

**Plan of Operations and Environmental Assessment of Proposed Three Dimensional Seismic
Testing within and near the Jean Lafitte National Historical Park and Preserve
in Jefferson and St. Charles Parishes, Louisiana**

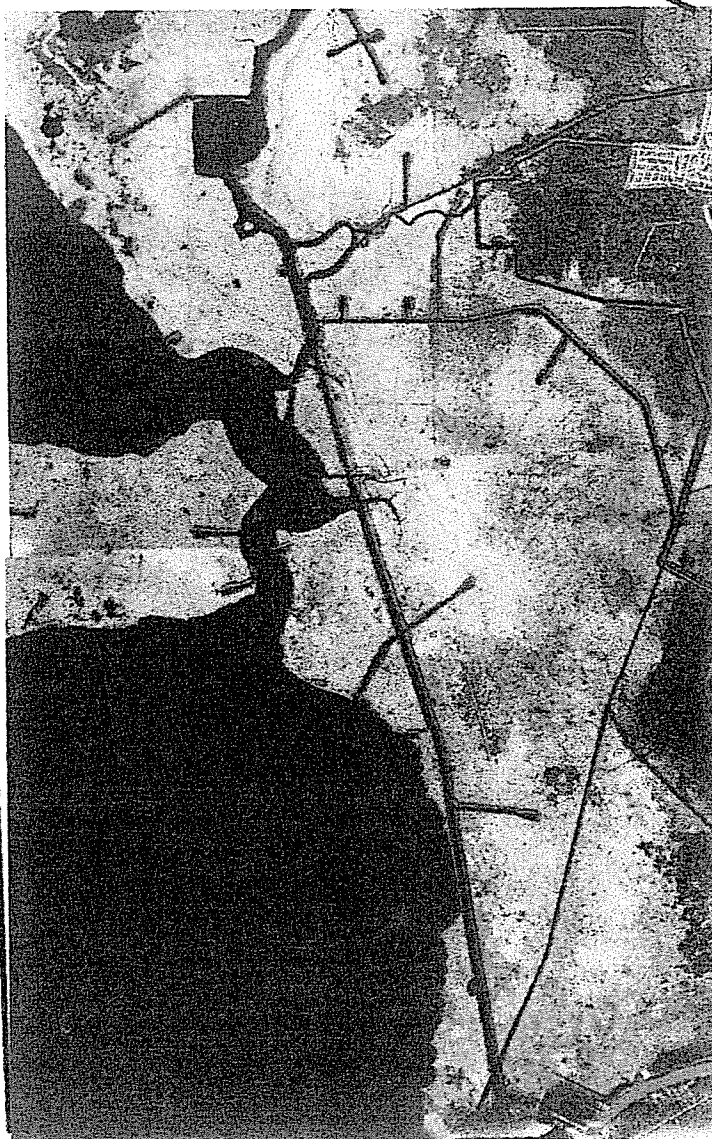


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Plan of Operations and Environmental Assessment of Proposed Three Dimensional Seismic Testing within and near the Jean Lafitte National Historical Park and Preserve in Jefferson and St. Charles Parishes, Louisiana

Burlington Resources Corporation is proposing to conduct a three dimensional seismic survey encompassing approximately fifty square miles in Jefferson and St. Charles Parishes, Louisiana. A portion of this proposed survey occupies an area within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve. The following plan of operation's objective is to accomplish the three dimensional seismic survey by avoiding and minimizing adverse impact to the environment, recreational facilities, scenic features, hydrologic regime, vegetation and faunal resources. This effort has been coordinated with parish, state, and federal regulatory agencies. Other state and federal research agencies maintaining operational facilities within the Barataria Preserve have also been consulted.

The proposed three dimensional survey will be accomplished in three phases that include surveying, drilling and recording. The survey area is a grid network of source lines and receiver locations. Source lines will be separated by 1,320-foot intervals with shot holes located along individual lines at 440-foot intervals. Receiver lines will be separated by 880-foot intervals with seismometers located along individual lines at 220-foot intervals. Within the Barataria Preserve, only 31.87 square feet of surface area will be disturbed by the drilling 3.5 inch shot holes during the seismic survey. Eighteen source lines are planned to traverse the Barataria Preserve where 477 shot holes will be drilled to 100 feet in depth. The Barataria Preserve encompasses 19.88 percent of the total proposed seismic survey area.

The proposed seismic survey will adhere to all provisions within 36 CFR 9.30 *et sequentia* relative to non-Federal oil and gas rights within the Barataria Preserve of the

Jean Lafitte National Historical Park and Preserve. The seismic survey proposed within the Operations Plan and Environmental Assessment incorporates protection of the Barataria Preserve by operational conditions and requirements that will preserve and protect vegetative characteristics, inherent ecological integrity of the existing ecosystems, water quality, air quality and freshwater drainage characteristics. As stated in the purpose and scope of 36 CFR Section 9.30(a), these regulations are “designed to insure that activities undertaken pursuant to these rights are conducted in a manner consistent with the purposes for which the” Barataria Preserve of the Jean Lafitte National Historical Park and Preserve “were created, to prevent or minimize damage to the environment and other resource values, and to insure to the extent feasible that all units of the National Park system are left unimpaired for the enjoyment of future generations.”

Presently, a Nationwide Permit Number 6 with specific conditions has been obtained from the New Orleans District, U.S. Army, Corps of Engineers (Permit EO-19-970-3964) and a Coastal Use Permit has been obtained from the Louisiana Department of Natural Resources (#P951286). The Jefferson Parish Council has provided Burlington Resources, Incorporated with a Letter of No Objection (JP-97-15), and numerous meetings and coordination with the National Park Service, U.S. Fish & Wildlife, Louisiana Department of Wildlife and Fisheries, U. S. Geological Survey’s Biological Resources Division and National Marine Fisheries Service have further refined the following plan of operations for the proposed three dimensional seismic survey.

The environmental assessment addresses those components of the seismic survey directly or indirectly impacting existing environmental conditions. The identification of impacts further assists Burlington Resources, Incorporated in refining the operational plan

to address, avoid and minimize any additional impacts to the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.

DESCRIPTION OF THE PROPOSED ACTION

1.1 Purpose and Need for Action

Burlington Resources, Incorporated is proposing to conduct a three dimensional seismic survey adjacent to and within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve in the spring and early summer of 1998. The entire survey will occupy an area of approximately 50 square miles; however, over eighty percent of the project is beyond the park's boundary (Figure 1.1-1).

The proposed project will provide a high resolution image of the subsurface geological features. Data gathered from this survey will permit Burlington Resources, Incorporated to effectively evaluate the hydrocarbon reserves within a 5,760 acre lease near and within the preserve's boundary. The additional area beyond the lease boundary is required to access geological features to a depth of 10,000 to 16,000 feet. The three dimensional survey will avoid unnecessary exploratory wells, minimize drilling unproductive wells, and eliminate the requirements for numerous two dimensional surveys.

The proposed seismic survey's goal is to evaluate the hydrocarbon reserves beneath the 5,760-acre lease with the absolute minimal disturbance to the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve. To achieve this goal, the following proposed objectives for this survey are:

- to initiate the main survey after completion of the early spring nesting season of inherent wildlife;



Figure 1.1-1. Proposed Three Dimensional Seismic Survey Area Relative to the Barataria Unit of the Jean Lafitte National Historic Park and Preserve.

LEGEND

20 Meter Resolution

- Boundary of Proposed Three Dimensional Seismic Survey
- Boundary of Jean Lafitte National Park and Preserve
- (White) Boundary of Burlington Resources, Incorporated Lease (5,760 Acres)
- Boundary of Exempt Area within Lease (384.5 Acres)
- Shell Exclusion Area (Minerals leased by another company)

- to complete the survey after the majority of migratory wildlife have initiated their northern migration;
- to utilize areas beyond the Barataria Preserve's boundary for staging personnel and equipment to minimize conflicts with public use.

This will be a single and complete project because there is no further intention of Burlington Resources, Incorporated to place any future structures within the lease area that extends within the existing boundary of the Barataria Preserve.

1.2 Environmental Assessment and Plan of Operations Framework

Burlington Resources, Incorporated retains a valid lease from the legal landowners that principally occupies Lake Cataouatche and a portion of the Barataria Preserve. Pursuant to Title 36 of the Code of Federal Regulations Section 9.9(a), "No operations shall be conducted within any unit until a plan of operations has been submitted by the operator to the Superintendent and approved by the Regional Director. All operations within any unit shall be conducted in accordance with an approved plan of operations." This document supplies the plan of operations and the environmental assessment relative to the proposed three dimensional seismic survey that includes approximately 6,360 acres of the Barataria Preserve.

The development of the Operational Plan and Environmental Assessment should provide the best opportunity for public notice, comment and conflict resolution for any facet of the proposed seismic survey. Consequently, the rights and concerns of the general public, who utilize or possess interest in the Barataria Preserve and its natural resources, will be addressed and the impacts to these resources will be diminished to the practicable minimum.

1.3 Description of the Proposed Action

The applicant, Burlington Resources, Incorporated, is proposing to perform three dimensional seismic testing occupying an area of approximately 50 square miles (Figure 1.1-1). The entire source and receiver locations total 9,536, covering a linear distance of 517.9 miles. There will be 2,372 source points encompassing 221.0 linear miles and 7,164 receiver locations totaling 296.9 linear miles. Therefore, the average receiver locations per square mile will be 146, while the average source points per square mile will be 48.

A swath of 43 source lines will be separated by 1,320 feet where individual source points will be placed at 440-foot intervals along each source line. Each line will directionally follow a course from north-northwest toward the south-southeast. A swath of 37 receiver lines will proceed in a direction of north-northeast to south-southwest where receiver locations will be separated by 220 feet. The resultant grid network of source and receiver lines approximates a 45 degree angle. A 1:24,000 digital orthomap has been supplied with this grid network as an overlay to the National Park Service in New Orleans, Louisiana.

This proposed seismic survey will encompass three phases: survey, drilling and recording; however, this activity will strive to be an almost continuous effort. During the survey phase, the shot holes and receiver stations will be located. Next, the shot holes will be drilled and loaded with explosive charges. Finally, the recording phase will comprise deploying the recording equipment, detonating the charges and recording the reflected energy.

Initially the survey will begin by locating and flagging shot holes and receiver points using global positioning systems. This methodology precludes cutting vegetation to the

maximum extent possible because line-of-sight is not required to determine a point. Also biodegradable flagging will be used to mark these points. This effort will be accomplished by walking wherever possible. Shot hole locations in standing water will be marked with cane poles. Cane poles, flagging and any other debris will be removed when receiver lines are being extracted. Any alligator nests, mammalian dens or known cultural sites will be avoided by offsetting the shot hole or receiver point. All sensitive areas traversed by source or receiver lines will also be flagged with biodegradable tape, and the tape removed as the receiver lines are extracted.

The shot hole drilling crew will follow the survey crew. Drilling in open water will be accomplished by air boat, while in the marsh where air boat use is limited by dry conditions, drilling will be accomplished by light-weight aluminum, tracked vehicles. In standing water, the drill will be fitted with a silt curtain to minimize any significant increases in turbidity to the surrounding environment. Drilling will require a water source to supply a fluid medium to assist the process. An estimated average of 150 gallons of water will be required to drill a shot hole to 100 feet in depth. Assuming approximately 50 shot holes will be drilled per day in the marsh, 7,500 gallons of water will be required daily for drilling purposes. Sources of water will adhere to the following guidelines:

- Water will be obtained from the nearest open water available to reduce damage to marsh vegetation.
- If open water is not available, a small hole will be cut in the marsh vegetation and a screened hose will be used to pump water to the drilling vehicle.
- If open water is not available and monitors decide that marsh vegetation cannot be removed, small, tender air boats will be used to supply water.

The source point energy will be a ten pound charge of biodegradable pentallite or comparable explosive approximately 100 feet in depth. The charges will be double capped to insure detonation of the explosive. Bentonite will then be added to the shot hole to direct the force of the charge downward. The remainder of the shot hole will be filled with the cuttings to approximately two feet from the surrounding top of the substrate where a plastic or metal cap will be placed to bridge the hole. Additional substrate will be spread around the hole, and/or natural marsh vegetation will be replaced. Therefore, the previously existing contour will be restored to the area of each shot hole.

After drilling personnel have completed the shot holes, the receiving line crew will deploy seismometers and lines according to the aforementioned grid pattern. Seismometers are encased within a cylindrical, waterproof housing and measure two inches in diameter and a height of six inches. When deploying the receiver lines, clearing a small passageway through tree lines no greater than 36 inches wide may be required for personnel to place these lines in the correct directional heading. These points will usually correspond to the intersection of waterway spoil banks and the direction of receiver line deployment. However, vegetation less than or equal to two inches in diameter will be flush cut with the main stem, and no cutting or impacts to cypress or other sensitive species will be accomplished. During receiver line deployment, the first priority is to avoid any sensitive area or location by offset, enter or pass through areas where exotic vegetation such as Chinese tallow is the dominant vegetation, or make a passage through the vegetation with the minimal amount of impact.

The deployment, maintenance and recovery of the receiver line equipment used in the seismic survey should not require more than eight air boat passes on any line; however, to further reduce the amount of air boat passes, a support helicopter will be used to convey

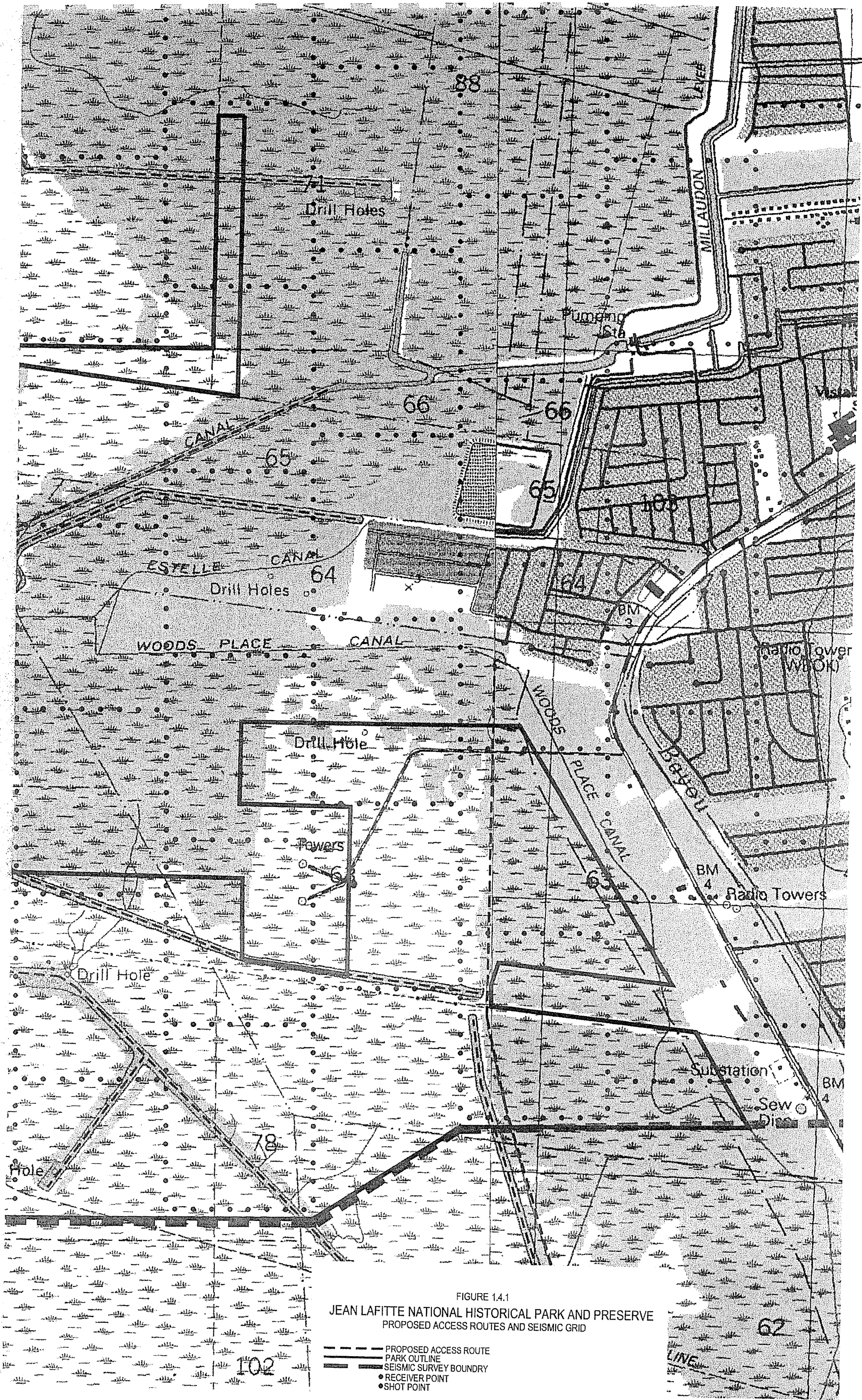
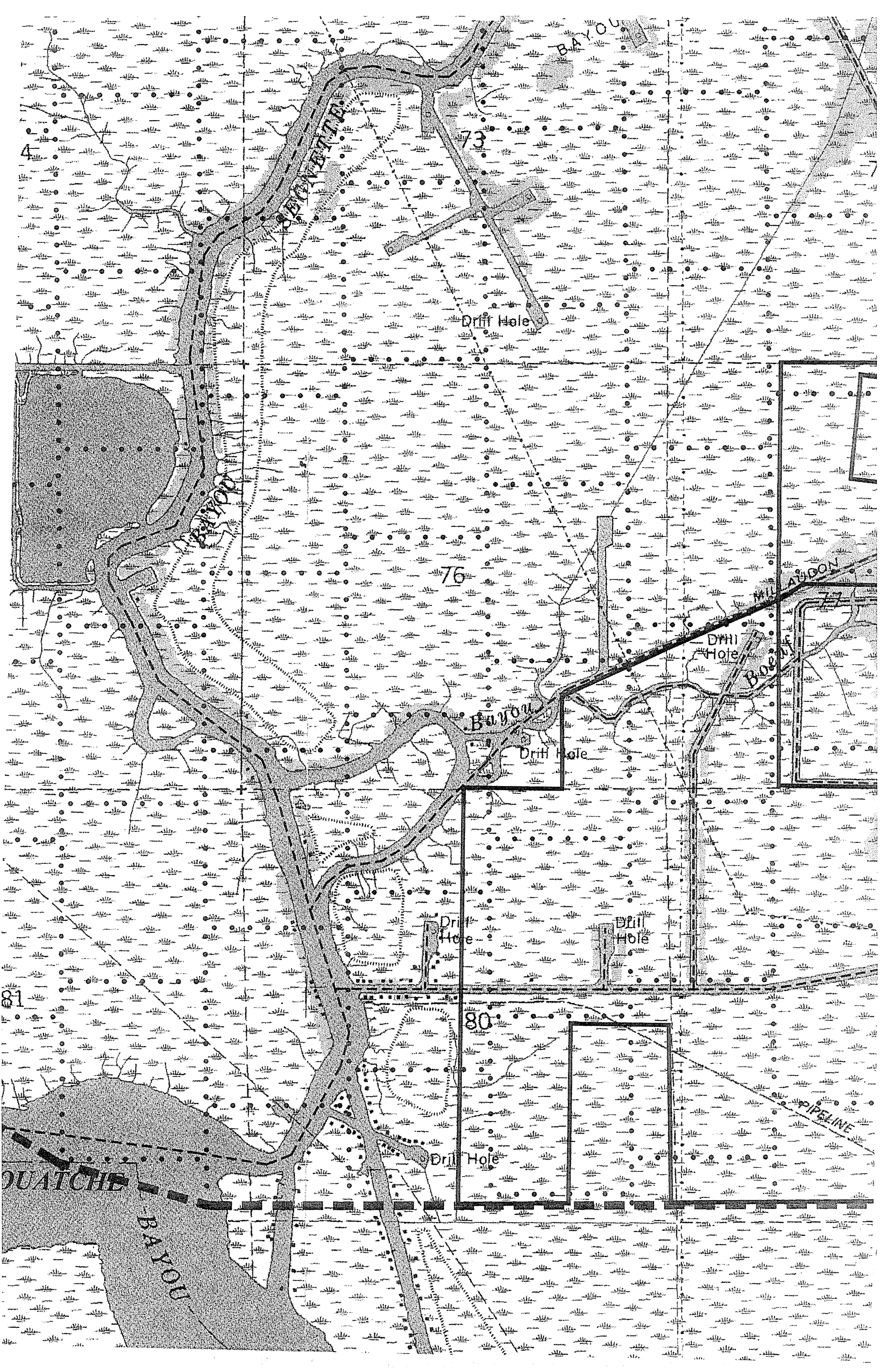


FIGURE 14.1
JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE
PROPOSED ACCESS ROUTES AND SEISMIC GRID



equipment to and from the work areas. Immediately, prior to detonation, personnel will visually inspect the area to make certain there are no visible signs of people or inherent wildlife near the source point that could be impacted by the detonation. After detonation of the explosive charge, personnel will remove all markers and flagging including an inspection of the location for any other debris. As work progresses and the recording of seismic data is completed, all equipment will be removed from the inspected area and moved forward in the survey.

