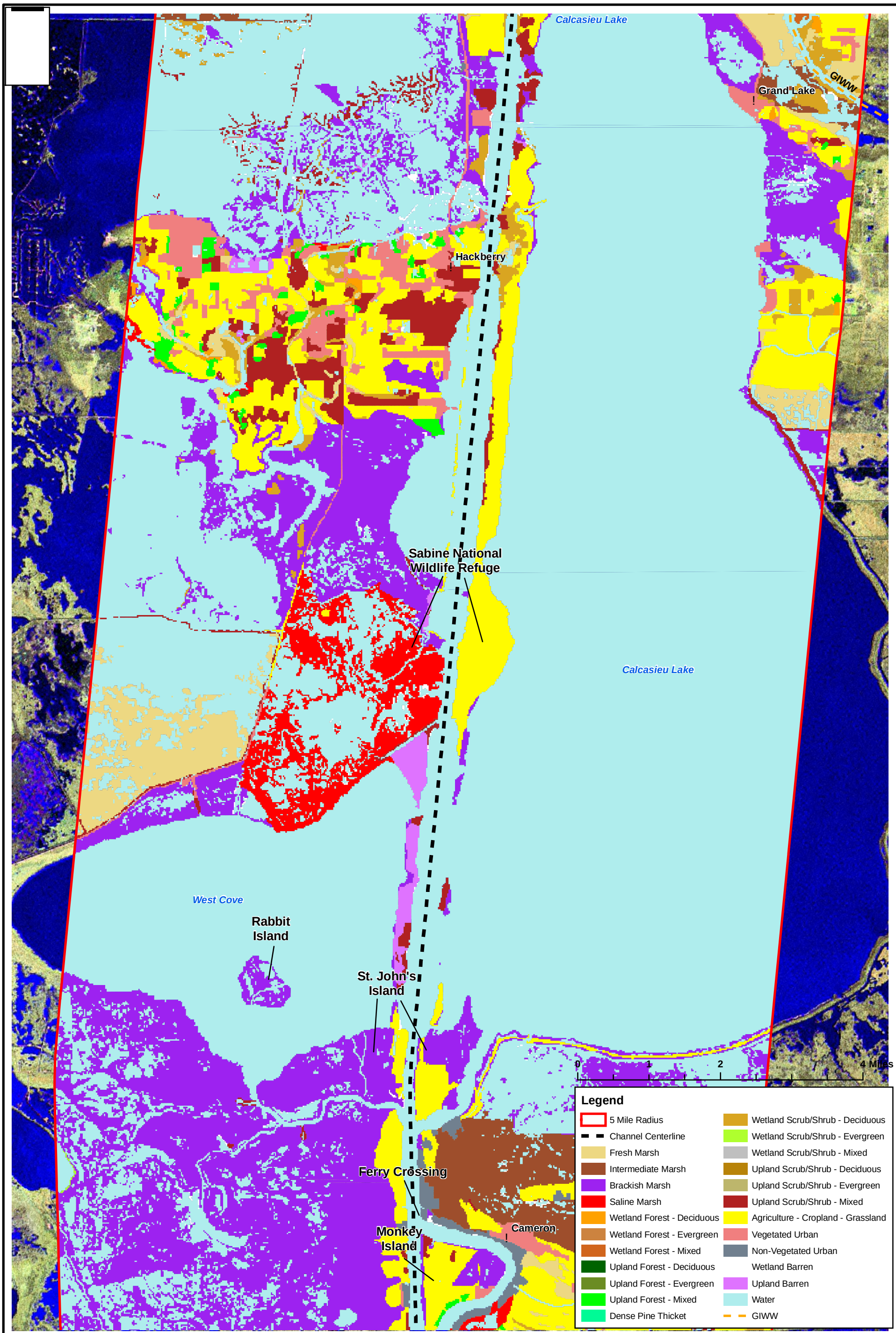
Figure: 5
Date: October 2006
Scale: 1:80,000
Source: USACE/GEC
Map Author: C. Perez



VEGETATION/LAND USE

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

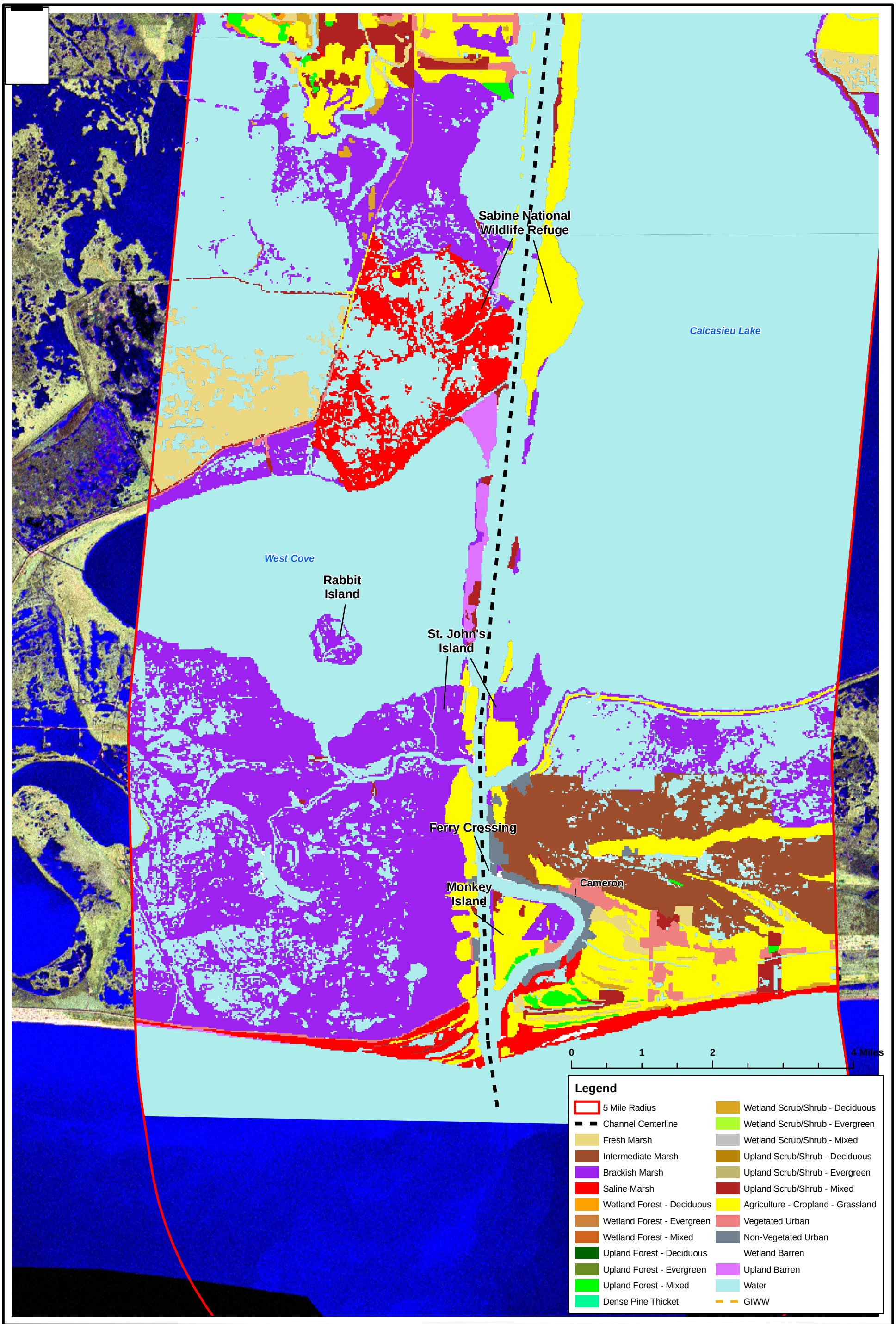
Figure: 6
Date: October 2006
Scale: 1:80,000
Source: USACE/GEC
Map Author: C. Perez



VEGETATION/LAND USE

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

Figure: 7
Date: October 2006
Scale: 1:80,000
Source: USACE/GEC
Map Author: C. Perez



VEGETATION/LAND USE

Dredge Material Sampling and Analysis
Calcasieu River and Pass, Louisiana

Figure: 8
Date: October 2006
Scale: 1:80,000
Source: USACE/GEC
Map Author: C. Perez

Table 1. Calcasieu River Basin Ecosystem Threats and Sources

Source of Threat	Altered Composition/ Structure	Altered Water Quality	Habitat Destruction or Conversion	Habitat Fragmentation	Modification of Water Levels; Changes in Natural Flow Patterns	Salinity Alteration	Sedimentation	Toxins/ Contaminants
Channelization of rivers or streams	X	X	X	X	X	X	X	X
Commercial/ industrial Development	X	X	X	X	X	X	X	X
Construction of ditches, drainage or diversion systems	X	X	X	X	X	X	X	X
Construction of navigable waterways	X	X		X	X	X	X	X
Conversion to agriculture or other forest types							X	
Development/ maintenance of pipelines, roads or utilities	X	X		X	X	X	X	X
Industrial discharge	X	X		X	X	X	X	X
Operation of drainage or diversion systems	X	X		X	X	X	X	X
Residential development	X	X		X	X	X	X	X

From: LDWF, Comprehensive Wildlife Conservation Strategy.

6.2 Contamination

Contamination has been detected in the lower Calcasieu River Basin from industries in the upper portion of the project area. The numerous chemical and petroleum product factories have released several hazardous and toxic substances into the environment and have subsequently found their way into the estuary system in the northern portion of the project. Currently, consumption advisories are in effect for fish and shellfish taken from Bayou d'Inde. The primary contaminants of concern for the lower basin are hexachlorobenzene, hexachlorobutadiene, polychlorinated biphenyls (PCBs), dioxin, polynuclear aromatic hydrocarbons (PAHs), mercury, copper and lead. A 2001 study of the benthic macroinverbrates of the Calcasieu estuary concluded that Bayou d'Inde had the lowest density of those species, with some sampling stations on the bayou devoid of any benthic macroinvertebrates. The study also concluded that of all stations sampled, the lowest densities occurred near the industries. (*Benthic Macroinvertebrate Community Survey of the Calcasieu Estuary (Louisiana)*, U.S. EPA, by CDM Corp. and Gary R. Gaston, May 2001)

A major oil spill into the Calcasieu River occurred in June 2006 originating from the CITGO oil refinery. A heavy rain event caused oil tanks to overflow releasing nearly two million gallons of waste oil into the river. Cleanup efforts are ongoing today. More details on this event can be found in the HTRW discussion for this study under separate cover.

6.3 Ship's Ballast Water

Ballast water is taken into unladen ships to provide stability on the open sea. It is taken on board at the port of its last unloading, before the voyage begins to its next port of call. However, this ballast water contains a menagerie of small aquatic organisms: minute jellyfish, larval mussels and barnacles, marine worms, tiny shrimp-like copepods and juvenile fish. These organisms share their confines with an assortment of single-celled plants, bacteria and viruses. Many of these organisms survive their journey and are unintentionally release into the waters of the ship's next loading point when the ballast water is pumped out because it is no longer needed.

One of the most notorious of these organisms to enter the U.S. is the zebra mussel (*Dreisenna polymorpha*), which was introduced in the Great Lakes area and has caused severe problems physically fowling underwater structures in northern U.S. waters. Fortunately, the zebra mussel does not do well in warmer waters and, thus far, has been confined to the cooler waters of the northern half of the country and, therefore, has not proven to be a problem in the project area.

However, ship's ballast water has also been known to transport disease organisms such as the cholera bacteria. In Chesapeake Bay, researchers have identified a new strain of *Vibrio cholerae*, which causes cholera, with origins in the Mediterranean or North Seas. Several studies have been conducted and are ongoing in an attempt to identify and track organisms being imported to ocean ports. There has been considerable research conducted in treating ballast water to kill organisms in ship's ballast tanks. Several methods have proven successful, such as adding oxygen scavenging chemicals, biocides, and most recently, ozone. But, so far shipping companies have resisted most of these methods as they add costs to their operations and cut down on profits.

The Federal government has passed legislation that requires all vessels that are engaged on an international voyage and bound for a U.S. port to conduct ballast water exchange before the vessel enters the U.S. Exclusive Economic Zone (EEZ). However, ballast water exchange is limited in its effectiveness in preventing introductions of invasive species because it does not remove all organisms from ballast tanks or sediments that settle to the bottom of ballast tanks.

In 2004, the International Maritime Organization (IMO) agreed to the International Convention for the Control and Management of Ship's Ballast Water & Sediments (Convention). The Convention, if ratified by a sufficient number of member nations and entered into force, will be the first time international law has attempted to minimize the spread of non-indigenous aquatic organisms by requiring that vessels manage their ballast water by ballast water treatment systems and operational procedures. The Convention would prohibit the release of ballast water that contains more than 10 organisms that are greater than 10 micrometers per cubic meter of water, or certain concentrations of smaller size classes or organisms. As of June 30, 2006, the Convention has been ratified by 6 IMO member nations, representing less than one percent of global merchant shipping tonnage. The Convention will enter into force only after it has been ratified by at least 30 IMO members representing more than 35 percent of global merchant shipping tonnage.

7.0 SPECIES COMPOSITION

Because the project area includes both coastal prairie and coastal marsh habitat areas, the area contains species from both habitat types. Some of the more obvious species often seen in the area include alligators, often observed sunning themselves in canals and rivers near roads,

numerous songbirds, Northern bobwhite quail, mourning doves, seagulls, dolphins, often observed in the river and larger lakes, white-tailed deer, coyotes, muskrat, nutria, turtles, snakes, blue crabs, shrimp, and in winter, thousands of waterfowl from the north. Of these migratory waterfowl, snow geese are the most abundant goose species, while green-winged teal and ring-necked ducks are the most numerous ducks. In the spring, just as neotropical migratory songbirds are arriving, these waterfowl depart for their northern nesting grounds. Some ducks remain in the area and breed here, of which the mottled ducks and fulvous whistling ducks are the most abundant. Wading birds are showy and often attract much attention. Common species include white ibis, white-faced ibis, purple gallinules, common moorhens, roseate spoonbills, and several species of herons.

The Cameron Prairie National Wildlife Refuge (NWR), run by the USFWS, is located in Cameron Parish just east of Calcasieu Lake. Its biota are representative of a major portion of the terrestrial habitat of the project area (since it is straddles the transition zone from coastal prairie to coastal marshes and contains areas of both habitats) and project area freshwater habitats. Marine species typically occurring in the project area do not occur on the Cameron Prairie refuge because it does not contain any salt or brackish marsh or aquatic habitat. The Cameron Prairie refuge operates as part of the larger Sabine NWR to its west and contains similar habitats (on a smaller scale) and species. The Cameron Prairie refuge has recently completed a Comprehensive Conservation Plan (CCP) which contains a list of its previously identified biota occurring on the refuge. The CCP for Sabine NWR is still in the early draft stage and was not available at the time of this writing. Table 2 uses the Cameron Prairie refuge list as a basis, with marine species that do not occur on the refuge added (including some protected species), as representative of those species that may occur within the project area. The list is not all inclusive and does not attempt to cover many other organisms, such as marine invertebrates, with the exception of the economically important shrimp of the area. Some fish species may appear on both the refuge list as well as the marine environment list, since they may be found in both fresh and salt waters.

Table 2. Biota of the Cameron Prairie National Wildlife Refuge and the Project Area

Common Name	Scientific Name
BIRDS	
Loons	
Common Loon	*Gavia immer*
Grebes	
Pied-billed Grebe	*Podilymbus podiceps*
Horned Grebe	*Podiceps auritus*
Eared Grebe	*Podiceps nigricollis*
Pelicans and their Allies	
American White Pelican	*Pelecanus erythrorhynchos*
Brown Pelican	*Pelecanus occidentalis*
Double-crested Cormorant	*Phalacrocorax auritus*
Neotropic Cormorant	*Phalacrocorax brasilianus*
Anhinga	*Anhiga anhinga*
Magnificent Frigatebird	*Fregata magnificens*
Herons, Egrets, and Allies	
American Bittern	*Botaurus lentiginosus*
Least Bittern	*Ixobrychus exilis*
Great Blue Heron	*Ardea herodias*
Great Egret	*Ardea alba*
Snowy Egret	*Egretta thula*

Common Name	Scientific Name
Little Blue Heron	*Egretta caerulea*
Tricolored Heron	*Egretta tricolor*
Reddish Egret	*Egretta rufescens*
Cattle Egret	*Bubulcus ibis*
Green Heron	*Butorides virescens*
Black-crowned Night-Heron	*Nycticorax nycticorax*
Yellow-crowned Night-Heron	*Nycticorax violacea*
Ibis, Spoonbill, and Stork	
Glossy Ibis	*Plegadis falcinellus*
White Ibis	*Eudocimus albus*
White-faced Ibis	*Plegadis chihi*
Roseate Spoonbill	*Platalea ajaia*
Wood Stork	*Mycteria americana*
Sandhill Crane	*Grus canadensis*
Waterfowl	
Fulvous Whistling-Duck	*Dendrocygna bicolor*
Black-bellied Whistling Duck	*Dendrocygna autumnalis*
Greater White-fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Ross's Goose	*Chen rossii*
Canada Goose	*Branta canadensis*
Wood Duck	*Aix sponsa*
Green-winged Teal	*Anas crecca*
American Black Duck	*Anas rubripes*
Mottled Duck	*Anas fulvigula*
Mallard	*Anas platyrhynvchos*
Northern Pintail	*Anas acuta*
Blue-winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
Northern Shoveler	*Anas clypeata*
Gadwall	*Anas strepera*
American Wigeon	*Anas americana*
Canvasback	*Aytha valisineria*
Redhead	*Aythya americana*
Ring-necked Duck	*Aythya collaris*
Lesser Scaup	*Aythya affinis*
Common Goldeneye	*Bucephala clangula*
Bufflehead	*Bucephala albeola*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-breasted Merganser	*Mergus serrator*
Ruddy Duck	*Oxyura jamaicensis*
Vultures, Hawks, and Allies	
Black Vulture	*Coragyps atratus*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Bald Eagle	*Haliaeetus leucocephalus*
Northern Harrier	*Circus cyaneus*
Sharp-shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Broad-winged Hawk	*Buteo platypterus*

Common Name	Scientific Name
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Peregrine Falcon	*Falco peregrinus*
Gallinaceous Birds (Quail, Turkey, and Allies)	
Northern Bobwhite	*Colinus virginianus*
Rails, Gallinules, Coots, and Cranes	
Yellow Rail	*Coturnicops noveboracensis*
Black Rail	*Laterallus jamaicensis*
Clapper Rail	*Rallus longirostris*
King Rail	*Rallus elegans*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
Purple Gallinule	*Porphyrio martinica*
Common Moorhen	*Gallinula chloropus*
American Coot	*Fulica americana*
Shorebirds	
Black-bellied Plover	*Pluvialis squatarola*
American Golden-Plover	*Pluvialis dominica*
Wilson's Plover	*Charadrius wilsonia*
Semipalmated Plover	*Charadrius semipalmatus*
Killdeer	*Charadrius vociferous*
Black-necked Stilt	*Himantopus mexicanus*
American Avocet	*Recurvirostra americana*
Greater Yellowlegs	*Tringa melanoleuca*
Lesser Yellowlegs	*Tringa flavipes*
Solitary Sandpiper	*Tringa solitaria*
Willet	*Catoptrophorus semipalmatus*
Spotted Sandpiper	*Actitis macularia*
Upland Sandpiper	*Bartramia longicauda*
Whimbrel	*Numenius phaeopus*
Long-billed Curlew	*Numenius americanus*
Marbled Godwit	*Limosa fedoa*
Ruddy Turnstone	*Arenaria interpres*
Red Knot	*Calidris canutus*
Sanderling	*Calidris alba*
Semipalmated Sandpiper	*Calidris pusilla*
Western Sandpiper	*Calidris mauri*
Least Sandpiper	*Calidris minutilla*
White-rumped Sandpiper	*Calidris fuscicollis*
Pectoral Sandpiper	*Calidris melanotos*
Dunlin	*Calidris alpine*
Stilt Sandpiper	*Calidris himantopus*
Short-billed Dowitcher	*Limnodromus griseus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Common Snipe	*Gallinago gallinago*
American Woodcock	*Scolopax minor*
Laughing Gull	*Larus atricilla*
Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Ring-billed gull	*Larus delawarenis*
Herring Gull	*Larus argentatus*