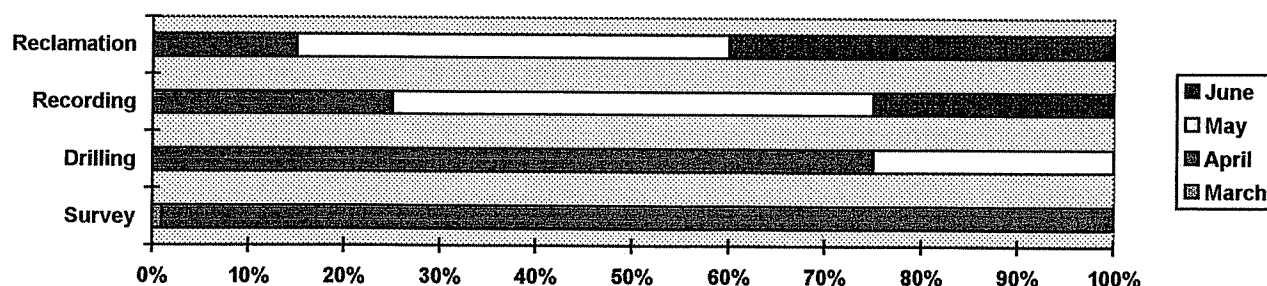
The recording instruments, battery charging generators and antenna mast will be placed upon a lift barge measuring approximately 70 feet by 38 feet. This platform has a draft of approximately 4 feet and will be located outside the Barataria Preserve's boundary. The recording unit's antenna mast can be extended to a height of 100 feet. Therefore, there will be no structures, temporary or permanent, that would be erected within the Barataria Preserve boundary.

The survey phase will initiate the field component of the seismic operations. This portion of the operations will require approximately three crews each comprised of three persons. Depending upon the number of survey crews utilized and even meteorological conditions, the survey phase is expected to last approximately one month. After the survey crews have identified approximately six source lines, the drilling operations will commence. Operating three survey crews, the drilling phase could commence 6 to 10 days after the initiation of the survey effort. Also, using three drilling vehicles excavating shot holes, placing charges and capping the shot holes will require approximately 12 to 15 days in the field; however, detonation and receiver line crews could conceivably be deployed 15 days after the initiation of survey operations. After approximately six shot lines have been completed, the detonating and recording crews will be deployed and the recording phase

will be initiated. After initiation of this phase of the seismic survey, there will be almost continuous operations within the preserve's boundary for approximately 30 days.

Therefore, the proposed seismic survey will require an estimated 45 days to complete all operations within the Barataria Preserve's boundary. The estimated days for completion of the survey, drilling and recording phases of the seismic survey are presented in Table 1.3-1. Although, it is hoped that there would be no reclamation necessary for the Barataria Preserve, an estimation of the time required for reclamation is also presented in Table 1.3-1. This estimation is based upon the worst case scenario and will not, in all probability, reflect the actual reclamation required for the proposed seismic survey. Through education of the survey, drilling and receiver crews and under the supervision of third party monitors, field personnel will be continuously on alert throughout the proposed seismic operations for any adverse impact to inherent environmental functions and values of the Barataria Preserve. The first priority is to avoid adverse impacts where possible, and if avoidance is impossible, minimize those that are perceived to become adverse for example by relocating ingress or egress points. Finally, any residual impacts not avoided or minimized, the reclamation procedures will be instituted to remove the residuum of impacts. Therefore, reclamation may be instituted at any time throughout the proposed seismic survey.

Table 1.3-1. Estimated Requirements for Reclamation



EXISTING ENVIRONMENTAL CONDITIONS

This section of the Environmental Assessment pertains to the inherent geology, soils, water quality, aquatic environment, terrestrial environment, air quality, cultural resources, threatened or endangered species, species of special concern and sensitive environmental areas that may be directly or indirectly impacted by the proposed seismic survey.

2.1 Geology and Soils

The proposed seismic survey is located near the outer margin of the Gulf Coastal Plain that physiographically dips or is tilted seaward from its inner margin toward the Gulf of Mexico at three to six degrees off horizontal. The dominant structural unit within the Gulf Coastal Plain is the Mississippi Embayment which is a broad, gently downwarped syncline tilted gulfward. Sedimentary layers at this outer portion of the Embayment may approach 100,000 feet in thickness near the project area. This sedimentary zone of thickening runs parallel to the continental shoreline and is referred to as the Gulf Geosyncline. The extraordinary accumulations of sediment and the abundance of stratigraphic traps destines this area of the Gulf Coastal region as one of the largest reserves for oil and natural gas in the nation (Murray, 1961).

The present deltaic plain of the proposed seismic survey area was more recently reworked during the Pleistocene and Holocene epochs of the Quaternary Period by fluvial action of the Mississippi River and sporadic incursions of marine sedimentary influences. A primary factor in the development of the survey area's geology and topography is the process of river diversion. River diversion occurs when overbank flows breach the natural levee system and create a crevasse splay of sediment and distributary channels. At least six of these geologically recent events have been classified into specific deltaic lobes

where the St. Bernard and Lafourche had the greatest impact upon the survey area's distributary formation (Baumann and Adams, 1981).

These distributary channels and sporadic marine incursions are primary factors in the inherent soil formations presently found within the proposed survey area. Soil formation is therefore a combination of parent material, topography, climate, soil organisms, vegetation and time. Specific inherent soil series within the survey area are preponderantly the Kenner series and a small inclusion of the Allemands series along Bayou Bardeaux and Lake Salvador (Figure 2.1-1). Also, one soil association occupies a small area in the extreme southeast corner of the proposed survey area that is classified as the Lafitte-Clovelly association. All series and associations within the survey area are hydric soils and therefore possess redoximorphic features common to this parameter of wetlands (U.S. Department of Agriculture, 1983 and 1987).

All soils within the proposed survey area are taxonomically classified as Histosols in the Saprist suborder (Soil Survey Staff, 1994). The differentiation within the great group Medisaprists separates the subgroup Terric Medisaprists which possess a mineral layer 11.81 inches or more thick represented by the Allemands and Clovelly series from that of the Fluvaquentic Medisaprists that have one mineral layer two or more inches thick or two or more mineral layers of any thickness represented by the Kenner series. The third subgroup represented by the Lafitte series is taxonomically within Typic Medisaprists.

The Kenner and Allemands series consist of very poorly drained, very slowly permeable organic soils that formed in herbaceous plant remains stratified with clayey alluvium or decomposed herbaceous material over alluvial clays, respectively. These two series are found in freshwater or slightly saline coastal marshes; the Lafitte-Clovelly association is found in brackish marshes of coastal areas.

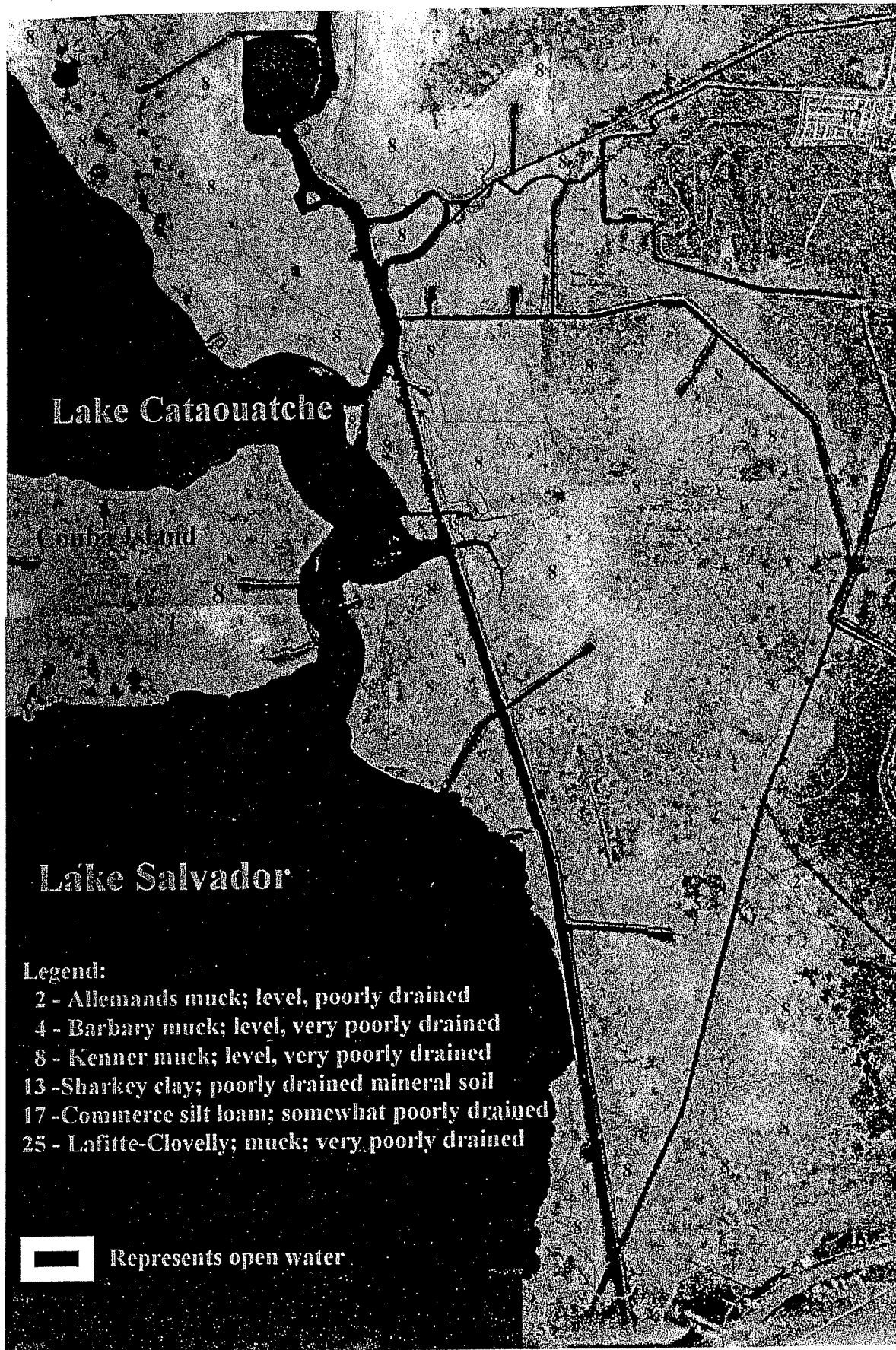


Figure 2.1-1. Soils within the Barataria Preserve of Jean Lafitte National Historical Park and Preserve. (Source: U.S. Department of Agriculture, 1983; 1987)

The two series within the Lafitte-Clovelly association are separated only by the mineral layer's depth or inversely, the organic layer thickness. The depth to the mineral layer in the Lafitte series varies from 51 to over 100 inches, while the Clovelly series has a mineral layer within 40 inches of the soil's surface horizon. Inversely, the organic layer within the Lafitte series is at least 51 inches thick, while the organic layer is optimally 40 inches thick in the Clovelly series and ranges from 16 to 40 inches. Lafitte soils formed in herbaceous plant remains over mineral sediments, while the Clovelly soils form in moderately thick accumulations of herbaceous organic material overlying very fluid, clayey fluvial sediments. These series cannot be separated easily by observation of the overlying plant materials; therefore, they have been grouped as an association.

The only other soil within the area that is not separable due to mapping conventions has been termed "dredged aquents" (U.S. Department of Agriculture, 1989). These soils would be considered minor inclusions and are represented by the spoil banks along canals and waterways that have been constructed within recent history. These soils were dredged from surrounding hydric series and may or may not exhibit redoximorphic features within the solum. These inclusions, while not sufficient in areal extent for mapping purposes, are noted to complete the soils within the survey area. However, more than 99 percent of the soils within the proposed survey area are comprised within the Kenner series (Figure 2.1-1). Less than one percent of the soils are contained within the Allemands series, and less than one-tenth percent of the soils are contained within the Lafitte-Clovelly association.

The pedogenic process within the proposed survey area has been altered due to the placement of levees along the present Mississippi River. Soil forming sediment from the fluvial action of overbank discharges has been replaced by pedogenic attributes of decomposing vegetation, especially the interior freshwater marshes. Beneath the floating

mat of vegetation, a colloidal suspension comprised of decomposing plant debris and water exist which varies from 3 to 10 feet deep. The greater depths of this colloidal suspension are typically found in the freshwater marsh's interior where resuspension of sediments cannot penetrate.

2.2 Terrestrial and Aquatic Environments

2.2.1 Vegetation

Three hundred thirty-five species of herbaceous and woody plants are known to exist within the Jean Lafitte National Historical Park and Preserve (Appendix 1); however, a small number of species account for the majority of the vegetative coverage (White, 1988). Table 2.2.1-1 lists the most common species encountered within the proposed project boundary.

Land cover characteristics, presented in Figure 2.2.1-1 represent the proposed seismic survey area within the Barataria Preserve of Jean Lafitte National Historical Park and Preserve. There are five different land cover classifications within this area that include bulltongue/spike-rush freshwater marshes (83.6 %), saltmeadow cordgrass intermediate marshes (0.1 %), wax myrtle scrub-shrub wetlands (14.1 %), forested transitional overstory along natural levees or spoil banks (0.5 %) and open water (1.7 %).

The dominant community within the proposed project area is freshwater marsh subtended by a floating mat. Primary species of the marsh community include bulltongue and maidencane with interspersed assemblages of wax myrtle. Other small, isolated assemblages include cattail or saltmeadow cordgrass. The herbaceous species listed in table 2.2-1 cover approximately 84% of the surface area within the park's freshwater marshes.

Open water of canals possesses floating aquatic vegetation such as water hyacinth, duckweed and mosquito fern. Dominant submerged aquatic plants include coontail and Carolina fanwort. Interior open water areas within the freshwater marsh sporadically contain white water lily.

Table 2.2.1-1 Plant species that may commonly inhabit the freshwater marshes, canals and canal spoil banks within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Polygonum punctatum</i>	Dotted smartweed
<i>Sagittaria lancifolia</i>	Bulltongue
<i>Vigna luteola</i>	Deerpea
<i>Eleocharis fallax</i>	Spikerush
<i>Phyla lanceolata</i>	Frog-fruit
<i>Panicum hemitomon</i>	Maidencane
<i>Aster tenuifolius</i>	Aster
<i>Lemna sp.</i>	Duckweed
<i>Sabal minor</i>	Dwarf palmetto
<i>Eleocharis flavescens</i>	Spikerush
<i>Eichhornia crassipes</i>	Water hyacinth
<i>Acer negundo</i>	Boxelder
<i>Sapium sebiferum</i>	Chinese tallow
<i>Myrica cerifera</i>	Wax myrtle
<i>Salix nigra</i>	Black willow
<i>Quercus nigra</i>	Water oak
<i>Quercus virginiana</i>	Live oak
<i>Acer Rubrum</i>	Red Maple
<i>Taxodium distichum</i>	Bald cypress
<i>Nyssa aquatica</i>	Water tupelo
<i>Ceratophyllum demersum</i>	Coontail
<i>Cabomba caroliniana</i>	Carolina fanwort
<i>Azolla caroliniana</i>	Mosquito fern

An influx of brackish water from the Gulf has created an area of intermediate marsh within the extreme southeastern portion of the proposed project area. The intermediate

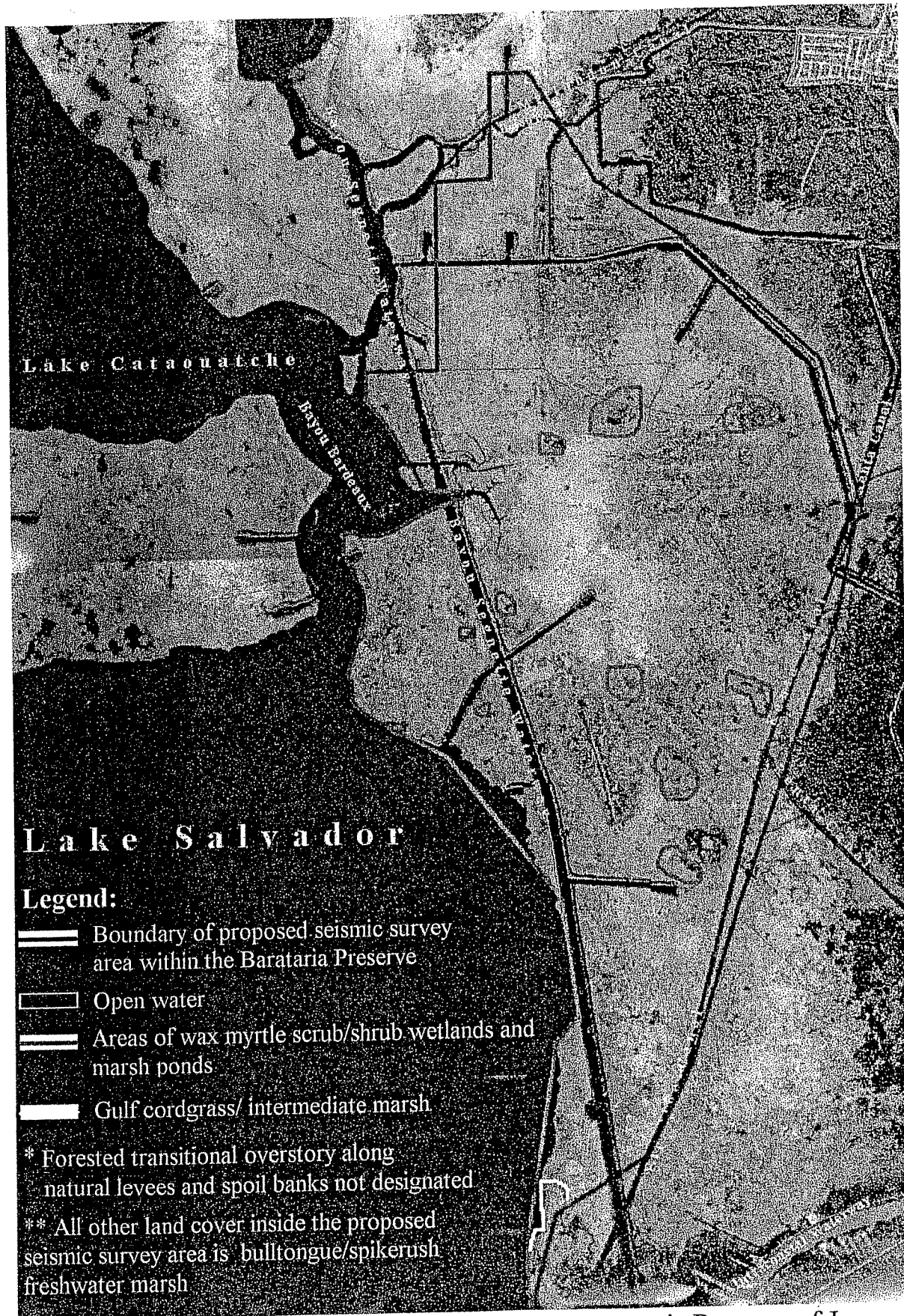


Figure 2.2-1. Land cover characteristics within the Barataria Preserve of Jean Lafitte National Historical Park and Preserve.

marsh can be distinguished from the fresh marsh by the presence of saltmeadow cordgrass and common reed.

The majority of the overstory vegetation is found beyond the boundary of the proposed project area. This palustrine, forested, permanently flooded area is comprised of baldcypress, water tupelo and red maple in the overstory with dwarf palmetto in the understory upon sporadic hummocks. Also overstory vegetation is linearly found along natural levees and spoil banks of canals within the proposed project area. Species occurring here include red maple, boxelder, black willow, water oak, live oak, water tupelo, and baldcypress. A pure stand of Chinese tallow tree exists along the northern half of Bayou Segnette as well as being widespread throughout the park. This exotic species also exists as understory within many areas of the wax myrtle thickets found throughout the proposed project area.

2.2.2 Hydrology and Water Quality

In recent years the hydrology and chemistry of the Barataria Basin have been altered by both natural and anthropogenic changes in the basin. Elimination of overbank flooding, levee construction, canal construction, and agriculture have combined to alter the basin from a flow-through estuary to an estuary where hydrology and chemistry are largely determined by precipitation and tides. Elimination of overbank flooding by levees along the Mississippi River reduces the sediment input to the detrital based food chain of these coastal freshwater marshes. Canal construction increased flows through the freshwater marsh system and circumvented the natural assimilative capacity of these marshes. Spoil banks associated with dredged canals further exacerbate the lack of natural sheet flow over the marshes additionally reducing assimilative capacity. These hydrological alterations are subsequently transported through the trophic levels of the existing food web. Presently,

resuspended bay bottom sediments and decomposing vegetation are the major sources of the detrital input to these freshwater marshes.

Due to urban development and agriculture further north of the proposed survey area, high levels of nutrients and sediments have been introduced into upland runoff. Urbanization has altered the natural hydrology of the basin by increasing upland runoff volumes through construction of impervious land masses. Increased runoff volume, sediment loads, and available nutrients have led to the eutrophication of the waters of the upper Barataria Basin and in some areas has led to hypereutrophication (Conner and Day, 1987).

The middle basin, which originates in the area of Lake Salvador, experiences tidal effects that act to flush the marshes more efficiently than those of the non-tidal upper basin. This effective flushing works to reduce the trophic state from eutrophic in the upper basin to mesotrophic in the middle basin which encompasses the Lake Salvador portion of the project area.

Surface water assessments performed in 1996 by the Louisiana Department of Environmental Quality for the Barataria Basin designated water body segment 020701 (Segnette Bayou near Westwego) as water quality limited. Designated uses are ranked according to "Degree of Support." Degree of support represents the overall uses that can be supported based on the numerical average of values assigned to individual use categories such as primary contact recreation, secondary contact recreation, and fish and wildlife propagation. Bayou Segnette near Westwego was designated as not supporting primary contact recreation, partially supporting secondary contact recreation, and not supporting fish and wildlife propagation. Suspected causes were linked to organic enrichment, low dissolved oxygen, pathogenic indicators, oil and grease.

Additional water quality parameters and biological information for the Jean Lafitte National Historical Park and Preserve were collected monthly between April, 1981 and March, 1982 (Garrison, 1982). Four sampling locations were within or adjacent to the proposed project area which included two locations on Bayou Segnette and Kenta Canal.

Dissolved oxygen concentrations ranged from 0.8 to 13.1 parts per million (i.e., mg/L). Dissolved oxygen is measure of the balance between oxygen producing organisms and oxygen consuming organisms and is one of the most important parameters affecting a freshwater aquatic ecosystem. Sufficient concentrations of dissolved oxygen are necessary to sustain a healthy and diverse assemblage of invertebrates and fish. The Environmental Protection Agency criteria for dissolved oxygen is 5 parts per million for most warm water organisms. Below this level impairment in production and life stages occurs, and concentrations below 4 parts per million can cause acute mortality in many freshwater aquatic organisms (United States Environmental Protection Agency, 1986).

Average dissolved oxygen concentrations for two sites along the Kenta Canal were 5.3 and 5.2 parts per million. One site along the Kenta Canal fell below this threshold level for acute mortality to fish and macroinvertebrates on four occasions during July, August and February. The other Kenta Canal location also dropped below this minimum level from July through September. Sampling locations along the Segnette Canal possessed higher dissolved oxygen concentrations that averaged 7.5 and 7.9 parts per million annually; however, both fell below or equaled this threshold limit causing acute mortality to fish and macroinvertebrates from July to September.

Other physiochemical constituents of the water column were in acceptable ranges according to the standards set by the United States Environmental Protection Agency (1986). These water quality parameters included turbidity, pH, biochemical oxygen

demand and nitrate. Phosphorus, however, was above the limits prescribed by the United States Environmental Protection Agency (1986).

Average annual phosphorus concentrations for the two locations along the Kenta Canal were 0.79 and 1.22 parts per million and 0.63 and 2.2 parts per million along the Segnette Canal. The Environmental Protection Agency standards for total phosphates as phosphorus should not exceed 0.05 parts per million in any stream at the point where it enters a lake or reservoir (United States Environmental Protection Agency, 1986). Phosphorus is often the limiting element in aquatic systems, but when concentrations exist in elevated amounts, it can stimulate excessive or nuisance growth of algae and lead to accelerated eutrophication. Phosphorus concentrations above 0.001 parts per million have been reported as lethal levels for important marine and estuarine species and also may result in significant bioaccumulation (United States Environmental Protection Agency, 1976).

Phytoplankton numbers were relatively low at all sites ranging from 1.8 cells/Liter to 1,700 cells/Liter in the Segnette Canal. By comparison approximately 1,000,000 cells/Liter constitutes an algal bloom. Overall community diversity for phytoplankton was low at all three sites, and all sites were dominated by a small number of genera. Dominant genera included Cyclotella sp., Agmenellum sp., Anacystis, sp., Oscillitoria sp., Scenedesmus sp., Melosira sp., and Lyngbya sp. which are moderately pollution tolerant organisms (United States Environmental Protection Agency, 1973).

Benthic macroinvertebrates are organisms that live at least part of their life attached or resting on available substrates in the aquatic environment. Like phytoplankton, the constituent species of the benthic community have been used as indicators of water quality. Sampling locations in the Kenta and Segnette Canals were dominated by Bezzia

sp., Problezzia sp, Chaoborus sp, Gammarus sp., Chironomus sp., and Gleodichironomus sp. that may tolerate more degraded environments. This does not unequivocally mean the canals and open water areas are excessively polluted; however, the obligate aquatic organisms near the base of the food web are able to tolerate adverse conditions.

2.2.3 Fish

The Jean Lafitte National Historical Park and Preserve's database provides documentation of those ichthyofaunal species that have been found within the park; however, documentation relative to habitat for these obligate aquatic species remain unknown. Table 2.2.3-1 lists those species that may occur within the freshwater marshes and canals of the Barataria Preserve. This list includes forty-six freshwater and euryhaline species which comprise 59% of the total species which are known to inhabit or have geographic ranges which encompass the waters within the park. The complete list of species and their habitats are located in Appendix 2. The assemblage of fish species may be limited to those possessing the ability to withstand reduced or low oxygen concentrations, especially during the summer and early fall. Other species such as killifish may also inhabit these areas at any time due to their ability to obtain oxygen from the air-water interface (i.e., meniscus).

Table 2.2.3-1 Fish species that may inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Dasyatis sabina</i>	Atlantic stingray
<i>Lepisosteus oculatus</i>	Spotted gar
<i>Lepisosteus spatula</i>	Alligator gar
<i>Amia calva</i>	Bowfin
<i>Elops saurus</i>	Lady fish
<i>Anguilla rostrata</i>	American eel
<i>Brevoortia patronus</i>	Gulf menhaden

Table 2.2.3-1
Fish species that may inhabit the freshwater marshes and canals
within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.

Scientific Name	Common Name
<i>Dorosoma cepedianum</i>	Gizzard shad
<i>Anchoa mitchilli</i>	Bay anchovy
<i>Cyprinus carpio</i>	Common carp
<i>Notemigonus crysoleucas</i>	Golden shiner
<i>Ameiurus melas</i>	Black bullhead
<i>Ameiurus natalis</i>	Yellow bullhead
<i>Ictalurus furcatus</i>	Blue catfish
<i>Ictalurus punctatus</i>	Channel catfish
<i>Pylodictis olivaris</i>	Flathead catfish
<i>Aphredoderus sayanus</i>	Pirate perch
<i>Strongylura marina</i>	Atlantic needlefish
<i>Cyprinodon variegatus</i>	Sheepshead minnow
<i>Fundulus chrysotus</i>	Golden topminnow
<i>Fundulus confluentus</i>	Marsh killifish
<i>Fundulus grandis</i>	Gulf killifish
<i>Fundulus pulvereus</i>	Bayou killifish
<i>Lucania parva</i>	Rainwater killifish
<i>Gambusia affinis</i>	Western mosquitofish
<i>Heterandria formosa</i>	Least killifish
<i>Poecilia latipinna</i>	Sailfin molly
<i>Menidia beryllina</i>	Tidewater silverside
<i>Centrarchus macropterus</i>	Flier
<i>Elassoma zonatum</i>	Banded pygmy sunfish
<i>Lepomis cyanellus</i>	Green sunfish
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis humilis</i>	Orangespotted sunfish
<i>Lepomis macrochirus</i>	Bluegill
<i>Lepomis microlophus</i>	Redear sunfish
<i>Lepomis punctatus</i>	Spotted sunfish
<i>Lepomis symmetricus</i>	Bantum sunfish
<i>Micropterus salmoides</i>	Largemouth bass
<i>Pomoxis nigromaculatus</i>	Black crappie
<i>Cynoscion nebulosus</i>	Spotted sea trout
<i>Leiostomus xanthurus</i>	Spot
<i>Sciaenops ocellatus</i>	Red drum/Red fish
<i>Mugil cephalus</i>	Striped mullet

Table 2.2.3-1 Fish species that may inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Dormitator maculatus</i>	Fat sleeper
<i>Paralichthys lethostigma</i>	Southern flounder
<i>Trinectes maculatus</i>	Hogchoker

2.2.4 Herpetofauna

Seventy-four species of amphibians and reptiles are known to inhabit or have ranges encompassing the park. Thirty-two of these species (43%) may be found in freshwater marsh or canal habitats (Table 2.2.4-1). The complete list of herpetofauna and their habitats are in Appendix 3.

Herpetofaunal species, like mammals, are more abundant along spoil banks and levees rather than in the marsh proper. These higher areas provide needed dry ground for adults and are the preferred sites for basking and hibernation (Conner and Day, 1987).

Table 2.2.4-1 Herpetofaunal species that may inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Siren intermedia</i>	Lesser siren
<i>Notophthalmus viridescens louisianensis</i>	Eastern newt
<i>Amphiuma triadactylum</i>	Three-toed amphiuma
<i>Ambystoma texanum</i>	Small-mouth salamander
<i>Desmognathus auriculatus</i>	Southern dusky salamander
<i>Eurycea quadridigitata</i>	Dwarf salamander
<i>Bufo valliceps</i>	Gulf coast toad
<i>Bufo w. woodhouseii</i>	Woodhouse's toad
<i>Acris c. crepitans</i>	Northern cricket frog
<i>Hyla cinerea</i>	Green treefrog
<i>Hyla squirella</i>	Squirrel treefrog
<i>Pseudacris crucifer</i>	Spring peeper

Table 2.2.4-1
Herpetofaunal species that may inhabit the freshwater marshes and canals within the
Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.

Scientific Name	Common Name
<i>Pseudacris triseriata</i>	Striped chorus frog
<i>Gastrophryne carolinensis</i>	Eastern narrow-mouthed toad
<i>Rana catesbeiana</i>	Bullfrog
<i>Rana c. clamitans</i>	Bronze frog
<i>Rana grylio</i>	Pig frog
<i>Rana utricularia</i>	Southern leopard frog
<i>Kinosternon subrubrum</i>	Eastern mud turtle
<i>Sternotherus odorata</i>	Common musk turtle/stinkpot
<i>Chelydra s. serpentina</i>	Common snapping turtle
<i>Macrochelys temminckii</i>	Alligator snapping turtle
<i>Chrysemys picta</i>	Southern painted turtle
<i>Dierochlys r. reticularia</i>	Eastern chicken turtle
<i>Graptemys kohnii</i>	Mississippi map turtle
<i>Graptemys pseudogeographica</i>	False map turtle
<i>Malaclemys terrapin pileata</i>	Mississippi diamondback terrapin
<i>Pseudomys c. concinna</i>	Eastern river cooter
<i>Trachemys scripta elegans</i>	Red-eared slider
<i>Terrapene carolina</i>	Eastern box turtle
<i>Trionyx spinifer</i>	Spiny softshell
<i>Anolis carolinensis</i>	Green anole
<i>Eumeces fasciatus</i>	Five-lined skink
<i>Eumeces laticeps</i>	Broad-headed skink
<i>Scincella lateralis</i>	Ground skink
<i>Coluber constrictor lantrunculus</i>	Black-masked racer
<i>Elaphe obsoleta lindheimeri</i>	Texas rat snake
<i>Farancia abacura reinwardtii</i>	Western mud snake
<i>Lampropeltis getula holbrooki</i>	Speckled kingsnake
<i>Lampropeltis triangulum amaura</i>	Louisiana milk snake
<i>Nerodia cyclopion</i>	Western green water snake
<i>Nerodia fasciata confluens</i>	Broad-banded water snake
<i>Nerodia erythrogaster flavigaster</i>	Yellow-bellied water snake
<i>Nerodia r. rhombifer</i>	Diamondback water snake
<i>Opheodrys a. aestivus</i>	Rough green snake
<i>Regina rigida</i>	Delta crayfish snake
<i>Regina grahamii</i>	Graham's crayfish snake
<i>Storeria dekayi limnetes</i>	Marsh brown snake

Table 2.2.4-1 Herpetofaunal species that may inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Thamnophis proximus orarius</i>	Gulf coast ribbon snake
<i>Thamnophis s. sirtalis</i>	Eastern garter snake
<i>Agkistrodon piscivorus</i>	Western cottonmouth
<i>Sistrurus miliarius streckeri</i>	Western pygmy rattlesnake
<i>Alligator mississippiensis</i>	American alligator

2.2.5 Birds

The park is clearly dominated by its inherent avifauna. Three hundred twenty-six species are known to inhabit or have geographic ranges encompassing the park (Appendix 4). Sixty-nine species (21%) may commonly inhabit the freshwater marshes and canals of the park (Table 2.2.5-1). This 21% is chiefly comprised of native and migratory waterfowl and wading birds. The residuum associated with freshwater marshes and canals are considered to be rare migrants or uncommon residents (Daily field list for the birds of the Barataria Preserve, Jean Lafitte National Historical Park).

Waterfowl begin arriving in the Barataria Basin about mid-August with the appearance of blue-winged teal, but the majority of the waterfowl do not begin arriving until October with numbers continuing to increase until mid-winter. The mottled duck

Table 2.2.5-1 Avian species that may commonly inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve during at least part of the year.	
Scientific Name	Common Name
<i>Podilymbus podiceps</i>	Pied-billed grebe
<i>Phalacrocorax auritus</i>	Double-crested cormorant
<i>Ardea herodias</i>	Great blue heron
<i>Botaurus lentiginosus</i>	American bittern
<i>Bubulcus ibis</i>	Cattle egret

Table 2.2.5-1

Avian species that may commonly inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve during at least part of the year.