Common Name	Scientific Name
Gull-billed Tern	*Sterna nilotica*
Caspian Tern	*Sterna caspia*
Royal Tern	*Sterna maxima*
Common Tern	*Sterna hirundo*
Forster's Tern	*Sterna forsteri*
Least Tern	*Sterna antillarum*
Black Tern	*Childonias niger*
Black Skimmer	*Rynchops niger*
Pigeons and Doves	
Mourning Dove	*Zenaida macroura*
White-winged Dove	*Zenaida asiatica*
Cuckoos	
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Groove-billed Ani	*Crotophaga sulcirostris*
Owls	
Barn Owl	*Tyto alba*
Eastern Screech Owl	*Megascops asio*
Great Horned Owl	*Bubo virginianus*
Burrowing Owl	*Athene cunicularia*
Short-eared Owl	*Asio flammeus*
Nightjars	
Common Nighthawk	*Chordeiles minor*
Chuck-will's widow	*Caprimulgus carolinensis*
Whip-poor-will	*Caprimulgus vociferous*
Swifts and Hummingbirds	
Chimney Swift	*Chaetura pelagica*
Ruby-throated Hummingbird	*Archilochus colubris*
Kingfishers	
Belted Kingfisher	*Megaceryle alcyon*
Woodpeckers	
Red-headed Woodpecker	*Melanerpes erythrocephalus*
Yellow-bellied Sapsucker	*Sphyrapicus varius*
Downy Woodpecker	*Picoides pubescens*
Northern Flicker	*Colaptes auratus*
Red-bellied Woodpecker	*Melanerpes carolinus*
Hairy Woodpecker	*Picoides villosus*
Flycatchers	
Olive-sided Flycatcher	*Contopus cooperi*
Eastern Wood-Pewee	*Contopus virens*
Yellow-bellied Flycatcher	*Empidonax flaviventris*
Acadian Flycatcher	*Empidonax virescens*
Eastern Phoebe	*Sayornis phoebe*
Vermilion Flycatcher	*Pyrocephalus rubinus*
Great Crested Flycatcher	*Myiarchus crinitus*
Western Kingbird	*Tyrannus verticalis*
Eastern Kingbird	*Tyrannus tyrannus*
Scissor-tailed Flycatcher	*Tyrannus forficatus*
Martins and Swallows	
Purple Martin	*Progne subis*
Tree Swallow	*Iridoproche bicolor*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*

Common Name	Scientific Name
Cliff Swallow	*Petrochelidon pyrrhonota*
Bank Swallow	*Riparia riparia*
Barn Swallow	*Hirundo rustica*
Jays and Crows	
Blue Jay	*Cyanocitta cristata*
Fish Crow	*Coruus ossifragus*
Nuthatchers	
Red-breasted Nuthatch	*Sitta canadensis*
Creepers	
Brown Creeper	*Certhia ameicana*
Wrens	
Carolina Wren	*Thryothorus ludovicianus*
Winter Wren	*Troglodytes troglodytes*
Sedge Wren	*Cistothorus platensis*
Marsh Wren	*Cistothorus palustris*
House Wren	*Troglodytes aedon*
Carolina Chickadee	*Poecile carolinensis*
Kinglets and Gnatcatchers	
Golden-crowned Kinglet	*Regulus satrapa*
Ruby-crowned Kinglet	*Regulus calendula*
Blue-gray Gnatcatcher	*Polioptila caerulea*
Bluebirds, Thrushes and Robins	
Eastern Bluebird	*Sialia sialis*
Veery	*Catharus fuscescens*
Gray-cheeked Thrush	*Catharus minimus*
Swainson's Thrush	*Catharus ustulatus*
Hermit Thrush	*Catharus guttatus*
Wood Thrush	*Hylocichla mustelina*
American Robin	*Turdus migratorius*
Thrashers	
Gray Catbird	*Dumetella carolinensis*
Brown Thrasher	*Toxastoma rufum*
Northern Mockingbird	*Mimus polyglottos*
Pitpits	
American Pitpit	*Anthus rubescens*
Waxwings	
Cedar Waxwing	*Bombycilla cedrorum*
Starling	
European Starling	*Sturnus vulgaris*
Shrike	
Loggerhead Shrike	*Lanius ludovicianus*
Vireos	
White-eyed Vireo	*Vireo griseus*
Blue-headed Vireo	*Vireo solitarius*
Yellow-throated Vireo	*Vireo flavifrons*
Warbling Vireo	*Vireo gilvus*
Red-eyed Vireo	*Vireo olivaceus*
Philadelphia Vireo	*Vireo philadelphicus*
Warblers	
Blue-winged Warbler	*Vermivora pinus*
Golden-winged Warbler	*Vermivora chrysoptera*
Tennessee Warbler	*Vermivora peregrine*

Common Name	Scientific Name
Orange-crowned Warbler	*Vermivora celata*
Nashville Warbler	*Vermivora ruficapilla*
Yellow Warbler	*Dendroica petechia*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Magnolia Warbler	*Dendroica magnolia*
Cape May Warbler	*Dendroica tigrina*
Black-throated Blue Warbler	*Dendroica caerulescens*
Yellow-rumped Warbler	*Dendroica coronata*
Black-throated Green Warbler	*Dendroica virens*
Blackburnian Warbler	*Dendroica fusca*
Yellow-throated Warbler	*Dendroica dominica*
Prairie Warbler	*Dendroica discolor*
Palm Warbler	*Dendroica palmarum*
Bay-breasted Warbler	*Dendroica castanea*
Blackpole Warbler	*Dendroica striata*
Cerulean Warbler	*Dendroica cerulea*
Black-and-white Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Prothonotary Warbler	*Protonotaria citrea*
Worm-eating Warbler	*Helmitheros vermivorus*
Ovenbird	*Seiurus aurocapilla*
Northern Waterthrush	*Seiurus noveboracensis*
Louisiana Waterthrush	*Seiurus motacilla*
Kentucky Warbler	*Oporornis formosus*
Mourning Warbler	*Oporonis philadelphia*
Hooded Warbler	*Wilsonia citrina*
Canada Warbler	*Wilsonia canadensis*
Yellow-breasted Chat	*Icteria virens*
Northern Parula	*Parula americana*
Common Yellowthroat	*Geothlypos trichas*
Wilson's Warbler	*Wilsonia pusilla*
Tanagers	
Summer Tanager	*Piranga rubra*
Scarlet Tanager	*Piranga olivacea*
Western Tanager	*Piranga tudoviciana*
New World Finches	
Northern Cardinal	*Cardinalis cardinalis*
Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Blue Grosbeak	*Passerina caerulea*
Indigo Bunting	*Passerina cyanea*
Painted Bunting	*Passerina ciris*
Dickcissel	*Spiza americana*
Sparrows	
Eastern Towhee	*Pipilo erythrophthalmus*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Savannah Sparrow	*Passerculus sandwichensis*
LeConte's Sparrow	*Ammodramus leconteii*
Saltmarsh Sharp-tailed Sparrow	*Ammodramus caudacutus*
Fox Sparrow	*Passerella iliaca*
Song Sparrow	*Melospiza melodia*

Common Name	Scientific Name
Lincoln's Sparrow	*Melospiza lincolnii*
Swamp Sparrow	*Melospiza georgiana*
White-throated Sparrow	*Zonotrichia albicollis*
White-crowned Sparrow	*Zonatrichia leucophrys*
Dark-eyed Junco	*Junco hyemalis*
Chipping Sparrow	*Spizella passerine*
Blackbirds, Grackles, Cowbirds and Orioles	
Red-winged Blackbird	*Agelais phoeniceus*
Eastern Meadowlark	*Sturnella magna*
Western Meadowlark	*Sturnella neglecta*
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*
Rusty Blackbird	*Euphagus carolinus*
Boat-tailed Grackle	*Quiscalus major*
Common Grackle	*Quiscalus quiscula*
Brown-headed Cowbird	*Molothrus ater*
Orchard Oriole	*Icterus spurious*
Altamira Oriole	*Icterus galulris*
Bobolink	*Dolichonyx oryzivorus*
Great-tailed Grackle	*Quiscalus mexicanus*
Old World Finches	
Purple Finch	*Carpodacus purpureus*
American Golffinch	*Carduelis tristis*
Weaver Finches	
House Sparrow	*Passer domesticus*
MAMMALS	
Marsupials	
Virginia Opossum	*Didelphis marsupialis*
Edentates	
Nine-banded armadillo	*Dasypus novemcinctus*
Insectivores	
Least Shrew	*Cryptotis parva*
Bats	
Red Bat	*Lasiurus borealis*
Seminole Bat	*Lasiurus seminolus*
Yellow Bat	*Lasiurus ega*
Carnivores	
Coyote	*Canis latrans*
Gray Fox	*Urocyon cinereooargenteus*
Red Fox	*Vulpes vulpes*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
Striped Skunk	*Mephitis mephitis*
River Otter	*Lutra Canadensis*
Bobcat	*Lynx rufus*
Ungulates	
White-tailed Deer	*Odocoileus virginianus*
Rodents	
Marsh Rice Rat	*Orysomys palustris*
Fulvous Harvest Mouse	*Reithrodontomys fulvescens*
Hispid Cotton Rat	*Sigmodon hispidus*
Muskrat	*Ondatra zibethicus*
House Mouse	*Mus musculus*