Scientific Name	Common Name
<i>Butorides striatus</i> *	Green-backed heron
<i>Casmerodius albus</i>	Great egret
<i>Egretta caerulea</i>	Little blue heron
<i>Egretta tricolor</i>	Tricolored heron
<i>Ixobrychus exilis</i> *	Least bittern
<i>Nyctanassa violaceus</i>	Yellow-crowned night heron
<i>Nycticorax nycticorax</i>	Black-crowned night heron
<i>Eudocimus albus</i> *	White ibis
<i>Plegadis chihi</i>	White-faced ibis
<i>Plegadis falcinellus</i>	Glossy ibis
<i>Aix sponsa</i>	Wood duck
<i>Anas acuta</i>	Northern pintail
<i>Anas americana</i>	American wigeon
<i>Anas fulvigula</i> *	Mottled duck
<i>Anas crecca</i>	Green-winged teal
<i>Anas discors</i>	Blue-winged teal
<i>Anas platyrhynchos</i>	Mallard
<i>Anas strepera</i>	Gadwall
<i>Cathartes aura</i>	Turkey vulture
<i>Coragyps atratus</i>	Black vulture
<i>Pandion haliaetus</i>	Osprey
<i>Accipiter cooperii</i>	Cooper's hawk
<i>Accipiter striatus</i>	Sharp-shinned hawk
<i>Buteo jamaicensis</i>	Red-tailed hawk
<i>Buteo platypterus</i>	Red-shouldered hawk
<i>Circus cyaneus</i>	Northern harrier
<i>Falco sparverius</i>	American kestrel
<i>Fulica americana</i>	American coot
<i>Gallinula chloropus</i> *	Common moorhen
<i>Porphyryula martinica</i> *	Purple gallinule
<i>Porzana carolina</i>	Sora
<i>Rallus elegans</i> *	King rail
<i>Rallus limicola</i>	Virginia rail
<i>Charadrius vociferus</i>	Killdeer
<i>Himantopus mexicanus</i> *	Black-necked stilt
<i>Actitis macularia</i>	Spotted sandpiper

Table 2.2.5-1

Avian species that may commonly inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve during at least part of the year.

Scientific Name	Common Name
<i>Calidris alpina</i>	Dunlin
<i>Calidris fuscicollis</i>	White-rumped sandpiper
<i>Calidris himantopus</i>	Stilt sandpiper
<i>Calidris mauri</i>	Western sandpiper
<i>Calidris melanotos</i>	Pectoral sandpiper
<i>Calidris minutilla</i>	Least sandpiper
<i>Calidris pusilla</i>	Semipalmated sandpiper
<i>Gallinago gallinago</i>	Common snipe
<i>Limnodromus griseus</i>	Short-billed dowitcher
<i>Limnodromus scolopaceus</i>	Long-billed dowitcher
<i>Tringa flavipes</i>	Lesser yellowlegs
<i>Tringa melanoleuca</i>	Greater yellowlegs
<i>Tringa solitaria</i>	Solitary sandpiper
<i>Sterna forsteri</i>	Forster's tern
<i>Bubo virginianus</i>	Great horned owl
<i>Ceryle alcyon</i>	Belted kingfisher
<i>Tyrannus tyrannus</i>	Eastern kingbird
<i>Tachycineta bicolor</i>	Tree swallow
<i>Cistothorus palustris</i>	Marsh wren
<i>Cistothorus platensis</i>	Sedge wren
<i>Anthus rubescens</i>	American pipet
<i>Lanius ludovicianus</i>	Loggerhead shrike
<i>Geothlypis trichas</i> *	Common yellowthroat
<i>Ammodramus leconteii</i>	Leconte's Sparrow
<i>Melospiza georgiana</i>	Swamp sparrow
<i>Melospiza melodia</i>	Song sparrow
<i>Agelaius phoeniceus</i> *	Red-winged blackbird
<i>Quiscalus major</i> *	Boat-tailed grackle

* Denotes species that have been known to breed in the park

which is common in freshwater marshes and the wood duck that prefers wooded streams or swamps, are the only species of waterfowl nesting in the Barataria Basin (Conner and Day, 1987).

Because the mottled duck is commonly found in freshwater marshes, its nesting and food habits will be discussed briefly. Ducklings most commonly feed on scuds (Amphipods) and midge larvae (Chironomids) for the first two weeks of life. At three to nine weeks of age the diet consists primarily of seed material from bulrush, widgeon grass (Ruppia sp.), southern water nymph, and spike rush. Late summer food for mottled ducks of all ages is composed primarily of rice. Fall and winter food sources vary greatly, and changes quickly in response to sudden changes of habitat with most feeding occurring in recently inundated marshes or prairies after significant rain events (Stutzenbaker, 1988).

Mottled ducks nest in a variety of habitats but most often choose well-drained sites where large, grassy areas of saltmeadow cordgrass and rough cordgrass (Spartina spartinae) are dominant. The peak nesting period for mottled ducks occurs between March and May but may extend as late as October or coinciding with the occurrence of the first frost. Mottled ducks are determined nesters and utilize their lengthy breeding season to compensate for earlier nesting failures. Mottled duck females have been known to renest as many as four times during one breeding season (Stutzenbaker, 1988).

The Barataria Preserve of the Jean Lafitte National Historical Park and Preserve supports limited numbers of mottled ducks, and the inherent vegetation is not a primary food source. Therefore, disturbance of nesting ducks or feeding habitat within the project area will be minimal.

The migratory or over-wintering puddle ducks (e.g. mallards and green-winged and blue-winged teal) within the basin are most common in shallow, fresh and intermediate

marsh ponds surrounding Lake Salvador, Lake Boeuf, and Lac des Allemands (Conner and Day, 1987). The project area within Jean Lafitte National Historical Park and Preserve is preponderantly comprised of freshwater marsh subtended by a floating mat. Open water of the interior is typically less than one-tenth of acre in size, thereby limiting the habitat available for use by these puddle ducks.

Common diving duck species of the area (i.e. redhead, ring-necked duck, canvasback, and lesser scaup) feed in a variety of habitats including the shallow freshwater marshes where molluscs and insects are the main dietary component. However, the preponderant diet of these species comprises leaves and stems of aquatic plants found in deeper, open waters (Kortright, 1967).

Wading birds are found in a variety of habitats throughout the year, but their nesting habits are quite specific. Great egrets and great blue herons nest in mature cypress trees and water tupelo. Smaller egrets, herons and ibis prefer to nest in smaller trees and shrubs near ponds and swamps (Portnoy 1977). Avian species that are secretive and nest in deep freshwater marsh areas are likely to be more disturbed by the proposed seismic survey than those more arboreal nesting species. These species include the red-winged blackbird, king rail, and American bittern. Disruption of nesting, loss of eggs or fledgling mortality are likely to occur due to air boat or light weight aluminum vehicle's trampling effect. If these nesting disruptions occur, there would be no significant effects to local populations or their long term numbers due to renesting potential. Furthermore, survey crews will mark all visible nests along ingress and egress areas to minimize and avoid impacts to the extent practicable for these inherent nesting avian species.

2.2.6 Mammals

Fifty-nine species of mammals (Appendix 5) are known to inhabit or have ranges that encompass Jean Lafitte National Historical Park and Preserve. Thirteen species (21% of the total species) may be found in or near freshwater marshes and/or canals (Table 2.2.6-1), and six of the thirteen species (10% of the total species) have been documented in freshwater marsh habitats within the park (Rossman and Demastes, LSU Museum of Natural History).

Table 2.2.6-1 Mammals that may inhabit the freshwater marshes and canals within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.	
Scientific Name	Common Name
<i>Didelphis virginiana</i>	Opossum
<i>Dasypus novemcinctus</i>	Nine-banded armadillo
<i>Canis latrans</i>	Coyote
<i>Procyon lotor</i>	Raccoon
<i>Mustela vison</i>	North American mink
<i>Lutra canadensis lataxina</i>	River otter
<i>Sus scrofa</i>	Wild boar
<i>Odocoileus virginianus</i>	White-tailed deer
<i>Castor canadensis</i>	American beaver
<i>Ondatra zibethicus</i>	Muskrat
<i>Oryzomys palustris</i>	Marsh rice rat
<i>Myocastor coypus</i>	Nutria
<i>Sylvilagus aquaticus</i>	Swamp rabbit

Small mammals are found throughout Barataria Basin and are most common along ecotones (Conner and Day, 1987). Most dens and nest sites are found on the higher ground of levees and the spoil banks of canals which comprises only a small percentage of the proposed seismic survey area.

2.3 Archeological and Historical Resources

Archeological investigations have been fairly well documented within the proposed survey area due to federal projects associated with developments of the U.S. Army, Corps of Engineers or surveys by personnel associated with the Jean Lafitte National Historical Park and Preserve. Beginning with Giardina (1969), at least 16 reports, surveys, assessments or analyses have been conducted within or adjacent to the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve including Beavers, 1977, 1982, 1982a; Franks, 1988; Gagliano, 1978; Gendel, 1984; Giardino, 1969, 1984; Goodwin, 1985; Holmes, 1986; Neuman, 1975, 1975a; Goodwin and Associates, 1985; Speaker, 1986; Swanson, 1988; and Young, 1985.

The archeological sequence in Louisiana is not precisely defined; however, a general scheme has been established.

a) Paleo-Indian Era 10000 B.C. - 6000 B.C.

The earliest people probably reached Louisiana after 10,000 BC from artifacts found in association with the remains of Pleistocene mammals at the Trappey Mastodon site, cordage of cane at the Avery Island site and a Clovis point at the John Pearce site. Fluted and unfluted lanceolate points of the Clovis, Folsom, Scottsbluff, Plainview and Meserve types are the only confirmed evidence of this period. Later in this era, Dalton and San Patrice type points replaced the Clovis prototypes with bifacial fluting replacing the single flake fluting.

During the early Paleo-Indian era, native American populations were wide ranging, following herds of Pleistocene megafauna and leaving few traces of their campsites. As this era began to wane, the traditional nomadic pattern began to shift as man exploited

local floral and faunal resources. The ensuing population stabilization and localization resulted in the development of diverse regional cultural patterns.

b) Meso-Indian Era 6000 B.C. - 2000 B.C.

During the early portion of this era, the settlement pattern continued to localize and native Americans began to exploit a greater diversity of natural resources. Additions of mortars, pestles, mealing stones and pipes provide evidence that the people were knowledgeable of plants as food. Also, shell, copper and other raw materials were widely used and traded during this era, and human interments began.

Although the close of the Meso-Indian Era is often considered to mark the first appearance of horticulture, the transition is not clear, and the subsistence base of many groups did not shift at this time. Generally, the appearance of pottery and the shift from dart points to arrow points is considered evidence of the termination of this era. For example, the bow and arrow replaced the atlatl that presumably appeared in this era. However, the appearance of pottery and arrow points was not simultaneous and in many cases, dart points persist well into the Neo-Indian Era. Stone projectile points diagnostic of this era include Morrow Mountain, Marshall, Frio, Tortugas, Ensor, Wells, Macon, Gary, Marcos, Morhiss, Trinity, Carrollton and Kirk.

c) Neo-Indian Era 2000 B.C. - 1600 A.D.

The Neo-Indian Era may be divided into several foci depending upon the classification scheme. This report follows Neuman (1984) denoting seven distinct cultures that developed during this time frame. These cultures include the Poverty Point, Tchefuncte, Marksville, Troyville-Coles Creek, Caddo, Plaquemine and Mississippian.

The Poverty Point culture from 2000 B.C. to 800 B.C. developed along coastal areas on natural levees and associated stream terraces. Characteristics of their occupation

were small sites circumscribing large regional centers. The regional centers possessed large earthen constructions and an extensive trade network of finished materials. These objects included lapidary work, fiber tempered pottery, stone tools, baked clay objects and steatite bowls. The Linsley site uncovered during the construction of the Mississippi River Gulf outlet dates from this cultural period from approximately 1740 B.C. Therefore, confirmed human occupation near the proposed survey area dates to this cultural period.

The Tchefuncte Culture that existed from approximately 500 B.C. to 400 A.D. is probably one of the earliest cultures known to produce ceramic pottery that occupied locations within the Jean Lafitte National Historical Park and Preserve. Other small villages were located on natural levees, in backwater areas and dome formations near the survey area. The Big Oak Island, Little Woods and Little Oak Island sites are all associated with this culture and located near the proposed survey area in the vicinity of Lake Pontchartrain. Due to the proximity of productive marshes, clams (Rangia cuneata) were the principal component of the midden mounds. Other species such as white-tailed deer, ducks, raccoons, beaver, muskrat, otter, bear, gray fox, catfish and alligator gar have also been found within these mounds. Other analogous locations such as the Copell site occupy approximately the same latitude in southern Louisiana. Although the Tchefuncte culture was later in the Neo-Indian era, the earthen mound building was not as impressive nor did this culture have an elaborate trade network as the previous Poverty Point culture. The Tchefuncte culture did, however, produce a greater quantity of ceramic pottery than the previous Poverty Point culture.

The Marksville Culture constructed conical mounds located primarily within the Red River Valley of Louisiana and southeastward to the Gulf Shores area of Alabama between 1 A.D. and 500 A.D. This culture possessed a large trade network due to the

diverse artifacts found within their funerary mounds. These artifacts included copper panpipes, mica, galena, earspools, bracelets, beads, mica figurines, ceramic figures and green stone celts. These artifacts suggest a regional manifestation of the vast Hopewellian complex from the Illinois River Valley; however, the Marksville culture's subsistence base that included chipped-stone points, knives, scrapers, ground-stone atlatl weights and plummets are analogous to the preceding Tchefuncte culture. Coastal sites are associated with natural levees and cheniers upon shell middens where ceramic pottery was prevalent. Pottery designs with animal motifs were common. These sites extended from the Sabine River to the Chandeleur Islands and included the Jean Lafitte National Historical Park and Preserve.

The Troyville/Coles Creek Culture between 400 A.D. and 1200 A.D. built flat topped, pyramidal shaped tumuli used as substructures for religious and ceremonial buildings rather than funeraries of the earlier Marksville Culture. Pottery of this culture is generally larger than the previous Marksville culture, decorated in checkered stamping, confined generally to the upper half of the object and typically lacking animal motifs. In the inland portions of Louisiana, the socioreligious structures surrounded open plazas, while along coastal areas, diverse shell middens were associated with these mounds as found within the Jean Lafitte National Historical Park and Preserve.

The larger midden mounds were used by previous and successive cultures that either placed cane (Arundinaria), clay or other associated building materials above the base layer to form culturally related structural features. Although there is a stratifying effect, it belies the pits, trenches and other excavations of successive cultures for funerary, pottery production or other occupational features. In both structure and form, these socioreligious architectural monuments emulate those of Meso-America but not as expansive.

The Meso-American influence may also have emanated in the use of cultigens such as squash and bottle gourds in the middle of this era circa 325 B.C., while corn first appeared in Louisiana artifacts about 400 A.D. and beans about 1000 A.D. Plant horticulture further assisted sedentism of the cultures by providing food for a larger population in a specific area and later grown in combination would provide better soil conditions for a greater length of time in a specific area. However, the abundant natural resources associated with the coastal environments throughout the year may have precluded the use of horticulture as a significant source of food.

The Caddo Culture was principally located in Northwest Louisiana, Oklahoma and Texas; however, coexistence occurred briefly and near the western and northwestern extension of the Troyville-Coles Creek culture. Other principle developments attributed to the Caddo Culture are the bow and arrow, cultigens (e.g. corn, beans and squash) and cranial deformation. Northeast within the Mississippi Alluvial Valley, the Plaquemine Culture also coexisted with the Caddo Culture.

The Plaquemine Culture occupied a triangular region with a base covering the Louisiana coastal zone, including the Jean Lafitte National Park and Preserve, and forming an apex near Greenville, Mississippi. At this northern estimated terminus, the Plaquemine Culture also coexisted with the Mississippian Culture. Archaeological manifestations of the Plaquemine culture indicate a protohistoric development of the Troyville-Coles Creek Culture from 1000 A.D. to 1600 A.D. Pottery design, small stone projectile points, clay ear ornaments and ground stone celts link the Plequemine and Troyville-Coles Creek cultures as well as mass burial funerary practices. The Plaquemine Culture constructed circular and rectangular, multistaged mounds that are the classic development of temple mound construction in the lower Mississippi Alluvial Valley. These circular, stepped

mounds typically possessed plazas between them with smaller round or rectangular domiciles indicate a class-structured society.

Characteristic Plaquemine ceramics include striated vessel exteriors from pre-fired rubbing of the clay possibly with vegetation, shell tempered clays, projecting handles on vessel rims, and the absence of stamped designs.

The Plaquemine and Mississippian Cultures, if they are separable, coalesced into some of the largest ceremonial-residential centers existing in the prehistoric period. The Cahokia site along the Mississippi River in Illinois occupies a rectangular area of 6.5 square miles. The ceremonial complex of these mound builders is a notable characteristic of this culture. Mississippian vessels were diverse from short to tall, globular with straight, recurved or everted rims; plain and compound long-necked bottles; straight rimmed plates; deep and shallow bowls; gourd forms; footed vessels; and vessels with strap and loop handles. These ceramics were manufactured by shell tempering from pulverized particles incorporated into the unfired clay. Decorative motifs were also applied to the ceramics in addition to positive and negative painting. Effigy vessels often depicted fish, reptiles, amphibians, birds, mammals and humans. Mississippian prehistoric remains have also been found within the Jean Lafitte National Park and Preserve.

Prior to the historic period, the ceremonial complex declined due in part to the warring factions of the purported chiefdoms that controlled the agrarian based culture. In Louisiana, the Taensas, Ouachas, Tchaouachas and Chitimachan groups were historic heirs of this Mississippian Culture. Recent evidence supports the theory that the Tchaouachas and Ouachas resided in the area until at least the 1850's (Swanson, et.al., 1991).

d) Historical

European explorations along the Louisiana coast and the Mississippi River initially included Spanish expeditions by Alonso Alvarez Pineda, Alvar Nunez Cabeza de Vaca, and Hernando De Soto. Later French exploration efforts were made by Marquette and Joliet. In 1682, de La Salle claimed the territory for France and named the land for Louis XIV. In 1718, New Orleans was founded, and French plantations were the dominant agrarian base. In 1762 with the First Peace of Paris, Louisiana was ceded to Spain, and Spanish rule ensued until the Treaty of San Ildefonso in 1800 where Louisiana again became a French colony. In 1803, the United States, during President Thomas Jefferson's régime, bought the Louisiana territory for 15 million dollars from Napoleon. In 1812, Louisiana became the 18th state. Since that time the Barataria basin has supplied New Orleans and Louisiana with seafood products of shrimp, crabs and fish. Since the 1930's, this area has been one of the larger suppliers of natural gas and oil.