Common Name	Scientific Name
Black Rat	*Rattus rattus*
Norway Rat	*Rattus norvegicus*
Nutria	*Myocastor coypus*
Fox Squirrel	*Sciurus niger*
Lagomorphs	
Swamp Rabbit	*Sylviagus aquaticus*
Eastern Cottontail	*Sylvilagus floridanus*
Marine	
Atlantic Spotted Dolphin	*Stenella frontalis*
Atlantic Bottlenose Dolphin	*Tursiops truncatus*
REPTILES AND AMPHIBIANS	
Alligators	
American Alligators	*Alligator mississippiensis*
Lizards	
Green Anole	*Anolis carolinensis*
Broadhead Skink	*Eumeces laticeps*
Ground Skink	*Scinella lateralis*
Five-lined Skink	*Eumeces fasciatus*
Slender Glass Lizard	*Ophisaurus attenuatus*
Turtles	
Snapping Turtle	*Chelydra serpentina*
Alligator Snapping Turtle	*Macroclemys temminckii*
Mississippi Mud Turtle	*Kinosternon subrubrum hippocrepis*
Common Slider	*Trachemys scripta*
Spiny Softshell Turtle	*Apalone spinifera*
Chicken Turtle	*Deirochelys reticularia*
Eastern Box Turtle	*Terrapene carolina carolina*
Stinkpot Turtle	*Sternotherus odoratus*
Snakes	
Southern Water Snake	*Nerodia fasciata*
Mississippi Green Water Snake	*Nerodia cyclopion*
Diamondback Water Snake	*Nerodia rhombifer*
Brown Snake	*Storeria dekayi*
Western Ribbon Snake	*Thamnophis proximus proximus*
Glossy Crayfish Snake	*Regina rigida*
Eastern Hognose Snake	*Heterodon platirhinos*
Mud Snake	*Farancia abacura*
Racer	*Coluber constrictor*
Rat Snake	*Drymobius elaphe*
Common Kingsnake	*Lampropeltis getula*
Southern Copperhead	*Agkinstodon contortrix contortrix*
Cottonmouth	*Agkinstodon piscivorus*
Pigmy Rattlesnake	*Sistrurus miliarius*
Yellow-bellied Water Snake	*Nerodia erythrogaster flavigaster*
Rough Green Snake	*Opheodrys aestivus*
Graham's Crayfish Snake	*Regina grahamii*
Salamanders	
Three-toed Amphiuma	*Ampiuma tridactylum*
Frogs and Toads	
Gulf Coast Toad	*Bufo valliceps valliceps*
Northern Cricket Frog	*Acris crepitans crepitans*
Green Treefrog	*Hyla cinera*

Common Name	Scientific Name
Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*
Bullfrog	*Rana catesbeiana*
Pig Frog	*Rana grylio*
Southern Leopard Frog	*Rana utricularia*
Squirrel Tree Frog	*Hyla squirella*
Woodhouse Toad	*Bufo woodhousii woodhousii*
Marine	
Green Sea Turtle	*Chelonia mydas*
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*
Loggerhead Sea Turtle	*Caretta caretta*
CRUSTACEANS	
White River Crayfish	*Procambarus acutus*
Red Swamp Crayfish	*Procambarus clarkii*
Marine	
Blue Crab	*Callinetus sapidus*
Brown Shrimp	*Panaeus aztecus*
White Shrimp	*Panaeus setiferus*
Pink Shrimp	*Panaeus duorarum*
MOLLUSCS	
Oyster	*Crassostrea virginica*
ISOPODS AND AMPHIPODS	
Wood-boring Isopod	*Limnoria tripunctata*
Rock Louse	*Ligia exotica*
Smooth-backed	*Sphaerona quadridentatum*
Fish Louse	*Cymothous spp.*
Wharf Roach	*Ligia spp.*
Beach Flea	*Orchestia grillus*
Marsh Hopper	*Talorchestia spp.*
FISH	
Gars	
Spotted Gar	*Lepisosteus oculatus*
Longnose Gar	*Lepisosteus osseus*
Alligator Gar	*Lepisosteus spatula*
Bowfins	
Bowfin	*Amia calva*
Herrings	
Gizzard Shad	*Dorosoma cepedianum*
Threadfin Shad	*Dorosoma petenense*
Lizardfishes	
Inshore Lizardfish	*Synodus foetens*
Carps	
Common Carp	*Cyprinus carpio*
Golden Shiner	*Notemigonus crysoleucas*
Suckers	
Bigmouth Buffalo	*Ictiobus cyprinellus*
Freshwater Catfishes	
Blue Catfish	*Ictalurus furcatus*
Black Bullhead	*Ictalurus melas*
Yellow Bullhead	*Ictalurus natalis*
Channel Catfish	*Ictalurus punctatus*
Paddlefish	
Paddlefish	*Polyodon spathula*

Common Name	Scientific Name
Sunfishes	
Banded Pygmy Sunfish	*Elassoma zonatum*
Warmouth	*Lepomis gulosus*
Bluegill	*Lepomis macrochirus*
Redear Sunfish	*Lepomis punctatus*
Bantam Sunfish	*Lepomis symmetricus*
Green Sunfish	*Lepomis cyanellus*
Largemouth Bass	*Micropterus salmoides*
White Crappie	*Pomoxis annularis*
BlackCrappie	*Pomoxis nigromaculatus*
Drums	
Freshwater Drum	*Aplodinotus grunniens*
Spot	*Leiostomus xanthurus*
Mullets	
Striped Mullet	*Mugil cephalus*
White Mullet	*Mugil curema*
Marine	
Red Drum	*Sciaenops ocellatus*
Spotted Seatrout	*Cynoscion nebylosus*
Sand Seatrout	*Cynoscion arenarius*
Atlantic Croaker	*Micropogonias undulates*
Black Drum	*Pogonias cromis*
Sheepshead	*Archosargus probatocephalus*
Little Tunny	*Euthynnus alletteratus*
Blackfin Tuna	*Thunnus atlanticus*
Skipjack Tuna	*Katsuwonus pelamis*
Atlantic Bonito	*Sarda sarda*
Yellowfin Tuna	*Hunnus albacaraes*
Wahoo	*Acanthocybium solandri*
Spanish Mackerel	*Scamberomorus maculates*
King Mackerel	*Scomberomorus cavalla*
Greater Amberjack	*Seriola dumerii*
Lesser Amberjack	*Seriola fasciata*
Crevalle Jack	*Caranx hippos*
Blue Runner	*Caranx crysos*
Black Jack	*Seriola rivoliana*
Florida Pompano	*Tracinotus carolinus*
Dolphin	*Coryphaena equisetis*
Cobia	*Rachycentron canadum*
Warsaw Grouper	*Epinephelus nigritus*
Jewfish	*Epinephelus itajara*
Yellowfish Grouper	*Mycteroperca venenosa*
Yellowwedge Grouper	*Epinephus flavolimbatus*
Gag	*Mycteroperca microlepis*
Yellowmouth Grouper	*Mycteroperea interstitialis*
Snowy Grouper	*Epinephelus niveatus*
Speckled Hing	*Epinephelus drummendhayi*
Rock Hind	*Epinephelus adscensionis*
Black Driftfish	*Hyperoglyphe bythites*
Red Snapper	*Lutjanus campechanus*
Blackfin Snapper	*Lutjanus buccanella*
Silk Snapper	*Lutianus vivanus*

Common Name	Scientific Name
Vermilion Snapper	*Rhomboplites auroprubens*
Lane Snapper	*Lutjanus synagris*
Wenchman	*Pristopomoides aquilonaris*
Yellowtail Snapper	*Ocyurus chrysurus*
Queen Snapper	*Etelis oculatus*
Gray Snapper	*Lutjanus griseus*
Creole Fish	*Paranthias furcifer*
Squirrelfish	*Holocentrus adscensionis*
Bigeye	*Priacanthus arenatus*
Spinycheek Scorpionfish	*Neomerinthe hemingwayi*
Spotted Scorpionfish	*Scorpaena plumieri*
Whitebone Porgy	*Calamus leucosteus*
Knobbed Porgy	*Calamus nodosus*
Tilefish	*Lopholatilus chamacleonticeps*
Atlantic Spadefish	*Chaetodipterus fader*
Gray Triggerfish	*Balistes capriscus*
Ocean Triggerfish	*Canthidermis sufflamen*
Queen Triggerfish	*Balistes vetula*
Tripletail	*Lobotes surinamensis*
Great Barracuda	*Spyyraeria barracuda*
Bluefish	*Pomatomus saltatrix*
Striped Mullet	*Mugil cephalus*
Bearded Brotula	*Brotula barbata*
Gafftopsail Catfish	*Bagre marinus*
Sea Catfish	*Arius felis*
Southern Flounder	*Parlichthys lethostigma*
Striped Bass	*Morone saxatilis*
Gulf Menhaden	*Brevoovtia patronus*
Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*
Bonnethead	*Sphyrna tiburo*
Blacktip Shark	*Carcharhinus breuipinna*
Nurse Shark	*Ginglymostoma cirratum*
Bull Shark	*Carcharhinus leucas*
Tiger Shark	*Galeocorda cuvier*
Lemon Shark	*Negaprion brevirostris*
Oceanic Whitetip Shark	*Carcarhinus longimanus*
Shortfin Mako Shark	*Isurus oxyrinchus*
PLANTS	
Alligatorweed	*Alternanthera philoxeroides*
American Lotus	*Nelumbo lutea*
Baccharis	*Baccharis halimifolia*
Baldcypress	*Taxodium distichum*
Banana Water Lily	*Nymphaea mexicana*
Branyard Grass	*Echinochloa cusgalli*
Black Needlerush	*Juncus roemerianus*
Black Willow	*Salix nigra*
Beggar's Tick	*Bidens laevis*
Bird's Eye Bush	*Ochna serrulata*
Blue Water Lily	*Nymphaea elegans*
Brazilian Verbena	*Verbena brasiliensis*
Brownseed Paspalum	*Paspalum plicatulum*
Bulltongue	*Sagittaria lancifolia*

Common Name	Scientific Name
Bullwhip	*Scirpus californicus*
Bushy Bluestem	*Andropogon glomeratus*
Buttonbush	*Cephalanthus occidentalis*
Cattail	*Typa spp.*
Chinese Tallow	*Sapium sebiferum*
Chocolate Weed	*Melochia corchorifolia*
Coastal Water-Hyssop	*Bacopa monnieri*
Coffeeweed	*Sesbania macrocarpa*
Common Bladderwort	*Utricularia vulgaris*
Coontail	*Ceratophyllum demersum*
Curly-leaf Dock	*Rumex crispus*
Duckweed	*Lemna minor*
Dog Fennel	*Eupatorium capillifolium*
Dwarf Spikerush	*Eleocharis parvula*
Eurasian Watermilfoil	*Myriophyllum spicatum*
Fall Panicum	*Panicum dichotomiflorum*
False Garlic	*Nothoscordum bivalve*
Fanwort	*Cabomba caroliniana*
Flatsedges	*Cyperus spp.*
Floating Water Primrose	*Ludwigia peploides*
Frogbit	*Lumnobium spongia*
Frogfruit	*Phyla nodiflora*
Giant Cutgrass	*Zizaniopsis miliacea*
Giant Ragweed	*Amrosia trifida*
Grasslike Fimbry	*Fimbristylis miliacea*
Horned Beakrush	*Rhynchospora corniculata*
Hydrilla	*Hydrilla verticillata*
Iris	*Iris virginica*
Jungle Rice	*Echinochloa colonum*
Maidencane	*Panicum hemitomo*
Marshhay Cordgrass	*Spartina patens*
Mosquito-Fern	*Azolla caroliniana*
Muskgrass	*Chara spp.*
Parrot Feather	*Myriophyllum aquaticum*
Pennywort	*Hydrocotyle spp.*
Pickerelweed	*Pontederia cordata*
Rattlebox	*Sesbania drummondii*
Red Rice	*Oryza functata*
Roseau Cane	*Phragmites australis*
Sago Pondweed	*Potamogeton pectinatus*
Saltmarsh Mallow	*Kosteletzkya virginica*
Saltmarsh Morning Glory	*Ipomoea sagittata*
Sawgrass	*Cladium jamaicense*
Seashore Paspalum	*Paspalum vaginatum*
Smartweed	*Polygonum spp.*
Softstem Bullrush	*Scirpus validus*
Southern Naiad	*Najas quadalupensis*
Southern Swamp Lily	*Crinum americanum*
Spadderdock	*Nuphar luteum*
Spikerushes	*Elecocharis spp.*
Sprangletop	*Leptochloa fascicularis*
Squarestem Spikerush	*Eleocharis quadrangulata*

Common Name	Scientific Name
Sumpweed	*Iva annua*
Thalia	*Thalia dealbata*
Thin-leaf Pondweed	*Potamogeton pusillus*
Three-cornered Grass	*Scirpus olneyi*
Toothache Tree	*Zanthoxylum calva-herculis*
Vasey Grass	*Paspalum urvillei*
Walter's Millet	*Echinochloa walteri*
Water Hyacinth	*Eichornia crassipes*
Water Lettuce	*Pistia stratiotes*
Water Pepper	*Polygomum hydropiperoides*
Water Shield	*Brasenia schreberi*
Wax-Myrtle	*Myrica cerifera*
White-topped Sedge	*Rhynchospora colorata*
White Water Lily	*Nymphaea odorata*
Wigeongrass	*Ruppia maritima*

Sources: U.S. Fish and Wildlife Service; and G.E.C., Inc.

8.0 CONSERVATION EFFORTS

As evidence of the high quality of wildlife habitat, located within the general project area are five national wildlife refuges and two state wildlife refuges. Conservation priorities of these refuges focus on improving and maintaining quality habitat for resident and migrant species. The following sections detail the ongoing efforts of both Federal and State agencies in improving and managing wildlife resources for the betterment of these species.

The following plans and conservation legislation have been developed and put into effect for management of project area biological resources:

1. Partners in Flight Bird Conservation Plan – The National Fish and Wildlife Foundation led efforts in the 1990's to form the Partners in Flight program to combine resources and knowledge of many people to jointly protect the natural diversity of our continent. Many partners have made the program successful by participating in Working Groups to develop Regional Bird Conservation Plans. The project area is located within the Coast Prairie Physiographic Area 6 whose goals include restoration projects to benefit migrant land birds.

2. North American Waterfowl Management Plan (NAWMP) – This plan was designed by the U.S. and Canadian governments in 1986 and undertook an intensive effort to protect and restore North America's waterfowl populations and their habitats. With its update in 1994, Mexico became a signatory to the NAWMP. Restoration of wetlands and associated ecosystems is the main premise of the plan in order to restore waterfowl populations to levels observed in the 1970s.

3. Gulf Coast Joint Venture (GCJV) (Chenier Plain Initiative) – Regional partnerships or joint ventures composed of individuals, sportsmen's groups, conservations organizations, and local, state, provincial and Federal government entities were formed under the NAWMP. One such partnership, the CGJV, was formed to conserve priority waterfowl habitat range along the Western U.S. Gulf

of Mexico Coast, one of the most important waterfowl areas in North America. The GCJV's greatest contribution to the NAWMP is to provide wintering grounds for waterfowl. The GCJV is divided geographically into six initiative areas, one of which is the Chenier Plain Initiative area of southwest Louisiana and southeast Texas. The goal of the Chenier Plain Initiative is to provide wintering and migration habitat for significant numbers of dabbling ducks, diving ducks and geese (especially snow and greater white-fronted geese, as well as year-round habitat for mottled ducks.

4. North American Waterbird Conservation Plan – The North American Waterbird Conservation Plan was developed under a partnership, the Waterbird Conservation for the Americas, which is a group of individuals and organizations having an interest and responsibility for conservation of water birds and their habitats in the Americas. The project area is located within the Southeast U.S. Regional Waterbird Conservation Planning Area. The objective of the region is to standardize data collection efforts and analysis procedures to allow better tracking of regional movements and the association of these movements with environmental or land use changes.

5. United States Shorebird Conservation Plan – This plan is a partnership involving organizations throughout the U.S. committed to the conservation of shorebirds. The project area is located within the Lower Mississippi, Western Gulf Coast Shorebird Planning Region. The goal of the region is to ensure that adequate quantity and quality of habitat is identified and maintained to support the different shorebirds that breed in, winter in, and migrated through the area.

6. Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) – This Act was passed in 1990 by Congress. It generates $50 to $60 million annually for Louisiana coastal wetland projects via an 85/15 Federal/State cost share. CWPPRA also provided for the 1993 Comprehensive Louisiana Coastal Wetlands Restoration Plan. Funding of proposed restoration projects is determined by the Louisiana Coastal Wetlands and Conservation and Restoration task force, which is composed of five Federal agencies and the State of Louisiana. As mandated by CWPPRA, the task force developed a detailed Coastal Wetlands Restoration Plan in 1993 that describes what restoration actions and projects should be implemented to address Louisiana's coastal land loss crisis. A Priority Project List is developed and approved by the task force each year, outlining which projects will receive CWPPRA funding.

7. Coast 2050: Towards a Sustainable Coastal Louisiana (Coast 2050) – Coast 2050 is a comprehensive, ecosystem-based plan developed to address coastal wetland loss throughout southern Louisiana by private citizens, local, state and Federal agencies, and the scientific community. This plan, which is recognized by the State of Louisiana, five Federal agencies, and local coastal parish governments, serves as the joint coastal restoration plan for CWPPRA. The goals of the plan are to assure vertical accumulation (soil, vegetation and other organic material) in order to achieve sustainability, maintain estuarine gradient to achieve diversity, and to maintain exchange and interface to achieve system linkages. The project area is included in Region 4 of this plan.

8. Louisiana Coastal Area Ecosystem Restoration Plan (LCA) – This plan evolved from the Coast 2050 Plan with the overall goal of reversing the current trend of degradation of the coastal ecosystem. The plan formed the basis for the Louisiana Coastal Area Ecosystem Restoration Study, designed to identify critical ecological needs, identify restoration efforts, establish restoration priorities, and identify scientific uncertainties in order to present a strategy for addressing long-term needs of coastal Louisiana restoration. The project area is located within Sub-province 7 for LCA.

9.0 THREATENED AND ENDANGERED SPECIES OF THE PROJECT AREA

An analysis of potential impacts on threatened and endangered (T&E) species within the vicinity of the proposed action is included pursuant to the requirements of the National Environmental Policy Act (NEPA) of 1969, 42 U.S.C. section 4321, *et seq.* Additional jurisprudence includes the Endangered Species Act of 1973 (PL 93-205; 16 U.S.C. 1531 *et seq*., as amended); the Fish and Wildlife Conservation Act of 1958 (PL 85-624; 16 U.S.C. 661 *et seq*.); La. Civ. Code Ann. Art. 56, secs. 1901 to 1907; article VI of the U.S. Constitution; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940. Threatened (T) or endangered (E) species are technically significant because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly significant because of the desire of the public to protect them and their habitats.

The project area is found within the Calcasieu Lake, Calcasieu Pass, and entire ecosystem. The Calcasieu River and Pass Navigation Project is located in southwest Louisiana in Cameron and Calcasieu parishes. The Calcasieu Estuary provides important habitat for migratory waterfowl, shorebirds, and wading birds and valuable nursery and breeding habitat for numerous estuarine-dependent sport and commercial fish and shellfish. Areas of the greatest concern are Coon Island Loop, Bayou Verdine, and Bayou d'Inde.

The following T&E species that may be present in the project vicinity of the Calcasieu Lake, Calcasieu Pass, and entire ecosystem are listed in tables 3 and 4. Figure 9 shows examples of recognized T&E state species.

Of the 10 T&E species, only three may potentially be observed within the region of interest (ROI). These are the piping plover (*Charadrius melodus*), Kemp's ridley sea turtle (*Lepidochelys kempii*), and brown pelican (*Pelecanus occidentalis*).

Table 3. Threatened (T) and Endangered (E) Species in Calcasieu Parish

Common Name	Scientific name	Federal Status	State Status
Red-cockaded woodpecker	*Picoides borealis*	E	E

Source: United States Fish and Wildlife Service (USFWS; April 2003).

Table 4. Threatened (T) and Endangered (E) Species in Cameron Parish

Common Name	Scientific name	Federal Status	State Status
Bald eagle	*Haliaeetus leucocephalus*	Delisted	E
Piping plover	*Charadrius melodus*	T	T; Critical Habitat
Brown Pelican	*Pelecanus occidentalis*	E	E
West Indian Manatee	*Trichechus manatus*	E	E
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	T
Green sea turtle	*Chelonia mydas*	T	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	E
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Loggerhead sea turtle	*Caretta caretta*	T	T

Source: United States Fish and Wildlife Service (USFWS; April 2003).