2.3.1 Known Prehistoric and Historic Sites

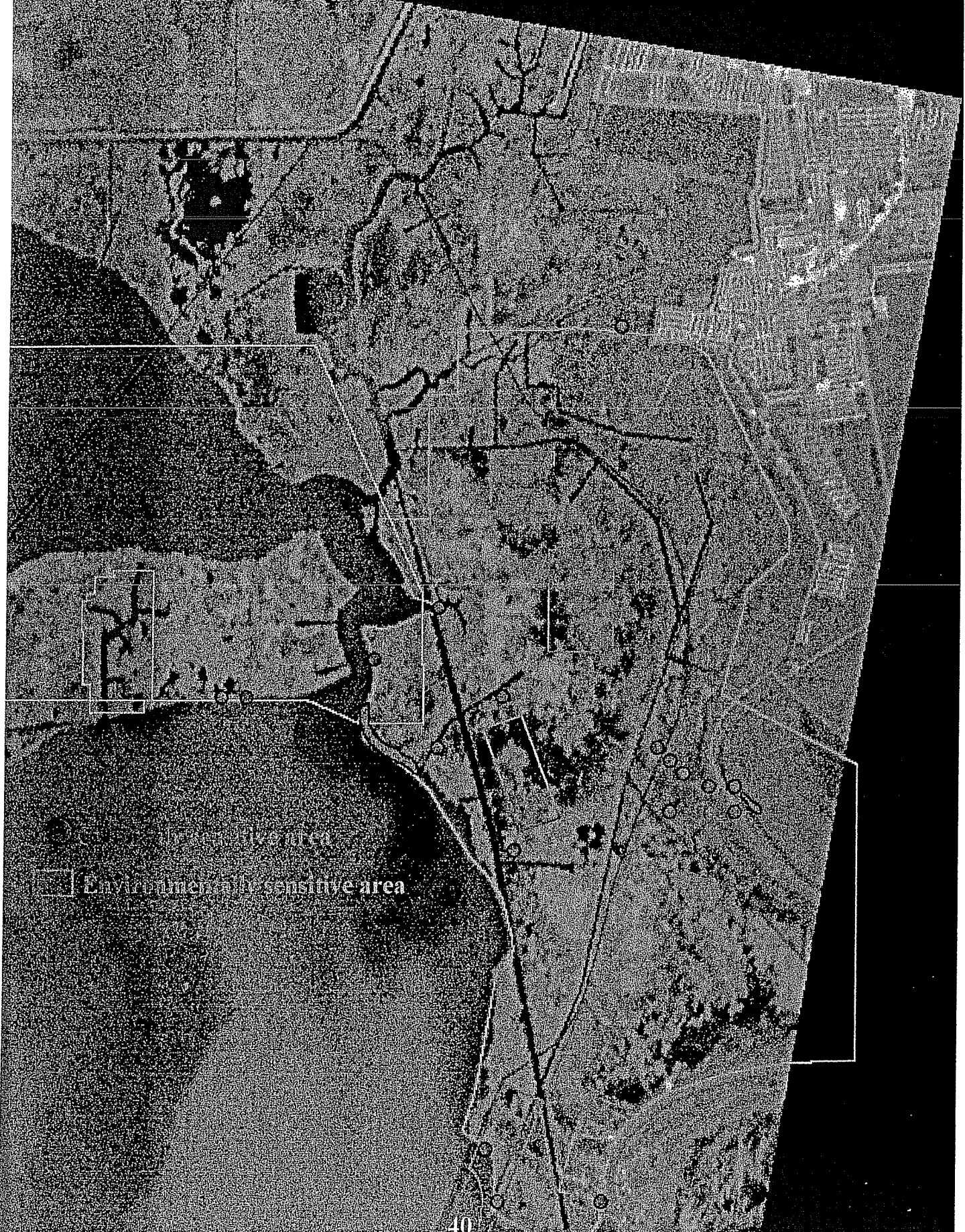
Although over 80 known sites have been located in the Jean Lafitte National Historical Park and Preserve, coordination with the Louisiana Division of Archeology produced 21 known archeological sites within or near the proposed seismic survey area. Nine of these known sites are within the proposed seismic survey area where six sites are within the Barataria Unit's boundary. Two sites are within the Timken Wildlife Management Area, and one known site is within the Salvador Wildlife Management Area. Only one known site is upon or immediately outside any state or federal property boundary (Figure 2.3.1-1).

The National Register of Historic Places lists 17 locations in Jefferson and St. Charles parishes (Table 2.3.1-1). The Barataria Preserve of the Jean Lafitte National

Historical Park and Preserve was listed on October 15, 1966. The proposed seismic survey will include approximately 6,360 acres of this unit of the park. The Barataria Preserve was established in 1978 by Public Law 95-625 of 16 USC 230, Section 901, *et sequentia*. This unit was established to “preserve for the education, inspiration, and benefit of present and future generation 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.”

Table 2.3.1-1 Site List of the National Register of Historic Places in Jefferson and St. Charles Parishes, Louisiana	
Historic Site	Parish
Destrehan Plantation	St. Charles
Dorvin House	St. Charles
Homeplace Plantation House	St. Charles
Kenner and Kugler Cemeteries Archeological District	St. Charles
LaBranche Plantation Dependency	St. Charles
Ormond Plantation House	St. Charles
Barataria Preserve of Jean Lafitte Historical Park Historic District	Jefferson
Camp Parapet Powder Magazine	Jefferson
Crockett, David, Fire Hall and Pumper	Jefferson
Felix-Block Building	Jefferson
Fort Livingston	Jefferson
Gretna Historic District	Jefferson
Harahan Elementary School	Jefferson
Kenner Town Hall	Jefferson
Magnolia Lane Plantation House	Jefferson
Old Jefferson Parish Courthouse	Jefferson
St. Joseph Church-Convent of the Most Holy Sacrament Complex	Jefferson

Figure 2.3-1-1. Cultural and Environmentally Sensitive Areas within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.



2.4 Air Quality

Air quality within the proposed survey will only be affected by the emissions of carbon monoxide from combustion engines associated with air boats, light aluminum tracked vehicles and helicopters. The national ambient air quality standard is set at 35 parts per million for a one hour average by the Environmental Protection Agency.

A primary standard sets a limit to protect public health, including the health of the “sensitive” population sector such as asthmatics, children and the elderly as prescribed by the Clean Air Act amendments of 1990. From monitoring stations in New Orleans, Louisiana at the city park and Tulane Medical Center, there were no values that exceeded or even approached the standard of 35 parts per million from 1994 through 1996 (Louisiana Department of Air Quality, 1997) (See Table 2.4.1-1). The air quality during these three years relative to concentrations of carbon monoxide appears to be improving, especially at the Tulane Medical Center monitoring station. Ambient carbon monoxide does not appear deleterious to public health even at stations located in a large metropolitan area such as New Orleans. Therefore, ambient carbon monoxide concentrations near the proposed survey area should be less than source emissions from a major metropolitan area.

Table 2.4.1-1 Annual Carbon Monoxide Levels at Two Monitoring Stations in New Orleans, Louisiana From 1994-1996.			
Year/Station	High PPM (Date)	Number of Samples	Mean PPM
1996			
New Orleans (City Park)	5.7 (12/03)	8,415	0.6
New Orleans (Tulane Medical Center)	11.2 (12/03)	7,933	1.1

Table 2.4.1-1
Annual Carbon Monoxide Levels at Two Monitoring Stations in
New Orleans, Louisiana From 1994-1996.

1995			
New Orleans (City Park)	5.0 (11/25)	8,275	0.5
New Orleans (Tulane Medical Center)	10 (01/26)	8,556	1.2
1994			
New Orleans (City Park)	6.0 (02/25)	8,184	0.8
New Orleans (Tulane Medical Center)	10.0 (02/26)	8,570	1.4

2.5 Recreation

The Barataria Preserve of the Jean Lafitte National Historical Park and Preserve provides passive recreational opportunities for the general public. Within the proposed survey area, the Barataria Preserve provides canoe trails, hiking trails along the spoil bank ridges of canals, boardwalks, and approximately 14 miles of artificial waterways for motor boats. Launching sites for this portion of the recreational public are provided outside the park's boundary. Commercial swamp tours, wildlife observation, and hunting are popular recreational pursuits; however, the preponderance of hunting is probably limited to the white-tailed deer population inhabiting the wax myrtle thickets within the proposed survey area.

Visitation to the entire Jean Lafitte National Park and Preserve from May, 1996 through April, 1997 totaled 1,204,896 visitor days where the Barataria Preserve comprised 33.5 percent of this total or 403,159 visitor days. The mean monthly visitation park wide was 104,408 visitor days, and the Barataria Preserve comprised an average of 33,597 visitor days per month. This visitation to the Barataria Preserve averages approximately

35 percent of the monthly park wide visitation on an annual basis with higher visitation in the months of August, October and April. The three lowest monthly visitations to the Barataria Preserve are September, December and February (Figure 2.4.1-1). Summarily, the Barataria Preserve had approximately 1,120 visitor days who may have visited the unit; however, the preponderance of these visitors were in all probability using the interpretive visitor's center rather than canoeing or hiking the trails within the area of the proposed seismic survey.

2.6 Threatened and Endangered Species Including State Species of Concern and Sensitive Environmental Areas

Table 2.6.1-1 provides a combination of federal and state threatened and endangered wildlife species which may occur periodically during the year in Jean Lafitte National Historical Park and Preserve. The table also lists four species of threatened and endangered plants in Louisiana. While the presence of a species may not be documented, the possibility of occurrence within the park was given due consideration. The list follows the U.S. Fish and Wildlife Service's (Division of Endangered Species) special reprint of 50 CFR 17.11 and 17.12 and is current as of December 31, 1997.

Louisiana Black Bear

The Louisiana black bear is one of sixteen subspecies of the American black bear (Hall, 1981). The Louisiana black bear often overwinters in hollow cypress trees in or along sloughs, lakes, or riverbanks. These bears are extremely mobile, herbivorous omnivores that consume a variety of foods. The distribution of foods and habitat for rearing young largely determines the extent of their movements and consequently their

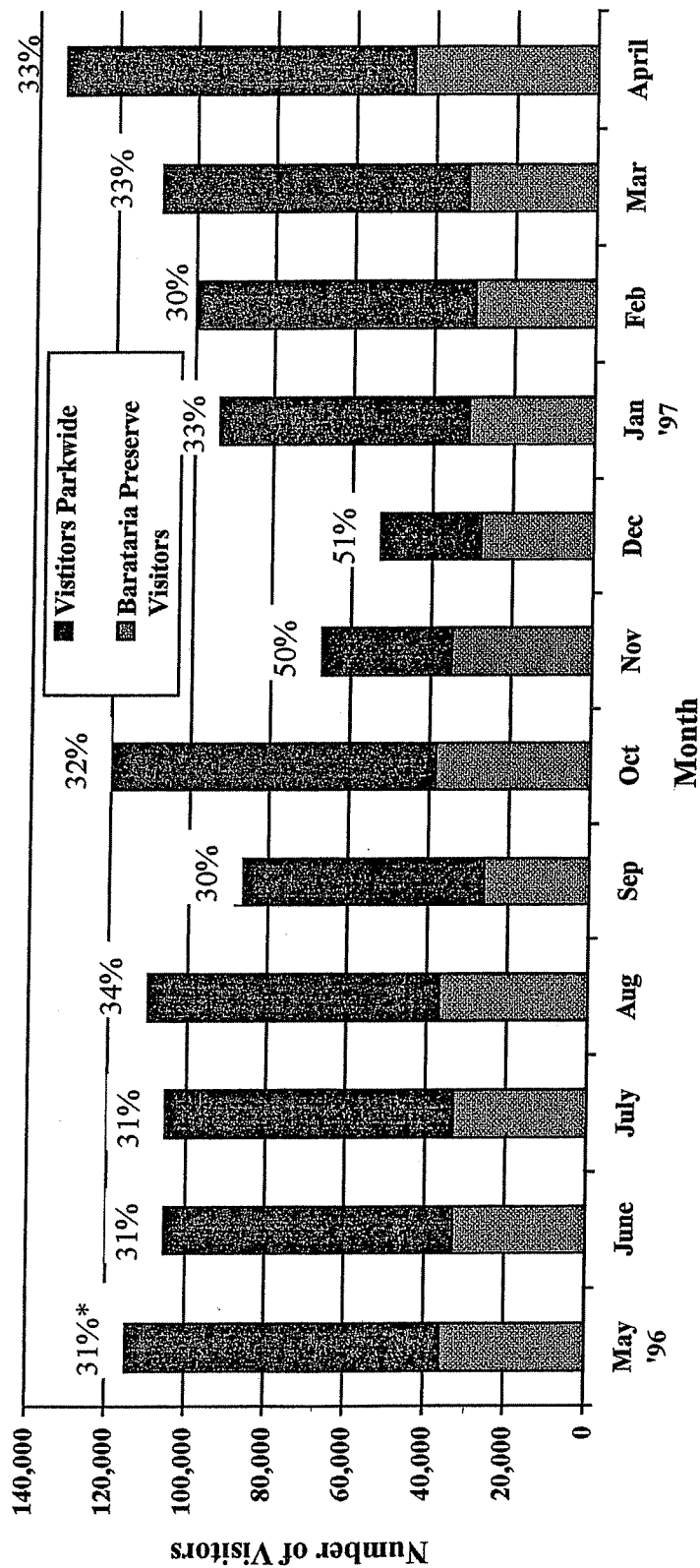


Figure 2.4.1-1. Number of visitors parkwide versus the number of visitors to the Barataria Preserve from May 1996 through April 1997.

* Percentage figures above the bars represent the percentages of total visitors that are composed of Barataria Unit visitors.

**Table 2.6.1-1
Threatened and Endangered Species (Animals and Plants)**

Common Name	Scientific Name	Federal Status	State Status
Louisiana black bear*	<i>Ursus americanus luteolus</i>	Threatened	Threatened
Jaguar	<i>Panthera onca</i>	Endangered	Not listed
Cylindrical lioplax	<i>Lioplax cyclostomaformis</i>	Candidate	Not listed
Sturgeon chub	<i>Macrhybopsis gelida</i>	Candidate	Not listed
Bald eagle*	<i>Haliaeetus leucocephalus</i>	Threatened	Threatened
American peregrine falcon*	<i>Falco peregrinus anatum</i>	Endangered	Endangered
Peregrine falcon	<i>Falco peregrinus</i>	Endangered (S/A)	Not listed
Inflated heelsplitter	<i>Potamilus inflatus</i>	Threatened	Threatened
West Indian manatee	<i>Trichechus manatus</i>	Endangered	Endangered
Louisiana pearlshell	<i>Margaritiifera hembeli</i>	Threatened	Threatened
Pink mucket pearlymussel	<i>Lampsilis abrupta</i>	Endangered	Endangered
Brown Pelican*	<i>Pelecanus occidentalis</i>	Endangered	Endangered
Piping plover	<i>Charadrius melodus</i>	Endangered	Threatened
Gulf sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Threatened	Threatened
Pallid sturgeon	<i>Scaphirynchus albus</i>	Endangered	Endangered
Least tern*	<i>Sterna antillarum</i>	Endangered	Endangered
Gopher tortoise	<i>Gopherus polyphemus</i>	Threatened	Threatened
Loggerhead sea turtle	<i>Caretta caretta</i>	Threatened	Threatened
Ringed map turtle	<i>Graptemys oculifera</i>	Threatened	Threatened
Black-capped vireo	<i>Vireo atricapillus</i>	Endangered	Endangered
Red-cockaded woodpecker	<i>Picoides borealis</i>	Endangered	Endangered
Earth-fruit	<i>Geocarpon minimum</i>	Threatened	Threatened
Louisiana quillwort	<i>Isoetes louisianensis</i>	Endangered	Endangered
Pondberry	<i>Lindera meliisifolia</i>	Endangered	Endangered
American chaffseed	<i>Schwalbea americana</i>	Endangered	Endangered

Notes:

S/A = Threatened or endangered due to similarity of appearance

* = Species has been identified within the boundary of Jean Lafitte NHP

home range. Necessary elements of black bear habitat include hard and soft mast, escape cover, denning sites, corridor habitats, and some freedom of disturbance by man. These necessary elements are found primarily in extensive areas of bottomland hardwood habitat.

Currently only two known breeding populations of the Louisiana black bear exist. These breeding populations occur within the Tensas River Basin of Franklin, Madison, and Tensas Parishes, and the Atchafalaya River Basin of south-central Louisiana. There are reported sightings of the bears outside of these two locations, but it is unknown whether these bears are reproducing or only wandering subadults and males (US Fish and Wildlife Service, 1995).

Jaguar

Although reinstated as a federally endangered species in September, 1997, the Jaguar is not specifically listed as threatened or endangered in Louisiana. The Jaguar is included here because its historic range includes portions of Louisiana (Lowery, 1974); however, there are no known populations of jaguar in Louisiana. The historic accounts of Lowery (1974) were from two published newspaper articles in the *Donaldsonville Chief* in 1886. In Lowery's account, this species was only given a provisional status in Louisiana.

Cylindrical Lioplax

The cylindrical lioplax is a gill breathing snail in the family Viviparidae. It lives in mud, under large rocks, and in rapid currents over streams and river shoals. A single collection of this species has been reported from the Tensas River, Madison Parish, Louisiana; however, there are no subsequent records beyond the Alabama-Coosa River system. Current searches of the Tensas River in Louisiana by Fish and Wildlife Service biologists (1995) have found no evidence of the species or its typical habitat. The cylindrical lioplax is currently known only from a fifteen mile stretch of the Cahaba River in Shelby and Bibb Counties, Alabama.

Sturgeon Chub

The sturgeon chub has recently been added as a candidate for possible addition to the federal threatened and endangered species list, and Louisiana is identified as part of its historic range. This chub inhabits the open channels of large, silty rivers and occurs in swift current over a substrate of sand or fine gravel. Further documentation of this species is unknown.

Bald Eagle

Once designated as an endangered species in 43 states, the bald eagle's status has been reclassified to threatened throughout conterminous United States. The bald eagle's historic range includes the area of the Jean Lafitte National Historical Park and Preserve, where it is regularly seen. This eagle is primarily riparian in nature, often associated with coasts, rivers, and lakes, and nests near bodies of water, where it feeds. In the southeast, nesting occurs primarily in Florida, South Carolina, and coastal Louisiana. Nests are usually constructed in living, dominant pines or cypress, however standing snags are occasionally used. The Preserve is within the area routinely foraged by one nesting pair.

American Peregrine Falcon

Considered neotropical migrants, these falcons nest from northern Alaska and Canada to Greenland. Wintering habitat includes Mexico, Central and South America, and the southern United States. This wintering range includes the area of Jean Lafitte National Historical Park and Preserve, where it is occasionally seen. A cliff or series of cliffs that dominates the surrounding landscape constitutes typical nesting habitat; however, river cutbanks, trees, and manmade structures have been utilized as nesting structure. The falcon's decline has been attributed to chlorinated pesticides (e.g. DDT).

Inflated Heelsplitter

The inflated heelsplitter is a freshwater clam known historically from the Amite and Tangipahoa Rivers in Louisiana, the Pearl River in Mississippi, and the Tombigee, Black Warrior, Alabama, and Coosa Rivers of Alabama. The present, known distribution is limited to the Amite River, Louisiana, and the Tombigee and Black Warriors Rivers, Alabama (Hartfield, 1989). The clam's preferred habitat is soft, stable substrate in slow to moderate currents.

West Indian Manatee

The West Indian manatee is a large gray or brown aquatic mammal. They inhabit both fresh and saline waters from 5 to 19 feet in depth, throughout their range. During the winter months, the United States' population is confined to the southern half of Florida's peninsular coastal waters and north to warm water outfalls of Georgia's southeast coast. During the summer months, they migrate north to coastal Virginia and westerly to Louisiana's Gulf Coast. Louisiana appears to be the western extent of the manatee's range, and the inclusion of the species as part of Louisiana's mammalian fauna is based on two individuals found dead and one single sighting (Lowery, 1974).

Louisiana Pearshell

The Louisiana pearshell is a freshwater mussel restricted to Louisiana streams. This mussel was previously thought to inhabit 11 streams in the Bayou Beouf drainage system Rapides Parish, Louisiana; however, surveys in 1991 and 1992 found this species' range extended to eight streams within the Red River system of Grant Parish, Louisiana. The typical habitat for this species is flowing water at depths from 12 to 20 inches over sand and gravel substrates.

Pink Mucket Pearlymussel

The pink mucket pearly mussel is listed as an endangered species within the state of Louisiana probably due to its historic range. The pink mucket pearlymussel's primary habitat is within the lower Mississippi and Ohio Rivers and their larger tributaries over gravel or sand.

Brown Pelican

Although brown pelicans were extirpated from the Louisiana coast during the 1960s, the species has been successfully reintroduced. Nesting for the brown pelican is generally confined to the Carolinas, Florida, Louisiana, and the Caribbean. These pelicans nest in colonies on small coastal islands typically in mangroves; however, ground nesting has also been reported. Feeding occurs primarily in shallow estuarine waters, where brown pelican numbers have increased following the elimination of organochlorine pesticides. It is now a common post-breeding visitor to the preserve.

Piping Plover

The piping plover is an endangered species in several northern states and threatened throughout the Gulf Coast states, including Louisiana. Piping plovers nest along sandy beaches of the Atlantic Coast, gravelly shorelines of the Great Lakes, and river sandbars throughout the Great Plains region. These birds are primarily confined to coastal habitats during the winter, preferring areas with expansive sand or mudflats in close proximity to a sandy beach. The primary threats to the piping plover are habitat modification, habitat destruction, and human disturbance to nesting adults and flightless chicks.

Gulf Sturgeon

Historically, this subspecies has occurred in most major rivers from the Mississippi River to the Suwannee River in Florida and marine waters of the central and eastern Gulf

of Mexico. Gulf sturgeons are anadromous fish with a diet consisting of amphipods, isopods, crustaceans, and marine worms. Spawning occurs February through April in large, coastal rivers.

Pallid Sturgeon

Listed as endangered in 1990, the pallid sturgeon's historic range included the middle and lower Mississippi River, the Missouri River, and the lower reaches of the Kansas, Platte and Yellowstone Rivers. Their preferred habitat is over bottom substrates of large, turbid, relatively warm, free-flowing rivers. Anthropogenic alteration of large river systems is reported to be the primary cause of decline.

Least Tern

The least tern's range includes the Jean Lafitte National Historical Park and Preserve where this species occurs as an uncommon visitor and migrant. Preferred nesting sites include salt flats, sandbars, and barren shores or other bare ground habitat, as well as gravel roof tops in the New Orleans area. Foods consist primarily of fish, and most pairs nest in association with wide, shallow rivers. Population declines have been attributed to reservoir construction, river channelization projects, recreational use of sandbar areas, and predation.

Gopher Tortoise

This species inhabits sandy coastal plain areas from extreme southern South Carolina to the southeastern corner of Louisiana. This tortoise' preferred habitat is transitional areas associated with a pine overstory. Habitat requirements also include an open understory with grass and forb groundcover and amply sunlit nesting areas.

Loggerhead Sea Turtle

Five species of threatened and endangered sea turtles are known to occur in the Gulf of Mexico; however, only one species, the loggerhead sea turtle, is considered to be threatened in Louisiana as listed by the U.S. Fish and Wildlife Service in Region 4. The loggerhead inhabits inshore bays, lagoons, salt marshes, ship channels, and mouths of large rivers. Though a preference for a variety of mollusks and crustaceans is apparent, loggerheads will feed on a variety of marine invertebrates and vegetation. Loggerheads have been reported to nest on the Chandeleur Islands of Louisiana; however, sea turtles do not nest in the Barataria basin (Conner and Day, 1987).

Ringed Map Turtle

This species occurs in the Pear River's main channel from near its mouth upstream to Neshoba County, Mississippi, and in the Bogue Chitto River from its confluence with the Pearl River upstream to near Franklinton, Louisiana. The turtle's habitat is primarily riverine in nature, where current is moderate and basking logs are available. Nesting habitat consists of large, high sand and gravel bars adjacent to the river.

Black-Capped Vireo

Inclusion of the black-capped vireo for Louisiana is probably an error. No records of occurrence within the Jean Lafitte National Historical Park and Preserve have been found. This insectivorous species prefers rangeland habitat with scattered clumps of shrubs separated by open grassland.

Red-cockaded Woodpecker

This bird's range is closely linked to the distribution of southern pines which occur from east Texas and Oklahoma eastward to Florida. Preferred nesting habitat includes mature, open stands of pines within the 80 to 100 year age class. Foraging habitat

comprises pine and pine-hardwood stands, although dense hardwood stands are usually avoided. No known sightings of this woodpecker in the park have occurred.

Earth-Fruit

Currently, the only known populations of earth-fruit are in Missouri and Arkansas. No known specimens have been taken from Louisiana, but it is included as a threatened species within the state. Earth-fruit grows on moist, sandy soils and on bare mineral soils of the Lefe and Wing Series.

Louisiana Quillwort

The Louisiana quillwort is a small, grass-like, aquatic plant closely related to ferns. The only known occurrence is in Washington and St. Tammany Parishes, Louisiana. It occurs predominately on sand and gravel bars in small to medium sized streams.

Pondberry

Pondberry is a deciduous shrub that vegetatively reproduces by stolons. Pondberry's historic range included one unidentified site in Louisiana. No known populations now occur within the state. Pondberry is associated with wetland habitats, ponds, depressions, and bottomland hardwood habitat. The plants may grow in open, sunlit habitats although they are typically found in shaded areas. The most significant threat to the pondberry is habitat conversion to other uses.

American Chaffseed

American chaffseed is an erect, perennial herb typically found in sandy, acidic, seasonally moist to dry soils. The only known historic record of American chaffseed in Louisiana is now considered to be erroneous.

2.6.1 Species of Special Concern

In coordination with the Louisiana Natural Heritage Program, nine species of special concern may have ranges that include the proposed survey area or are known to occur within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve. These species of special concern may occupy habitats that are near the extremity of their range or comprise only 5 to 20 existing populations within the state. These species of special concern include one plant and eight vertebrate species.

The only plant species of special concern is the creeping spikerush (Eleocharis fallax) that is known to occur within the Barataria Preserve. The vertebrate species include one amphibian, five avian and two mammalian species. The two-toed amphiuma is included in the list as a result of known range; however, this species has not been collected within the Barataria Preserve.

Avian species of special concern include Cooper's hawk (Accipiter cooperii), roseate spoonbill (Ajaia ajaja), reddish egret (Egretta rufescens), and glossy ibis (Plegadis falcinellus). Cooper's hawk and glossy ibis are present year round within the Barataria Preserve, and Cooper's hawk may nest in forested areas. The reddish egret is a rare winter visitor. The roseate spoonbill might wander to the Barataria Preserve, although this species has not been sighted.

The two mammalian species include long-tailed weasel (Mustela frenata) and eastern spotted skunk (Spilogale putorius); however, no known specimens have been collected. The long-tailed weasel is listed only due to its reported range within the area (Lowery, 1974a).

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2.6.2. Environmentally Sensitive Areas

In coordination with personnel of the National Park Service, two general types of habitat were deemed to be environmentally sensitive. These two habitat types within the proposed seismic survey area include wax myrtle thickets interspersed within the floating marsh and cypress trees located in the extreme northeast corner of the proposed survey.

The wax myrtle thickets will be avoided to the practicable extent possible under the following criteria. No drilling crews will bisect the thickets during their portion of the seismic survey. Receiver line crews, if necessary, may lay their lines through the thickets with only a 36 inch wide pathway where no cutting of wax myrtle limbs will be allowed larger than two inches in diameter. All impacts to cypress trees will be avoided, and no cutting of this species will occur.

The specific locations for these sensitive environmental areas are depicted in Figure 2.3.1-1 and Figure 2.2-1. These areas will be avoided to the practicable extent possible.

ANALYSIS AND INTERPRETATION

3.1 Environmental Assessment of the Proposed Action

3.1.1 Geology and Soils

There would be no impacts to the geology of the seismic survey area. The deep Holocene sediments previously deposited by the Mississippi River would not be impacted except the excess cuttings from the drilling could transpose some of the inherent layering of the sediments.

Soil compaction or rutting as a consequence of equipment movement was a primary concern addressed during previous meetings with personnel of the National Park Service. Even slight changes in ground elevation can result in habitat changes in coastal freshwater

marshes. Furthermore, ruts could lead to an unnatural drying allowing further invasion of exotics such as the Chinese Tallow tree. Excessive rutting could result in loss of the floating marsh and changes in species composition of the Barataria Preserve. To avoid and minimize the potential for these negative impacts, airboats and lightweight tracked vehicles for all seismic survey activities will be instituted. Furthermore, vehicular passes will be kept to a minimum by using lightweight aluminum tracked vehicles and small tender airboats in combination.

The only impact to soils would be in the disruption of approximately 31.87 square feet of area within the Barataria Preserve, while the entire survey will disrupt approximately 158.48 square feet of surface area covering the 50 square miles. The proposed shot holes will displace a total volume of 586.96 cubic yards of material. Within the Barataria Preserve, 118.04 cubic yards of soil material will be displaced; however, assuming 85 percent of this volume will be returned to the shot hole only 17.71 square yards of excess soil material will be displaced within the Barataria Preserve.

Receiver points within the Barataria will have even more transient environmental affect. The seismometers will be pushed into the substrate and the hole will fill quickly within the freshwater marshes of the Barataria Preserve. Receiver points will have the least environmental effect upon the soils of the entire seismic area.

3.1.2 Terrestrial and Aquatic Environments

3.1.2.1 Vegetation

Vegetation in the seismic survey area will be affected primarily by airboat and lightweight aluminum vehicles passage along the source and receiver lines as well as disruption of approximately 31.87 square feet at shot hole locations within the marsh. The primary impact to vegetation will be flattening as the airboat or lightweight aluminum,

tracked vehicle moves along the individual source or receiver line. This transient impact to vegetation will be further minimized by reducing the number of passes along source and receiver lines and using foot access to survey and receiver line deployment as much as possible. Therefore, long term impacts to marsh vegetation will not occur due to implementation of the proposed guidelines for accessing source and receiver line locations. Any indication of excessive rutting through access will be immediately reported to the National Park Service designee.

Access to source and receiver lines will include:

- Avoid sensitive areas where indicated by the National Park Service or environmental monitors,
- Flush cutting vegetation of 2 inches or less in diameter at the mainstem when deploying seismic receiver lines through sensitive wax myrtle thickets,
- Access over waterways and levees, if required, will be limited to areas where exotic vegetation such as Chinese Tallow tree dominate the area or as recommended by the National Park Service designee or environmental monitors.

The freshwater marsh community should not experience any long-term effects from the proposed seismic survey. Reducing the number of passes to a minimum will avoid rutting and disturbance to vegetation. The impacts of pushing over the marsh vegetation should be temporary and localized in terms of spatial extent.

3.1.2.2 Hydrology and Water Quality

There will be no adverse, long or short term impact to hydrology within the seismic survey area. Movement of water during and after the seismic survey will not be affected.

Due to the floating nature of the marsh, no impacts to overland flows are expected. Since there will be no mechanical damage to waterways nor the aqueous solution underneath the existing floating marsh, there would be no impact from saltwater intrusion or heightened freshwater outflows from the marsh or canals.

The quality of surface water in the seismic survey area will not be impaired by the activities. During drilling operations, a turbidity screen will be placed around the drill to minimize impacts to surrounding environments. During detonation of the explosive charges, the increase in turbidity should be minimal, localized and short in duration. Shallow water areas in the marsh will be avoided whenever possible while traversing the source or receiver lines. However, minimal turbidity increases are expected in small open water areas that will be traversed by airboat or tracked vehicle. These impacts should be localized and short in duration.

The seismic survey will require moderate quantities of water for drilling purposes. The preponderance of this water will come from local surface water, the aqueous solution beneath the floating marsh or hauled in by small tender airboats. When obtaining water from beneath the floating mat of vegetation, a small hole will be cut in the vegetation and a hose extended into the subsurface solution. The vegetative plug will be replaced prior to moving the drilling rig to the next location.

3.1.2.3 Fish

The impact of the seismic survey upon existing fish populations will primarily be short-term and localized. There will be no impacts to fish populations due to surveying or recording seismic data; however, during detonation of explosive charges some local loss of individuals may occur due to concussion. These losses will occur in the open water areas

and would not affect population size or stability. Individual losses will be replaced within succeeding generations of each population affected.

Impacts from localized increases in turbidity due to drilling or detonation will be minimal as populations will displace into adjacent habitat for a short period of time, if at all. Drilling rigs will use a silt screen to reduce turbidity into adjacent locations and minimize its impact. Any fish kills encountered in proximity to the seismic activities will be documented using the park's fish kill documentation form and will be reported immediately to the National Park Service.

3.1.2.4 Herpetofauna

Impacts to amphibians and reptiles will also be short term and localized. Turbidity increases are not expected to be detrimental to the existing populations. During detonation of explosive charges, some individuals are expected to succumb to mechanical narcosis; however, there should be no loss of individuals except where this would aid predation within the immediate area.

3.1.2.5 Birds

Due to their mobility, avian species are not expected to be impacted by the proposed seismic survey. Some individuals may be displaced during drilling operations or detonation; however, these displacements are expected to be short term in duration. Nesting species are likely to suffer mortality; however, the population will not be significantly affected due to renesting potential of species such as the red winged blackbird. Migratory waterfowl and other neotropical migrants would be minimally impacted as their migrations will be initiated and their habitats will only be occupied for a short time period.

3.1.2.6 Mammals

Due to their mobility, mammals within the seismic survey are expected to be displaced into adjacent habitats during drilling and other seismic survey activities. During detonation a few individuals may experience mechanical narcosis; however, the impacts to these small mammals will also be of short duration. Therefore, localized and short term impacts to the mammalian individuals is expected; however, population stability and numbers are not expected to be impacted.

3.1.3 Archeological and Historical Resources

All known archeological sites within the seismic survey will be marked for avoidance. If any additional sites are found during drilling, surveying or laying out source and receiver lines, the monitors or drilling operator will notify the National Park Service designee for appropriate action. Since all known archeological locations will be avoided, there will be no impacts to these resources.

Impacts to the historical site of the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve will be minimized to the practicable extent possible. All impacts will be of short duration and any mitigation required for disturbances to ingress areas or marsh vegetation will be initiated immediately after any notification of degradation.

3.1.4 Air Quality

Impacts to air quality are expected to be minimal. There may be a very local increase in carbon monoxide from airboat, lightweight aluminum tracked vehicles or helicopters from their respective combustion engines. However, the impacts from these sources should be minimal and short in duration. Therefore, there will be no long term or significant increases in the carbon monoxide levels within the seismic survey area.

3.1.5 Recreation

Locating the staging areas, launching sites and personnel deployment areas off site from the Barataria Preserve will reduce the impacts to recreational resources. If the survey can be conducted from April to mid-May, impacts to a large majority of the visiting public will also minimize the recreational impacts. Aesthetic impacts to the recreational public will be short term and associated with the flattening of marsh vegetation and possibly laying receiver lines across one trail within the Barataria Preserve. However, signs approved by the National Park Service relative to the seismic survey will be located at strategic sites along the trail and other areas deemed necessary by the National Park Service.

3.1.6 Threatened and Endangered Species Including State Species of Concern and Sensitive Environmental Areas

During the seismic survey, no endangered or threatened animal or plant is expected to come into direct contact with or be affected by the activity. Four avian species may occur within the seismic survey area. They are the Peregrine falcon, brown pelican, piping plover and bald eagle.

The seismic survey will occur after the spring migration of the Peregrine falcon has been initiated. This species is usually found in association with large concentrations of waterfowl and shorebirds that comprise its diet. However, it is doubtful that large concentrations of waterfowl or shorebirds will be encountered within the floating marsh area of the Barataria Preserve during the proposed seismic survey.

There are two known populations of brown pelicans that have colonized Barataria Bay and North Island of the Chandeleur chain. Both populations are south of the proposed seismic survey area; however, small groups may be found as transients in Lake Salvador or

Lake Cataouatche. If any of these small groups are sighted by the environmental monitors, their existence will be immediately reported to the National Park Service designee to determine the course of action necessary to reduce disturbance impacts to this species.