Haliaeetus leucocephalus
Bald Eagle (delisted)

Picoides borealis
Red-Cockaded Woodpecker

Pelecanus occidentalis
Piping Plover

Charadrius melodus
Brown Pelican

Trichechus manatus
West Indian Manatee

Acipenser oxyrinchus desotoi
Gulf Sturgeon

Figure 9. Examples of State Threatened and Endangered Species

Chelonia mydas
Green Sea Turtle

Eretmochelys imbricata
Hawksbill Sea Turtle

Lepidochelys kempii
Kemp's Ridley Sea Turtle

Dermochelys coriacea
Leatherback Sea Turtle

Caretta caretta
Loggerhead Sea Turtle

Figure 9 (cont'd). Examples of State Threatened and Endangered Species

Piping plovers are small shorebirds approximately seven inches long with sand-colored plumage on their backs and crown and white underparts. Piping plovers from all breeding populations winter along South Atlantic, Gulf Coast, and Caribbean beaches and barrier islands, primarily on intertidal beaches with sand and/or mud flats with no or very sparse vegetation. They depart for the wintering grounds from mid-July through late October. Wintering piping plovers feed on exposed wet sand in wash zones; intertidal ocean beach; wrack lines; washover passes; mud-, sand-, and algal flats; and shorelines of streams, ephemeral ponds, lagoons, and salt marshes by probing for invertebrates at or just below the surface. They use beaches adjacent to foraging areas for roosting and preening. Small sand dunes, debris, and sparse vegetation within adjacent beaches provide shelter from wind and extreme temperatures.

Kemp's ridley sea turtles are one of the smallest and the most seriously endangered of the sea turtles, with adults reaching about two feet in length and weighing up to 100 pounds. The adult has an oval carapace that is almost as wide as it is long and is usually olive-gray in color. The carapace has five pairs of costal scutes. In each bridge adjoining the plastron to the carapace, there are four inframarginal scutes, each of which is perforated by a pore. The head has two pairs of prefrontal scales. Hatchlings are black on both sides. Kemp's ridley sea turtles have a triangular-shaped head with a somewhat hooked beak with large crushing surfaces. These turtles are a shallow water benthic feeder with a diet consisting primarily of crabs. The major foraging habitat is the nearshore and inshore waters of the northern Gulf of Mexico (especially Louisiana waters) as well as the Gulf of Campeche in the southern Gulf of Mexico. Kemp's ridley sea turtles are often found in salt marsh habitats.

Brown pelicans are large dark gray-brown water birds with white about the head and neck. Immature brown pelicans are gray-brown above and on the neck, with an underside of white. The adult can reach up to eight pounds and have wing spreads of over seven feet. Nesting is generally confined to the Carolinas, Florida, Louisiana, Alabama, and the Caribbean. Brown pelicans nest in colonies mostly on small coastal islands. The nests are usually built in mangrove trees of similar size vegetation, but ground nesting may also occur. Nests vary from practically nothing to well built nests of sticks, reeds, straws, palmetto leaves, and grasses. The eastern subspecies nests mostly in early spring or summer, although fall and winter nesting have been recorded in some localities. Normal clutch size for the brown pelican is three eggs. Feeding occurs primarily in shallow estuarine waters with the birds seldom venturing more than 20 miles out to sea except to take advantage of especially good fishing conditions. Sand spits and offshore sand bars are used extensively as daily loafing and nocturnal roost areas.

Other species which are tracked by the Louisiana Natural Heritage Program (May 2006) may be present in both Calcasieu and Cameron Parishes that may be considered rare, threatened, and endangered and can be seen in tables 5 and 6, respectively. These species may not be comparable with the species in the USFWS tables above, and the accuracy of noted species is not guaranteed. Tables 5 and 6 should only be used as a reference guide.

Table 5. Rare, Threatened, and Endangered Species and Natural Communities Tracked by the Louisiana Natural Heritage Program Calcasieu Parish – May 2006

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Agalinis filicaulis	Purple false-foxglove	S2N,S3B	G3G4		
Aimophila aestivalis	Bachman's sparrow	S3	G3		
Ajaia ajaja	Roseate spoonbill	S3	G5		
Amsonia ludoviciana	Louisiana blue star	S3	G3		
Anemone berlandieri		S2?	G4?		
Asclepias hirtella	Green milkweed	S1	G5		
Bottomland hardwood forest	Bottomland hardwood forest	S4	GNR		
Brachycercus flavus	Yellow brachycercus mayfly	S1	G4		
Brackish marsh	Brackish marsh	S3S4	GNR		
Canis rufus	Red wolf	SX	G1		LE, XN
Caracara cheriway	Crested caracara	S1	G5		PS:LT
Carex meadii	Mead's sedge	S2	G4G5		
Carex microdonta	Little tooth sedge	S3	G4		
Chateopappa asteroids	Chaetopappa	S1	G5		
Coastal prairie	Coastal prairie	S1	G2Q		
Cooperia drummondii	Evening rainlily	S1S2	G5		
Cycleptus elongates	Blue sucker	S2S3	G3G4		
Dichanthelium strigosum var. leucoblepharis		S1?	G5T3T5		
Fallicambarus dissitus	Pine hills crawfish	S2	G4		
Fallicambarus macneesei	Old prairie crawfish	S2	G3		
Galium virgatum	Southwest bedstraw	S2	G5		
Grus Canadensis	Sandhill crane	S1N	G5		PS
Haliaeetus leucocephalus	Bald eagle	S2N, S3B	G4	Endangered	Delisted
Hieracium longipilum	Hawkweed	S1	G4G5		
Lampsilis satura	Sandbank pocketbook	S2	G2		
Liatris punctata	Gayfeather	S1	G5		
Lobelia flaccidifolia		S2?	G5		
Ludwigia microcarpa	Small-fruited water-willow	S1	G5		
Ludwigia sphaerocarpa	Grapefruit primrosewilow	S1	G5		
Monarda lindheimeri	Lindheimer's bee-balm	S1	G4		
Nymphaea elegans	Blue water lily	S2S4	G4?		
Orconectes blacki	Calcasieu painted crawfish	S2	G2		
Panicum tenerum	Southeastern panic grass	S2S3	G2G3		
Physostegia longisepala	Long-sepaled false dragon-head	S2S3	G2G3		
Picoides borealis	Red-cockaded woodpecker	S2	G3	Endangered	LE
Polygala chapmanii		S1	G3G5		
Polygala crenata		S2	G4?		
Polyodon spathula	Paddlefish	S3	G4	Prohibited	
Pterocaulon virgatum	Wand blackroot	S1	G5		
Reithrodontomys humulis	Eastern harvest mouse	S3S4	G5		
Rhynchospora divergens	Spreading beakrush	S1	G4		
Rynchospora miliacea	Millet beakrush	S2	G5		
Rhynchospora nitens	Short-beaked baldsedge	S2S3	G4?		
Rhynchospora perplexa		S2?	G5		
Rhynchospora tracyi	Beak-rush	SH	G4		
Saccharum brevibarbe	Short-beard plumegrass	SH	G3G5		
Salix humilis var. tristis	Dwarf gray willow	S2	G5T4T5		
Samolus ebracteatus	Brookweed	S1	G4G5		
Scleria verticillata	Low nutrush	S1	G5		
Scutellaria cardiophlla	Heart-leaved skullcap	S2	G4?		
Spilogale putorius	Eastern spotted skunk	S1	G5		
Sporobolus silveanus	Silveus dropseed	S2S3	G4		
Strophitus subvexus	Southern creekmussel	S1	G3		
Terrapene ornate	Ornate box turtle	S1	G5	Restricted Harvest	
Waterbird Nesting Colony	Waterbird nesting colony	SNR	GNR		
Western acidic longleaf pine savannah	Western saline longleaf pine Savannah	S1	GNR		

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Western saline longleaf pine savannah	Western saline longleaf pine Savannah	S1	G1		
Xyris fimbriata	Fringed yellow-eyed grass	S2?	G5		
Xyris louisianica		S2S3	G3		
Xyris stricta	Pineland yellow-eyed grass	S1	G3G4		

EXPLANATION OF RANKING CATEGORIES EMPLOYED BY NATURAL HERITAGE PROGRAMS NATIONWIDE
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LT = Listed Threatened
PE = Proposed Endangered
PT = Proposed Threatened
C = Candidate
PDL = Proposed for delisting
E (S/A) or T (S/A) – Listed endangered or threatened because of similarity of appearance
XE = Essential experimental population
XN = Nonessential experimental population
No Rank = Usually indicates that the taxon does not have any federal status. However, because of potential lag time between publication in the Federal Register and entry in the central databases and state databases, some taxa may have a status which does not yet appear.
(Rank, Rank) = Combination values in parenthesis = The taxon itself is not named in the Federal Register as having U.S. ESA status; however, all of its infraspecific taxa (worldwide) do have official status. The statuses shown in parentheses indicate the statuses that apply to infraspecific taxa or populations within this taxon. *THE SPECIES IS CONSIDERED TO HAVE A COMBINATION STATUS IN LOUISIANA*
(PS) = partial status = Status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population has U.S. ESA status, but the entire species does not. *THE SPECIES DOES NOT HAVE A STATUS IN LOUISIANA*
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GLOBAL ELEMENT RANKS:
G1 = critically imperiled globally because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extinction
G2 = imperiled globally because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extinction throughout its range
G3 = either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g., a single physiographic region) or because of other factors making it vulnerable to extinction throughout its range (21 to 100 known extant populations)
G4 = apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery (100 to 1,000 known extant populations)
G5 = demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery (1,000+ known extant populations)
GH = of historical occurrence throughout its range; i.e., formerly part of the established biota, with the possibility that it may be rediscovered (e.g., Bachman's Warbler)
GU = possibly in peril range-wide, but status uncertain; need more information
G? = rank uncertain. Or a range (e.g., G3G5) delineates the limits of uncertainty
GQ = uncertain taxonomic status
GX = believed to be extinct throughout its range (e.g., Passenger Pigeon) with virtually no likelihood that it will be rediscovered
T = subspecies or variety rank (e.g., G5T4 applies to a subspecies with a global species rank of G5, but with a subspecies rank of G4)

STATE ELEMENT RANKS:
S1 = critically imperiled in Louisiana because of extreme rarity (5 or fewer known extant populations) or because of some factor(s) making it especially vulnerable to extirpation
S2 = imperiled in Louisiana because of rarity (6 to 20 known extant populations) or because of some factor(s) making it very vulnerable to extirpation
S3 = rare and local throughout the state or found locally (even abundantly at some of its locations) in a restricted region of the state, or because of other factors making it vulnerable to extirpation (21 to 100 known extant populations)
S4 = apparently secure in Louisiana with many occurrences (100 to 1,000 known extant populations)
S5 = demonstrably secure in Louisiana (1,000+ known extant populations)
(B or N may be used as qualifier of numeric ranks and indicating whether the occurrence is breeding or nonbreeding)
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SR = reported from Louisiana, but without conclusive evidence to accept or reject the report
SU = possibly in peril in Louisiana, but status uncertain; need more information
SX = believed to be extirpated from Louisiana
SZ = transient species in which no specific consistent area of occurrence is identifiable

STATE PROTECTION STATUS:
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Endangered = Taking or harassment of these species is a violation of state and federal laws.
Threatened = Taking or harassment of these species is a violation of state and federal laws.
Threatened/Endangered = Taking or harassment of these species is a violation of state and federal laws.
Prohibited = Possession of these species is prohibited. No legal harvest or possession.
Restricted Harvest = There are restrictions regarding the taking and possession of these species.