The occurrence of the piping plover within the seismic survey is a possibility along the western edge of the Barataria Preserve. This area possesses mud flats and beaches that are used by this species. If these birds are sighted during the seismic survey, the environmental monitors will immediately notify the National Park Service designee to determine options to minimize disturbance to the piping plover.

The pair of bald eagles that have been sighted near the Barataria Preserve will be on their northern migration by the time the proposed seismic survey would be initiated. The present fledglings will also be following their initial migration when the proposed seismic survey would be initiated; therefore, there would be no adverse impact to the bald eagles or their offspring.

Threatened or endangered sea turtles occur further south along the Gulf of Mexico; however, environmental monitors will be required to report any sightings of these species to the National Park Service designee to determine the appropriate course of action.

Other threatened or endangered species described in Section 2.6 do not have habitat requirements that include those afforded by the land use classification described in Section 2.2.1. Therefore, no adverse impact is expected to those species that would not inhabit the environments afforded by the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve.

Impacts to species of special concern will also be avoided to the maximum extent practicable in the Barataria Preserve. These state listed species include Cooper's hawk, reddish egret, glossy ibis, white-breasted nuthatch, long-tailed weasel, eastern spotted

skunk and creeping spikerush. The presence of these species will be reported immediately to the National Park Service designee by the environmental monitors, and appropriate actions will be taken to ensure that these species are not harmed or disturbed.

Impacts to sensitive environmental areas will be avoided to the maximum extent practicable. No impacts will occur to cypress trees from cutting during the seismic survey. Drilling of shot holes will be offset to avoid impacts to wax myrtle thickets. Wax myrtle thickets will be traversed by the receiver line crews with only minimal impact by flush cutting only those branches off the main stem that are two inches in diameter or less. The pathway through these thickets will be limited to a maximum of 36 inches. Environmental monitors will report immediately to the National Park Service any violations of this procedure.

3.1.7 Cumulative Impact of the Proposed Seismic Survey

Cumulative impacts from the proposed seismic survey are essentially nil. There will be no irreversible and irretrievable commitment of resources. All impacts to the environment are expected to be of short duration specifically within one growing season. From previous seismic surveys administered by the Louisiana Department of Wildlife and Fisheries, only one small area was impacted greater than one growing season where a tracked vehicle was immobilized and extraction attempts created rutting near the disabled vehicle.

Therefore, all aspects of this proposed project are reversible and retrievable through certain planning and field commitments to avoid, minimize and where necessary, reclaim any adverse impacts to the environment. Since there will be no construction of permanent structures, land use will not change nor will there be any irreversible and irretrievable commitment of land use to this proposed project. Recovery of the floating marsh should

occur within one growing season. Aquatic and terrestrial wildlife resources should recover within one month after the seismic survey has been completed. Therefore, the short term use of the environment for the proposed seismic survey will neither be extensive nor significantly affected.

Existing basin wide chronic stresses upon the environment would not be impacted by similar uses of the environment. Disruption of the environment from seismic surveys primarily deals with a disruption of soils and vegetation within the immediate proximity of the source point or shot hole. Increased turbidity from the source point would be minimal in comparison to the resuspension of sediments from traveling surface waves. Furthermore, the existing turbidity from traveling surface waves would be near the inherent water columns' ability to transport colloidal or suspended materials. Therefore, the inherent ability of the water column to transport any significantly higher colloids or suspended materials is not available. Similarly, colloidal and suspended materials under the floating mat would not be significantly impacted by existing and future seismic surveys.

The existing chronic stresses upon the environment within and near the Barataria Preserve have very little connection with the proposed or any future seismic surveys. The water quality, macroinvertebrates, fish, amphibians, reptiles, birds and mammals are affected to a greater extent by the siting and effluents from nearby residential, commercial and upstream industrial land use patterns than any proposed or future seismic survey.

The potential for future seismic activities upon the same surface of land depends primarily upon the amount and extent of subsurface interests held by the various mineral owners. Since Burlington Resources, Incorporated presently retains a majority of the

mineral leases surrounding the present Barataria Preserve, there would be minimal further seismic activities upon the same surface of land.

DESCRIPTION OF ALTERNATIVES

4.1 Proposed Action Alternative

The proposed alternative calls for a three dimensional seismic survey covering approximately 50 square miles (Figure 1.1-1) which will provide a high resolution image of the subsurface geologic features. The proposed 3-D project will begin with survey activities followed by the drilling and recording phases; however, the three phases are to be incorporated into one continuous project. Initially, the survey will begin by locating and flagging shot holes and receiver points using global positioning systems. This methodology precludes cutting vegetation to the maximum extent possible because line-of-sight is not necessary to determine a point, and the survey effort will be accomplished by walking wherever possible. Shot holes will be marked with biodegradable flagging and cane poles in areas of standing water. Flagging materials and any other debris will be removed when receiver lines are being extracted. The drilling and recording portions of the seismic program will be conducted by drilling 477 shot holes to 100 feet in depth, loading the shots with 10 pounds of biodegradable explosives, and receiving the resultant reflected energy signal with seismometers placed in a grid at 220 feet intervals along lines separated by 880 feet between adjacent receiver lines. Within the Barataria Preserve, only 31.87 square feet of the land surface will be disturbed by the proposed seismic survey.

The advantage of using three dimensional seismic technology, relative to older methods such as two dimensional seismic technology, is that it greatly enhances the subsurface imaging and allows efficient and effective development of hydrocarbons. Several hydrocarbon-bearing objectives could be intersected with a single well. The

utilization of this technology could raise the individual well's chance of success from 40% to 90%.

The impacts of the proposed seismic survey will be mitigated by general procedures and by stipulations set forth in 36 CFR 9.30 *et sequentia*. Mitigation procedures will include employing third party monitors to oversee the seismic survey activities throughout the program to reduce and document resource damage. These field monitors will report to the park superintendent or other designee on a regular basis, or whenever questions arise regarding threatened or endangered species, sensitive wildlife or habitat features, cultural resources, or public safety issues.

4.2 Alternative Locations

Because of the location of Burlington Resources, Incorporated's mineral lease, a three dimensional seismic survey which includes a portion of the area within the park boundary is necessary. Presently there are no alternative locations that could be surveyed to elicit results specific to the Burlington lease using the best available technology. Therefore, the leaseholder believes that no alternative areas for the survey are plausible.

4.3 Two Dimensional Alternative

While two dimensional data is valuable in general interpretation of the subsurface, only three dimensional seismic exploration can reveal the intricate faulting and depositional relationships as well as properly image and position deep structures. The exclusive use of two dimensional data could conceivably lead to the improper placement of surface facilities and the drilling of unproductive or uneconomic wells.

4.4 Alternative Shot Hole Locations

Burlington Resources, Incorporated researched using only canals and waterways within the Barataria Preserve to avoid any impacts to the floating marsh; however, the

amount of data generated from this alternative could not be used to obtain sufficient information regarding the subsurface formation at a depth of 10,000 to 16,000 feet.

4.5 Exploratory Wells

Prior to seismic investigations using explosives, exploratory wells were the only alternative open to the oil and gas industry. This alternative would require enormous monetary expenditures, require the erection and placement of structures that would have long term environmental impacts, and be less successful than the preferred three dimensional seismic alternative. Therefore, this alternative would monetarily and environmentally cost Burlington Resources, Incorporated and the National Park Service's Barataria Preserve, respectively. This alternative was summarily dropped from further consideration.

4.6 Alternative Energy Sources

Two alternative sources of energy for geophysical exploration are hammer impact devices and boat-towed wide band devices. The hammer impact devices often called thumpers or vibrators require heavy, truck mounted equipment. These devices would cause significant environmental problems within the freshwater floating marshes of the Barataria Preserve. Furthermore, it would be illegal to transport this equipment into the park because of existing regulations which only permit the use of air boats within areas of standing or flowing water. Boat towed devices could not operate in the marshes of the Barataria Preserve nor in Lake Salvador due to the excessive draft required by these vessels.

4.7 No Action Alternative

"The No Action Alternative" is often a viable and necessary alternative within most Environmental Assessments completed for federal agencies and subject to public review

because the government agency administering the public resource may deem that the proposed project is not in the best interest of the public.

With respect to subsurface mineral rights, the holder (lessee) of the mineral lease has specific rights to pursue the recovery of minerals under such lease, and in fact, these mineral lease rights may supersede many rights of the surface landowner. In most cases the surface landowner may not hinder the subsurface lessee from pursuing exploration activities with regards to the mineral resources if just compensation is provided for damages to the surface property; however, since Burlington Resources, Incorporated proposed three dimensional seismic survey includes a portion of the Barataria Preserve of Jean Lafitte National Historical Park and Preserve which is held by and under the direction of the National Park Service, deed restrictions require that a permit be sought from the National Park Service for activities relative to non-Federal oil and gas rights within the Barataria Preserve.

The lessee has demonstrated that the proposed action will likely have no deleterious effects on the surrounding environment within the boundary of the Barataria Preserve of Jean Lafitte National Historical Park and Preserve due to precautions taken during the project (e.g. minimization of impacts to the fullest extent and third party monitoring) and reclamation and monitoring activities following the project. Also, alternatives to the proposed three dimensional seismic survey (e.g. two dimensional seismic) would likely prove to be more detrimental and costly because further actions would likely be required to gather sufficient information (e.g. exploratory drilling). Predicated upon these facts, the subsurface lease holder views the "No Action Alternative" as nonviable.

METHODS TO FURTHER REDUCE ENVIRONMENTAL IMPACTS OF THE THREE DIMENSIONAL SEISMIC SURVEY

5.1 Operational Methods to Reduce Impacts

Certain operational and management mitigative procedures will be implemented for the duration of the seismic survey to control, reduce and correct adverse impacts within the project area. Documentation of associated activities will provide park management with the necessary information needed to modify seismic activities, as necessary, to ensure that park objectives and site integrity are not compromised.

Burlington Resources, Inc., will to the greatest extent practicable, conduct all exploration in a manner as to prevent damage, erosion, pollution or contamination of lands, waters, vegetation and facilities of the area. Upon completion of the survey, the area shall be restored as nearly as possible to its condition prior to the commencement of the seismic operations.

Other operational methods to reduce impacts and ensure compliance with park regulations and objectives include the following:

- Field personnel will be trained prior to initiating seismic activities relative to existing environmental conditions within the Barataria Preserve, its ecosystems, and operational commitments to avoid and reduce the probability of environmental or cultural resource damage. All personnel will be required to attend this initial environmental training. Training will be repeated periodically throughout the survey due to anticipated personnel replacement.
- Environmental monitors will be hired to ensure compliance with the operational commitments relative to the sensitive biota, cultural resources and other stipulations for accomplishing the seismic survey within the Barataria Preserve. The monitors will be hired upon approval of the Superintendent or the National

Park Service's designee. These personnel will be supplied with access to communications, air boats with operators and helicopters with accredited pilots. Monitors' daily operational logs and photography of daily activity will be supplied to the Superintendent on a weekly basis, with a report at the conclusion of the operation.

- All work crew generated refuse (i.e. paper, cans, bottles, fluid containers, grease tubes, and spent lubricants) will be removed by accepted procedures daily or as directed by the National Park Service's designee. All flagging, cane poles, wires, and survey associated debris will be removed immediately following the cessation of survey activity upon each receiver line.
- Pier 90 Marina will be used as a primary staging area. This facility is located on U.S. Highway 90 between Avondale and Boutte. From the marina, access will be along Bayou Verret, Lake Cataouatche, Bayou Bardeaux, Lake Salvador and Bayou Segnette. This route will also be utilized as an evacuation path should any tropical depressions become a threat to the completion of the proposed seismic survey. Within the Barataria Preserve, waterways and existing man-made canals will be traversed to arrive as close to the final destination for a specific day (Figure 5.1-1).
- All seismic survey activities are proposed between March 31, 1998 through May 15, 1998 to minimize disturbance to neotropical migrants, inherent wildlife and plant communities according to recent research within the Barataria basin. This time frame is also during a lower visitation rate to the Barataria Preserve which will minimize disturbance to recreational use.



Figure 5.1-1. Proposed Ingress to Barataria Preserve of the Jean Lafitte National Park and Preserve from the Highway 90 Marina.

LEGEND

- Proposed Ingress from Highway 90 Marina
- Boundary of Proposed Three Dimensional Seismic Survey
- Boundary of Jean Lafitte National Park and Preserve
- (White) Boundary of Burlington Resources, Incorporated Lease (White Line)
- Boundary of Exempt Area within Lease
- Shell Exclusion Area (Mineral lease of another company)

- Air boat drills will be used in shallow water habitats of Lake Cataouatche, Lake Salvador and Bayou Bardeaux. Lightweight aluminum tracked vehicles will be used for drilling in emergent wetlands that are too dry for air boat use.
- These aluminum vehicles were recommended by the Louisiana Department of Wildlife and Fisheries due to their minimal impact upon the marsh habitat relative to the use of air boats in eight other seismic surveys within Louisiana.
- All tracked vehicles and air boat drills will make only one pass, if possible, to reach a drilling location. Tracked vehicles may remain overnight in the Barataria Preserve where tender air boats will be used to deploy personnel for the next day.
- Minimizing damage to waterway banks and shorelines will be accomplished by avoiding traveling laterally near waterways, changing ingress area if rutting becomes significantly damaging to the waterway, and using plywood or other appropriate materials across small waterways.
- Damage to vegetation along shot and receiver lines will be minimized by restricting the number of vehicle and air boat passes along these lines to the absolute minimum required, walking whenever possible in placing and servicing receiver lines or equipment, using helicopters to transport equipment to the lines where possible, and arc turning of tracked vehicles and air boats. Any damage to vegetation will be restored as closely as possible to its prior condition after cessation of seismic operations along receiver lines.
- Equipment used to haul water to the drills must be consistent with the drilling vehicles used in a particular habitat. Determinations will be made with input

from on-site, environmental monitors whether water would be delivered by air boat or obtained at the drilling location by excavating a small hole in the marsh and extracting water. Small plugs of marsh would be removed to expose the underlying water source. After drilling the shot hole, the marsh vegetation would be replaced to the previously existing contour. Wherever possible, water available at the drill location will be utilized.

- Locations such as shot holes, water holes and access points damaged by seismic survey activities will be restored as closely as possible to pre-existing conditions. Access areas where invasive exotics such as Chinese tallow tree are removed will be revegetated with native species at the discretion of the National Park Service's designee. An approved herbicide (e.g., glyphosate) may also be supplied to the National Park Service to control any recovery of this exotic species.
- All equipment will be cleaned prior to initiating the survey and regularly thereafter to reduce the potential of spreading exotic plants such as Chinese tallow tree and water hyacinth.
- Sensitive environmental areas (e.g., wax myrtle stands) will be avoided to the maximum extent possible. Offsets by the drilling rigs will not enter those areas where a closed canopy of this species exists. Receiver line crews may traverse these areas when laying the line; however, only a 36-inch wide lane will be required for access. Only those limbs less than or equal to two inches will be flush cut with the main stem.
- Sensitive cultural resource areas will be avoided by all seismic crews with a buffer of 120 feet from any known areas that have been delineated by the

Louisiana Department of Culture, Recreation and Tourism. Any cultural feature or artifact discovered during the course of the seismic survey will be reported to the environmental monitor, seismic survey project manager and National Park Service designee. The environmental monitors and National Park Service's designee possess the "stop work" authority for any cultural feature or artifacts discovered during the course of the seismic survey.

- All state, federal, and park regulations will be strictly adhered to with regards to wildlife. Harassing, injuring or destroying wildlife is prohibited. All nesting and denning sites of inherent wildlife will be avoided by all personnel and equipment.
- All park regulations shall be in force and adhered to by all seismic personnel at all times unless explicitly exempted by the park superintendent. Seismic personnel will also comply with all applicable ordinances, laws, decrees, statutes, rules and regulations of all federal and state entities.
- All activities will not encroach closer than 50 feet to any vegetative sampling plot, hydrograph, or any other research associated sites or equipment. All shot holes will be placed at safe distances from any recognized special feature and will conform to the setback distances recommended by the International Association of Geophysical Contractors unless specified by other permit related conditions. These setback distances are presented in Table 5.1-1.
- All explosives will be stored in a secure magazine at an approved location in accordance with the Bureau of Alcohol, Tobacco, and Firearms regulations.

- All roads, trails, levees and other infrastructure impacted by the seismic survey will be immediately repaired as nearly as possible to pre-project conditions at Burlington's expense.

Table 5.1-1 Safe Operating Distance Chart Commonly Used and Accepted by the Geophysical Industry	
Explosives Energy Source Charge size shown in pounds	
	Size of Charge (lb) = 6-10 Setback Distance (ft)
Pipeline less than 6" diameter	140'
Pipeline 6" to 12" diameter	215'
Pipeline greater than 12" diameter	290'
Telephone lines	56'
Railroad track or main paved highway	215'
Electric power line (shothole not to exceed 200' depth)	300'
Water well, buildings, underground cistern, and all other objects not mentioned including all living things	430'
Cultural features	120'

5.2 Reclamation Plan

The following reclamation plan is provided to assure that reestablishment of native vegetation, normal surface and subsurface water flow, restoring pre-existing contours, neutralizing any contaminating substances, and removing all other man-made debris for the safe movement of inherent wildlife or which does not jeopardize public use or visitor safety.

5.2.1 Above Ground Structures, Man-made Debris and Contaminating Substances

The only above ground structures associated with this proposed three dimensional seismic survey will be wire flagging, cane poles and other biodegradable flagging used to mark source and receiver locations, delimit avoidance areas or ingress areas. All man-

made debris will be removed as the receiver are extracted before moving to another location. All man-made debris will be disposed of daily in sturdy trash bags from operational procedures (e.g., cans, bottles, waste paper, or food wrappers) within the airboats or light-weight aluminum tracked vehicles. Therefore, there will be no man-made debris left in the Barataria Preserve as a result of the proposed seismic survey.

All potentially contaminating substances such as grease tubes, oil or gas will be disposed in the appropriate containers. Any oil added to motorized vehicles that may be left overnight in the field will use drip pans to reduce the probability of any spills. Drip pans will provide 1.5 times the volume required to fill the reservoir. All vehicles in the marsh will carry absorbent pads to immediately contain any potential escape of oil or gasoline. All gasoline will be transported in approved containers. There should be no contaminating substances released into the environment due to the proposed three dimensional seismic survey. However, in accordance with 36 CFR Section 9.45, Burlington Resources, Incorporated will report any potentially contaminating substances to the Superintendent within 24 hours of any accidental spill with subsequent reporting according to the Resource Conservation and Recovery Act and/or Occupational Safety and Health Administration. Initial information will include the type of product released, the time the spill was discovered, estimated spill volume, cause of spill, and area covered. This will ensure that wastes and potential contaminating substances will be contained within the smallest practicable area, will be confined to prevent escape attributable to percolation, rain, high water or other causes and subsequently will be removed from the area as quickly as practicable to prevent "contamination, pollution, damage or injury to the lands, water (surface and subsurface), facilities, cultural resources, wildlife and vegetation of or visitors of the unit."