Table 6. Rare, Threatened, and Endangered Species and Natural Communities Tracked by the Louisiana Natural Heritage Program Cameron Parish – May 2006

Scientific Name	Common Name	State Rank	Global Rank	State Status	Federal Status
Ajaia ajaja	Roseate spoonbill	S3	G5		
Amaranthus greggii	Gregg's amaranth	S2S3	G4?		
Astragalus nuttallianus	A milk-vetch	S2S3	G5		
Brackish marsh	Brackish marsh	S3S4	GNR		
Canis rufus	Red wolf	SX	G1		LE,XN
Canna flaccida	Golden canna	S4?	G4?		
Caracara cheriway	Crested caracara	S1	G5		PS:LT
Cenchrus tribuloides	Dune sandbur	S2	G5		
Chamaesyce bombensis	Sand dune spurge	S1	G4G5		
Charadrius alexandrinus	Snowy plover	S1B,S2N	G4		PS:LT
Charadrius melodus	Piping plover	S2N	G3	Threatened/Endangered	LE,LT
Charadrius wilsonia	Wilson's plover	S1S3B,S3N	G5		
Coastal dune grassland	Coastal dune grassland	S1S2	GNR		
Coastal live oak-hackberry forest	Coastal live oak-hackberry forest	S1S2	G1G2Q		
Coastal prairie	Coastal prairie	S1	G2Q		
Columbina passerine	Common ground-dove	S1B,S2N	G5		
Dalea emarginata	Wedge-leaf prairie-clover	S2	G5		
Draba cuneifolia	Wedge-leaf whitlow-grass	S1	G5		
Eleocharis elongate	Slim spike-rush	S1?	G5?		
Eriochloa punctata	Punctate cupgrass	S2	G5		
Freshwater marsh	Freshwater marsh	S1S3	GNR		
Grus Canadensis	Sandhill crane	S1N	G5		
Lithospermum incisum	Narrow-leaved puccoon	S1	G5		
Ludwigia sphaerocarpa	Grapefruit primrosewilow	S1	G5		
Malaclemys terrapin	Diamondback terrapin	S2	G4	Restricted Harvest	
Migratory Bird Staging/ Stopover Site	Migratory bird staging/ stopover site	SNR	GNR		
Monanthochloe littoralis	Saltflat-grass	S1	G4G5		
Nymphaea elegans	Blue water lily	S2S4	G4?		
Paspalum monostachyum	Gulfdune paspalum	S2	G4?		
Pediomelum rhombifolium	Roundleaf-scarf-pea	S2S3	G5		
Pelecanus occidentalis	Brown pelican	S2	G4	Endangered	PS:LE
Physostegia correllii	Correll's false dragon-head	S1	G2		
Plegadis falcinellus	Glossy ibis	S2	G5		
Polyodon spathula	Paddlefish	S3	G4	Prohibited	
Pterocaulon virgatum	Wand blackroot	S1	G5		
Ratibida peduncularis	Mexican hat	S2S3	G4G5		
Rhynchospora globularis var. pinetorum		S1?	G5?T3?		
Rhynchospora microcarpa		S1?	G5		
Rhynchospora nitens	Short-beaked baldsedge	S2S3	G4?		
Rhynchospora perplexa		S2?	G5		
Rhynchospora scirpoides	Long-beaked baldrush	S1	G4		
Sabatia arenicola	Sand Rose-gentian	S1	G3G5		
Samolus ebracteatus	Brookweed	S1	G4G5		
Sida ellitottii	Elliott sida	SH	G4G5		
Sideroxylon reclinatum		S1?	G4G5		
Spilogale putorius	Eastern spotted skunk	S1	G5		
Terrapene ornate	Ornate box turtle	S1	G5	Restricted Harvest	
Thalia dealbata	Powdery thalia	S2S3	G4		
Tidestromia lanuginose	Woolly honeysweet	S1	G5		
Trichechus manatus	Manatee	SZN	G2	Endangered	LE
Uniola paniculata	Sea oats	S2	G5		
Utricularia purpurea	Purple bladderwort	S3	G5		
Waterbird Nesting Colony	Waterbird nesting colony	SNR	GNR		

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STATE PROTECTION STATUS:
State status are contained in Title 56 of the Louisiana Revised Statutes as well as relevant rules and regulations adopted by the Louisiana Wildlife and Fisheries Commission and the Secretary of the Department of Wildlife and Fisheries. The Secretary of the Department of Wildlife and Fisheries is authorized to implement additional restrictions in emergency situations in order to protect fish and wildlife resources.
Endangered = Taking or harassment of these species is a violation of state and federal laws.
Threatened = Taking or harassment of these species is a violation of state and federal laws.
Threatened/Endangered = Taking or harassment of these species is a violation of state and federal laws.
Prohibited = Possession of these species is prohibited. No legal harvest or possession.
Restricted Harvest = There are restrictions regarding the taking and possession of these species.

10.0 ESSENTIAL FISH HABITAT (EFH) ASSESSMENT

The Magnuson-Stevens Fishery Conservation and Management Act, as amended, PL 104-208, addresses the authorized responsibilities for the protection of Essential Fish Habitat (EFH) by National Marine Fishery Service (NMFS) in association with regional fishery management councils (FMC). The act establishes eight Regional Fishery Management Councils responsible for the protection of marine fisheries within their respective jurisdictions. EFH is defined as

"those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." This definition extends to habitat specific to an individual species or group of species; whichever is appropriate within each Fishery Management Plan (FMP). The act also authorizes the designation of Habitat Areas of Particular Concern (HAPC) for marine fisheries. These areas are subsets of EFH that are rare, susceptible to human degradation, ecologically important or located in an ecologically stressed area. Any Federal agency that proposes any action that potentially affects or disturbs any EFH must consult with the Secretary of Commerce and Fishery Management Council authority per the Magnuson-Stevens Act, as amended (2005). Interim final rules were published on December 19, 1997, in the Federal Register (Vol. 62. No. 244) to establish guidelines for the identification and description of EFH in fishery management plans. These guidelines include impacts from fishing and non-fishing activities as well as the identification of actions needed to conserve and enhance EFH. The rule was established to provide protection, conservation, and enhancement of EFH.

10.1 Project Location

The Calcasieu River and Pass Navigation Project is located in southwest Louisiana in Cameron and Calcasieu parishes.

10.2 Types of Essential Fish Habitat in the ROI

The region of interest (ROI) is located within the jurisdiction of the Gulf of Mexico Fishery Management Council (GMFMC). States with representation on the Council include Texas, Louisiana, Florida, Alabama, and Mississippi. The GMFMC has identified and described EFH for hundreds of species covered by seven FMPs. The Council prepares fishery management plans designed to manage fishery resources from where state waters end, out to the 200-mile limit of the Gulf of Mexico. These waters are also known as the Exclusive Economic Zone (EEZ). The GMFMC has identified several types of EFH that occur in estuarine and marine conditions for the entire region of jurisdiction and for the state of Louisiana. These EFH types and their corresponding categories can be found in Table 7.

Table 7. Essential Fish Habitat and Habitat Areas of Particular Concern (HAPC) Identified for Management by the Gulf of Mexico Fishery Management Council

Essential Fish Habitat		HAPC
Estuarine Areas	**Marine Areas**	**Texas/Louisiana**
Estuarine emergent wetlands	Water column	Flower Garden Banks National Marine Sanctuary
Mangrove wetlands	Vegetated bottoms	
Submerged aquatic vegetation	Non-vegetated bottoms	
Algal flats	Live bottoms	
Mud, sand, shell, and rock substrates	Coral reefs	
Estuarine water column	Artificial reefs	
	Geologic features	
	West Florida Shell	
	Mississippi/Alabama shelf	
	Louisiana/Texas shelf	
	South Texas shelf	

Source: NMFS, 2000.

Coastal Louisiana is predominately a broad marsh indented by shallow bays containing innumerable valuable nursery areas. Total estuarine area in 1970 encompassed more than 7.2 million acres, of which over 3.9 million acres was marsh vegetation and more than 3.3 million acres was surface water area (Perret *et al*., 1971). These waters are generally shallow with over half between zero and 5.9 ft in depth. Sediments consist of mud, sand and silt and are very similar across the coast, ranging from coarse near the Gulf and barrier islands to fine in the upper estuaries (Barrett *et al*., 1971).

In general, the descriptive section of the Gulf of Mexico Estuarine Inventory (GMEI) for Louisiana does not provide specific, quantitative information (e.g., acreage of vegetation and oyster beds) by water body. Rather, such information is presented statewide by vegetative types (for aquatic vegetation), or by parish (for oyster beds). The following summarizes the major, statewide information contained in the area description of Louisiana's GMEI within the ROI (Perret *et al.*, 1971).

Emergent vegetation is not evenly distributed along the Gulf coast. Emergent marsh amounts to more than 3.9 million acres and is made up of four main types: Saline (349,231 ha [862,973 acres]) consists of oystergrass (*Spartina alterniflora*), glasswort (*Salicornia* sp.), black needlerush (*Juncus roemerianus*), black mangrove (*Avicennia nitida*), saltgrass (*Distichlis spicata*) and saltwort (*Batis marina*); Brackish (1,203,790 acres) is made up of wiregrass (*Spartina patens*), threecorner grass (*Scirpus olneyi*) and coco (*Scirpus robustus*); Intermediate (650,576 acres) consists of wiregrass (*Spartina patens*), deer pea (*Vigna repens*), bulltongue (*Sagittaria* sp.), wild millet (*Echinochloa walteri*), bullwhip (*Scirpus californicus*) and sawgrass (*Cladium jamaicense*); and, Fresh (1,193,325 acres) consists of maiden cane (*Panicum hemitomon*), pennywort (*Hydrocotyle* sp.), pickerelweed (*Pontederia cordata*), alligator weed (*Alternanthera philoxeroides*), bulltongue (*Sagittaria* sp.), and water hyacinth (*Eichhornia crassipes*). Approximately 63 percent of the marsh is found in Louisiana as the result of an abundant sediment supply transported by the Mississippi River.

Submerged vegetation occurs along the coastal areas but no acreage figure is available for its range. The GMEI did not attempt to obtain acreage figures for the submerged vegetation because of the small areas in which it occurs.

Live oyster beds amount to more than 133,000 acres. More than 116,000 acres are private leases with the largest ones being in St. Bernard (36,939 acres), Plaquemines (37,654 acres) and Terrebonne (20,347 acres) Parishes. Some 1,200 acres are public reefs in Cameron Parish and are opened seasonally. More studies of oyster beds and their locations are necessary for proper impact analyses in the ROI.

More than 1,000 miles of navigation channels designed and/or maintained by the U.S. Army Corps of Engineers are in the estuarine zone. Barrett *et al*. (1971) provide abundant data on the hydrological aspects of Louisiana's estuaries. In general, the estuaries and near offshore waters are low in salinity and high in nutrients compared with the other Gulf States. High rainfall and large volume of river discharge account for these characteristics. The Mississippi and Atchafalaya Rivers are the main contributors of nutrients to the estuaries and also are responsible for the large dilutions in salinity within the coastal area.

The only noted HAPC, Flower Garden Banks National Marine Sanctuary, is actually the northernmost coral reefs in the United States. Located approximately 105 miles directly south of the Texas/Louisiana border, the Flower Gardens are perched atop two salt domes rising

above the sea floor. This bank supports a coral/sponge habitat and rich assemblages of associated animals and plants where the siltstone bedrock can still be seen in many places. This noted HAPC for Louisiana is not within the project vicinity.

10.3 Essential Fish Habitat Designations Within the ROI

The NMFS publication *Essential Fish Habitat: New Marine Fish Habitat Conservation Mandate for Federal Agencies* (2000) provides descriptions of EFH for marine species managed by the GMFMC. This publication was used, with assistance from the Habitat Conservation Division of the NMFS Southeast Regional Office, to identify EFH for managed species within the ROI. Table 8 lists species managed under the Magnuson-Stevens Fishery Conservation and Management Act grouped by FMP for which EFH designations exist in the ROI.

Table 8. Essential Fish Habitat Designations Within the Calcasieu ROI

Species	Eggs	Larvae	Juveniles	Adults
Shrimp Species				
brown shrimp (*Farfantepenaeus aztecus*)	X	X	X	X
white shrimp (*Litopenaeus setiferus*)	X	X	X	X
pink shrimp (*Farfantepenaeus duorarum*)	X	X	X	X
Gulf stone crab (*Menippe adina*)	X	X	X	
Red drum (*Sciaenops ocellatus*)	X	X	X	X
Reef Fish				
warsaw grouper (*Epinephelus nigritus*)	X	X	X	
yellowedge grouper (*Epinephelus flavolimbatus*)	X	X	X	X
red snapper (*Lutjanus campechanus*)	X	X	X	X
vermilion snapper (*Rhomboplites aurorubens*)	X	X	X	X
lane snapper (*Lutjanus synagris*)	X	X	X	
dog snapper (*Lutjanus jocu*)	X	X	X	
wrenchman (*Lutjanus buccanella*)	X	X		
dwarf sand perch (*Diplectrum bivittatum*)			X	
greater amberjack (*Seriola dumerili*)	X	X	X	
lesser amberjack (*Seriola fasciata*)	X	X	X	
almaco jack (*Seriola rivoliana*)			X	
anchor tilefish (*Caulolatilus intermedius*)	X	X		
goldface tilefish (*Caulolatilus chrysops*)	X	X		
golden tilefish (*Lopholatilus chamaeleonticeps*)	X	X	X	
gray triggerfish (*Balistes capriscus*)	X	X	X	
Coastal Migratory Pelagic Species				
king mackerel *(Scomberomorus cavalla)*	X	X	X	X
cobia *(Rachycentron canadum)*	X	X	X	
Coral	X	X	X	X

Source: NMFS, 2000.

The estuarine and marine waters of Calcasieu and Cameron Parishes are included in the EFH managed area. Specifically, various species have been designated as being Federally managed species or species groups potentially found within the Calcasieu Lake, Calcasieu Pass, and entire ecosystem.

10.3.1 Shrimp Species

Penaeid species include the brown shrimp (*Farfantepenaeus aztecus*), white shrimp (*Litopenaeus setiferus*), and pink shrimp (*Farfantepenaeus duorarum*). Adult penaeids generally occupy offshore areas of higher salinity, where spawning occurs. After hatching, larvae enter estuaries and remain there throughout the juvenile stage. Estuarine habitat serves as a nursery area for penaeids, offering a suitable substrate, an abundant food supply, and protection from predators. Subadult penaeids consume organic matter, including marsh grasses and microorganisms, found in estuarine sediments. Adult penaeids are omnivorous.

EFH for penaeids includes shallow inshore waters, marsh edged, submerged aquatic vegetation, tidal creeks, inner marsh, mud bottoms, and sand/shell substrate. HAPC for penaeids includes tidal inlets and state nursery and overwintering habitats. These areas contain a high abundance of juvenile specimens and are critical for early growth and development among penaeids. Penaeid HAPC within the ROI includes the mouth and all tidally influenced portions of the Calcasieu River and associated nearshore habitat.

10.3.2 Gulf Stone Crab

Gulf stone crab (*Menippe adina*) occur throughout the Gulf of Mexico, although the majority of fishing occurs along the Gulf coast of Florida. Adult stone crabs are benthic organisms and can be found from the shoreline out to depths of 200 ft. Juveniles are also benthic dwellers but do not burrow. Juveniles can be found on shell bottom, sponges, and *Sargassum* mats as well as in channels and deep grass flats. Stone crab larvae are planktonic and require warm water 30^{o}C and high salinity (30-35 ppt) for most rapid growth. The stone crab is a high trophic level predator and is primarily carnivorous at all life stages. Juveniles feed on small molluscs, polychaetes, and crustaceans.

EFH for the Gulf stone crab includes inshore waters of less than 59 ft, estuarine hard bottoms, estuarine sand/shell, estuarine submerged aquatic vegetation, nearshore hard bottoms, and nearshore sand/shell. Gulf stone crab HAPC within the ROI includes the mouth and all tidally influenced portions of the Calcasieu River and associated nearshore habitat.

10.3.3 Red Drum

Red drum (*Scianeops ocellatus*) is an important commercial and recreational gamefish found in coastal waters throughout the Gulf of Mexico. Adults inhabit nearshore waters, particularly areas within the surf zone or in the vicinity of inlets. Spawning occurs in nearshore areas, and eggs and larvae are transported by tides and wind currents into estuaries. Larvae and juveniles occupy estuarine environments until maturation. Red drum are predatory in all stages of life; however, the type of prey consumed varies with life stage. Subadult red drum primarily consume small marine invertebrates including mysids and copepods, while adult specimens feed on large marine invertebrates, including shrimp and crabs, and small fishes.

EFH for red drum includes tidal inlets, mud bottoms, submerged aquatic vegetation, the marsh-water interface, mangrove communities, oyster reefs, and nearshore waters with depths of less

than 164 ft. HAPC for red drum includes tidal inlets, state nursery areas, spawning sites, and submerged aquatic vegetation. Red drum HAPC within the ROI includes the mouth and all tidally influenced portions of the Calcasieu River and associated nearshore habitat.

10.3.4 Reef Fish

There are 15 species of reef fish within this complex that are likely to be found within the ROI. Although species within this complex generally occupy similar ecological niches and exhibit similarities in behavior and life stages, a considerable variation in diet and habitat use exists among individual species. Member species of the complex are generally predatory, but the type of prey varies widely among species and ranges from small invertebrates to fishes, including other species within this complex. Larvae and juvenile specimens may be pelagic or estuarine, and adults may occupy estuarine, nearshore, or pelagic environments.

EFH for the reef fish includes submerged aquatic vegetation, mangrove communities, lagoons, hardbottoms, nearshore habitat, and estuarine sands and muds. HAPC for the complex includes hardbottom, mangrove communities, submerged aquatic vegetation, oyster/shell substrates, inlets, and state nursery areas. HAPC for the reef fish within the ROI includes the mouth and all tidally influenced portions of the Calcasieu River and associated nearshore habitats.

10.3.5 Coastal Migratory Pelagic Species

Coastal Migratory Pelagic Species are an assemblage of marine fishes that inhabit coastal waters of the Gulf of Mexico from the shoreline to the continental shelf edge. These species migrate seasonally within these coastal waters. Members of this assemblage that are likely to be present within the ROI include the king mackerel (*Scomberomorus cavalla*) and cobia (*Rachycentron canadum*). Coastal migratory pelagics are predatory and generally occupy open marine waters, but subadults may occupy tidal inlets and estuarine environments.

EFH for Coastal Migratory Pelagic Species includes shallow nearshore waters, beaches, and estuarine environments. No HAPC for the assemblage occurs within the ROI. EFH for Coastal Migratory Pelagic Species within the ROI includes the mouth and all tidally influenced portions of the Calcasieu River and associated nearshore habitats.

10.3.6 Coral

Coral reef communities and solitary specimens exist throughout the Gulf of Mexico. It is of importance to a wide range of non-consumptive users (e.g., divers) and provides habitat or related ecosystem services needed for commercial and recreational fishing activities. The two separate banks at the Flower Gardens are distinct geologic structures located about 15 miles apart and over 124 miles from the coasts of Texas and Louisiana. The coral reefs on those banks are the northwestern most reefs in the Gulf of Mexico. Coral are suspension feeders for the most part, using nematocysts to capture prey. As such, their prey is the various planktonic organisms carried in the water column. Much of the prey are found in reef sediments during the day and enter the water column at night. Thus, the water column as well as reef sediments represent the habitat of the prey of coral.

EFH for corals includes marine waters, hard banks/reefs. No HAPC for the assemblage occurs within the ROI.

11.0 REFERENCES

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