During drilling operations, drill cuttings will be used to backfill the hole, after the explosive charge is set and the casing is removed. Any excess cuttings will be dispersed around the shot hole to not more than 0.25 inches above the previously existing contour. Any excess bentonite remaining near the shot hole, after drilling is completed, will be collected and disposed appropriately at the off site access point on Highway 90.

5.2.2 Plugging and Capping

After the shot hole is drilled, bentonite is added, and the casing is removed, drill cuttings will be used to backfill the shot hole. At a depth of two feet from top of the hole, a metal or plastic “spider” plug will be set to bridge the shot hole. A plug of native soils and vegetation will then be placed as the top component of the shot hole to mimic the previously existing soil and vegetative conditions.

5.2.3 Restoring Contours

Any ruts or depressions will be leveled in a manner that restores natural contours to optimize the restoration of previously existing vegetation or conditions.

5.2.4 Reestablishing Natural Vegetation

Any ingress areas or areas that require vegetation to be replanted upon levees or along waterways will conform to the following guidelines. At ingress areas, only overstory vegetation will be cut. Shrubs and herbaceous species will not be cut or otherwise removed unless they consist of exotic species. The removal of overstory will be directed toward those exotic species such as Chinese tallow tree existing in pure stands along the canals. The stumps of this species will be painted with an approved herbicide to reduce the probability of stump sprouting and out competing the native vegetation to be replanted.

After the last vehicle has departed the ingress point, a layer of jute mesh will be applied across the breadth of the embankment. Native species of shrubs such as wax myrtle or yaupon will then be planted to stabilize the embankment. A native mixture of herbaceous species will also be planted to shade out the seedlings of the previously existing Chinese tallow tree. Also during this time, acorns of native overstory species such as live oak, Texas oak, and/or water oak will be planted on 3-foot centers to provide future mast for the inherent wildlife inhabiting the area. Native herbaceous species to be planted within the jute mesh will be coordinated with personnel from the National Park Service. The benchmark of successful reclamation will be when 75% of the area has returned to native vegetation

Other ingress areas along natural waterways, where there are no overstory species, will be supported by the jute mesh and biologs (e.g., a floating, neutrally buoyant or submersible, usually round mass of vegetative material totally or partially composed of coconut husk fibers that can be used as an attachment device in selective conditions). Areas of the floating marsh that appear to be potentially separated by rutting from tracked vehicles will be held with jute mesh and/or biologs until the vegetation can reattach to the marsh. This procedure will be coordinated with personnel from the National Park Service to assure that no marsh vegetation will be detached from the existing floating mat. The success of this procedure will be determined by periodically inspecting the mat to determine if 70% of the marsh vegetation that was disturbed has reattached to the floating mat by the end of the growing season. Responsibility for benchmark measurements and successful reclamation lies with Burlington Resources, Incorporated or their designee.

5.2.5 Cost Estimate of the Reclamation Plan

The reclamation plan was designed to avoid adverse impacts to the environment. Therefore, the cost of reclamation should only be considered a worst case estimate due to the anticipated lack of adverse environmental impacts from planning procedures and stipulations that are designed to avoid any adverse impacts. The estimated reclamation costs are divided into specific categories as follows of equipment, personnel, materials and monitoring (Table 5.2.5-1). This worst case scenario assumes four areas of ingress or egress will have to be reclaimed where eight biologists will be used to stabilize the vegetation. Six ingress areas will be stabilized with jute mesh for 133.3 feet. This will require three men approximately 5 days to complete the stabilization procedures.

Equipment used will be three days for jon boats and two days for airboats. Automobiles will be used to transport personnel and equipment from the office to Highway 90 Marina near Boutte, Louisiana. Other materials to be used include gloves, seed for the jute mesh, seedlings to replant among the jute mesh fibers, stakes and biodegradable rope to hold the mesh in place. Mulch will also be used underneath the mesh to stabilize any canal or marsh banks.

The six areas that were stabilized by jute mesh will also be sprayed with an approved application of glyphosate on a monthly basis or as needed during the growing season to reduce the competition from Chinese tallow tree. The spraying will consume approximately 7 days during the growing season with a jon boat used for each of the estimated 7 days.

Finally, monitoring of the Barataria Preserve will be the largest expense to determine the revegetation success. Two aerial photography missions have been completed during September and December, 1997. Also, two missions by Lear jet were

completed with the Advanced Testing and Land Application System (ATLAS) and Calibrated Airborne Mapping System (CAMS) for the Barataria Preserve. After the operational and reclamation phase of the seismic survey is completed, an estimated 20 day will be required to complete reclamation evaluations. Another aerial photography mission will be scheduled near the end of the 1998 growing season to determine the rate of revegetation within the Barataria Unit. An airboat and helicopter will be used to survey the Barataria Preserve prior to and after the aerial photographic mission. Georeferencing the mission will require an estimated \$2,460. Next, algorithms will be used for change detection between missions and areas of conformance will be ground checked for verification that the vegetation has successfully regenerated to fall or winter levels documented in September and December, 1997. The revegetation will also be documented by ground base photography along areas traversed by the seismic operations. The successful revegetation is expected to be accomplished by the spring of 1999.

Table 5.2.5-1. Estimated Cost of Reclamation			
Item	Cost/Unit	Estimated Utilization	Total Cost
Equipment			
Boat	\$150/day	12 days	\$1,800.00
Airboat	\$900/day	6 days	\$5,400.00
Helicopter	\$3,000/day	2 days	\$6,000.00
Lear Jet	\$3,850/hour	2 hours	\$7,700.00
Automobile	\$.315/mile	1,607 miles	\$506.21
Sprayer	\$135/unit	2 units	\$270.00
Chain saw	\$42/day	20 days	\$840.00
			subtotal: \$22,516.21
Personnel			
Contract labor	\$81.44/day	60 days	\$4,886.40
Plant ecologist	\$400/day	20 days	\$8,000.00

Table 5.2.5-1. Estimated Cost of Reclamation			
Item	Cost/Unit	Estimated Utilization	Total Cost
Materials			
Biologs	\$135/unit	8 units	\$1,080.00
Jute Mesh	\$250/100 feet	800 feet	\$2,000.00
Stakes	\$14/100	200 stakes	\$28.00
Rope/string	\$19/100 feet	200 feet	\$38.00
Mask	\$75/unit	4 masks	\$300.00
Filters for mask	\$25/50 units	100 units	\$50.00
Glyphosate	\$120/gallon	5 gallons	\$600.00
Gloves	\$12/unit	5 units	\$60.00
Seed	\$0.75/pound	100 pounds	\$75.00
Seedlings	\$250/1,000	2,000 seedlings	\$500.00
Mulch	\$23/yd ³	4 yd ³	\$92.00
			subtotal: \$4,823.00
Monitoring			
Aerial photography	\$5,850/unit	4 units	\$23,400.00
Georeferencing	\$2,460/unit	4 units	\$9,840.00
Ground photography	\$23/roll	17 rolls	\$391.00
Mensuration	\$3,950/event	4 events	\$15,800.00
			subtotal: \$49,431.00
Total estimated reclamation cost: \$89,656.61			

5.3 Hurricane Evacuation Plan

Should the threat of a hurricane occur during the survey and drilling phases of the project, equipment and personnel can be evacuated from the area in just a few hours. The evacuation would begin while the storm is in the Gulf and 24 to 36 hours before it is forecast to move ashore. Air boats would be loaded aboard their trailers at the Pier 90 Marina and moved via Highway U.S. 90, or U.S. 90 to I-310 and I-10 westward to their owner's base of operation. The air boat drills would have to be transported by trucks that will use the same route. Egress from the park to the Pier 90 Marina would use the same route as described in Figure 5.1-1 for ingress to the park.

Should the threat occur while recording operations are in progress, the evacuation would have to begin earlier. When a spread is fully deployed, several days are required to recover all of the cables and geophones that are on the ground. This work would begin after the storm enters the Gulf of Mexico and is forecast to strike the Alabama, Mississippi, or Louisiana coast. Assisted by helicopter, weather permitting, personnel would first pick up the boxes containing recording and telemetry electronics and return them to their storage trailers. They would then begin picking up cables and geophones. Priority must be given to the equipment that is offshore in the waters of Lake Salvador and Lake Cataouatche, as it is the most vulnerable, and if lost, could pose a danger to navigation in the future. This equipment would be transferred to the docks where it would be loaded onto trucks so that it can be removed from the area if necessary. After the lakes have been cleared, the cables and phones within the marsh would be recovered. All of these operations must be completed at least eight hours prior to the hurricane's first squalls are due to appear. At that time, all equipment not recovered will remain on the ground.

ADDITIONAL STATE AND FEDERAL COMPLIANCE

6.1 New Orleans District, U.S. Army, Corps of Engineers Nationwide Permit # 6

Burlington Resources, Incorporated has received a permit to implement the proposed seismic survey from the New Orleans District, U.S. Army, Corps of Engineers

(Permit EO-19-970-3964). Burlington Resources, Incorporated will comply with all terms and conditions within this permit to complete the seismic survey.

6.2 Louisiana Coastal Use Permit

Burlington Resources, Incorporated's contractor, Weems Geophysical, Incorporated, has a valid five year statewide permit to conduct seismic surveys from the Louisiana Department of Natural Resources, Division of Coastal Zone Management (#P951286). All terms and conditions of this permit will be followed during this proposed seismic survey.

6.3 Endangered Species Act Consultation

Burlington Resources, Incorporated's contractor, the Frasier Group, Incorporated has met with the Endangered Species staff of the U.S. Fish and Wildlife Service office in Lafayette to determine any threatened or endangered species that may be encountered within the proposed seismic survey area. The bald eagle was the only species addressed during the meeting in July, 1997, and there were no known nesting areas within the proposed seismic survey area that would be impacted.

6.4 State Historic Preservation Officer

In a letter dated June 24, 1997, the State Historic Preservation Officer notified Mr. Tom Muchard of Burlington Resources, Incorporated that the proposed survey would have no effect on cultural resources as long as it is possible to avoid all site locations delimited on attached quadrangle maps. As a condition to the no objection, Burlington Resources, Incorporated would agree to halt work and notify the State Historic Preservation Officer if any archaeological materials are uncovered during ground disturbing activities. Burlington Resources, Incorporated will comply with all terms and conditions of this no objection letter.

6.5 Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)

These two Executive Orders direct Federal agencies to enhance floodplain and wetland values, to avoid development in floodplains and wetlands whenever there is a practicable alternative, and to avoid to the extent possible adverse impacts associated with the occupancy or modifications of floodplains and wetlands.

Due to the location of the target formations, the proposed seismic activity must be located in a floodplain to obtain sufficient data for a 5,760-acre lease located primarily in Lake Salvador and partially within the boundary of the Barataria Preserve. Although not all seismic surveys are wetland dependent, the location of this lease requires the seismic survey to be located within the wetlands of the Barataria Preserve. Since there will be no structures erected as a portion of this proposed project, no increased flooding will occur during or after the proposed survey, nor will the proposed survey contribute to any future flood damages (i.e., one foot plus increment to the 100 year flood).

Furthermore, the proposed seismic survey's plan of operation has, to the maximum extent possible, avoided wetland impacts, minimized those impacts that cannot be avoided and provided mitigatory measures for any damage to wetlands within the Barataria Preserve of the Jean Lafitte National Historical Park and Preserve. All impacts to wetlands have been identified within the environmental assessment, and specific measures and methods have been developed to mitigate adverse impacts to those wetlands.

The National Park Service has concluded that any adverse impacts to floodplains and wetlands will be of small spatial extent (< 0.10 acre), of short duration, and all practicable measures have been taken to avoid, minimize and mitigate disturbances; therefore, a statement of findings will not be prepared.

6.6 Jefferson Parish

On July 9, 1997, the Jefferson Parish Council voted to issue a conditional letter of no objection to the U.S. Army Corps of Engineers in connection with the application of Weems Geophysical, Incorporated to conduct a three dimensional seismic survey in Jefferson Parish (JP-97-15) relative to the Louisiana Department of Natural Resources Coastal Use Permit #P951286.

6.7 Administrative Documents for the National Park Service

Prior to initiating operational activities within the Jean Lafitte National Historical Park and Preserve, Burlington Resources Incorporated will supply the Superintendent with the following documents:

- List of mineral owners and status of each lease with signed agreements,
- Emergency response coordination with the name, address and telephone number for the operator, liable person for operations, field representative and emergency contact person(s),
- List of oil, gas and utility companies with rights-of-way in the Barataria Preserve and agreements for the seismic survey,
- Affidavit of compliance for legally binding Burlington Resources, Incorporated with regulations of the National Park Service and other applicable Federal, state and county laws and regulations,
- A performance bond of sufficient amount will be provided according to 36 CFR Section 9.48(d),
- Copies of all applicable permits that were obtained for the seismic survey, and
- Map with offset source and receiver lines after pertinent data layers (e.g., sensitive environmental areas, cultural resources) have been encoded.

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**APPENDIX 1. PLANT SPECIES OF KNOWN OCCURRENCE IN JEAN LAFITE
NATIONAL HISTORICAL PARK AND PRESERVE IN JEFFERSON
AND ST. CHARLES PARISHES, LOUISIANA.**

Species	Habitat Types
Japanese Climbing Fern (<u>Lygodium japonicum</u>)	Mesic woods to ditch edges
Floating antler fern (<u>Ceratopteris pteridoides</u>)	Shallow shores and backwaters of creeks and bayous
Resurrection fern (<u>Pleopeltis polypodioides</u> var. <u>polypodioides</u>)	Epiphytic upon trees where shade is provided for colony
Kunth's maiden fern (<u>Thelypteris kunthii</u>)	Swamps, along streams and in crevices of moist, sandy to calcareous soils
Southern marsh fern (<u>Thelypteris palustris</u>)	Scrub/shrub
Ebony spleenwort (<u>Asplenium platyneuron</u>)	Rocky woods, old fields, sandy pine lands, thickets and road banks
Netted chain fern (<u>Woodwardia areolata</u>)	Acid swamps, bogs and wet pine lands
Water-spangles (<u>Salvinia minima</u>)	Pools of streams, bayous and canals
Mosquito fern (<u>Azolla caroliniana</u>)	Freshwater marsh
Carolina mosquito fern (<u>Onoclea sensibilis</u>)	Muddy ditches, marshes, swamps and seepage areas
Eastern red-cedar (<u>Juniperus virginiana</u>)	Old fields, mesic woodlands to xeric locations
Baldcypress (<u>Taxodium distichum</u>)	Mixed deciduous hardwood; Cypress-Tupelo; old spoil banks
Southern cattail (<u>Typha domingensis</u>)	In brackish or fresh marshes and pools

Species	Habitat Types
Broadleaf cattail (<u>Typha latifolia</u>)	Freshwater marsh in monospecific stands; intermediate marsh
Southern water nymph (<u>Najas guadalupensis</u>)	Attached to bottom and floating just below surface of water in ponds, lakes, springs, ditches and springs in fresh or brackish water
Creeping burrhead (<u>Echinodorus cordifolius</u>)	In mud and shallow water ponds and quiet streams
Bull-tongue arrowhead (<u>Sagittaria lancifolia</u>)	Freshwater marsh; intermediate marsh; scrub/ shrub
Duck-potato (<u>Sagittaria latifolia</u>)	Marshes, low meadows and pond margins
Delta arrowhead (<u>Sagittaria platyphylla</u>)	In mud or shallow water of marshes, streams, sloughs, swamps and ponds
Common frog's bit (<u>Limnobiium spongia</u>)	Freshwater marsh
Broom sedge (bluestem) (<u>Andropogon glomeratus</u>)	Freshwater marsh; scrub/shrub
Small carp-grass (<u>Arthraxon hispidus</u>)	Wet soil in waste places
Giant cane (<u>Arundinaria gigantea</u>)	Bogs, mesic woods, savannass and dry woods
Rhodes grass (<u>Chloris gayana</u>)	Fields and waste places
Variable rosette grass (<u>Dichanthelium commutatum</u>)	Low or swampy woods
Smooth crab grass (<u>Digitaria ischaemum</u>)	Established as a weed over much of the U.S.
Hairy crab grass (Northern crab grass) (<u>Digitaria sanguinalis</u>)	Disturbed soil along roads, in fields and gardens, margins of ponds, and wet gravel bars

Species	Habitat Types
Barnyard grass (<u>Echinochloa crusgalli</u>)	Low fields, marshes and waste places
Walter's millet (Coast cockspur) (<u>Echinochloa walteri</u>)	Freshwater marsh; intermediate marsh; scrub/ shrub
Indian goose-grass (<u>Eleusine indica</u>)	Common weed in lawns, gardens and waste places
Virginia wild rye (<u>Elymus virginicus</u>)	In mud and water of streams, ponds and marshy areas
Little love grass (<u>Eragrostis minor</u>)	Waste places
Nodding fescue (<u>Festuca subverticillata</u>)	Fields and waste places
Little barley (<u>Hordeum pusillum</u>)	Dry or sterile, especially alkaline soils
Catchfly grass (<u>Leersia lenticularis</u>)	Sloughs, bayous, swamps, ditches, and in mud and shallow water
Whitegrass (<u>Leersia virginica</u>)	Swamps and bogs along bayous, rivers and streams, and sand flats on the edge of ponds
Bearded sprangletop (<u>Leptochloa fascicularis</u>)	Freshwater marsh
Long-leaf basket grass (<u>Oplismenus hirtellus</u>)	Shaded areas
Short-leaf basket grass (<u>Oplismenus setarius</u>)	Low woods and maritime forests
Beaked panic grass (<u>Panicum anceps</u>)	Sandy well-drained forested uplands, in wet prairies, swampy meadows, and edges of lakes and streams
Fall panic grass (<u>Panicum dichotomiflorum</u>)	Freshwater marsh; scrub/shrub
Maidencane (<u>Panicum hemitomon</u>)	Freshwater marsh; intermediate marsh; scrub/ shrub

Species	Habitat Types
Red-top panic grass (<u>Panicum rigidulum</u>)	Freshwater marsh
Switchgrass (<u>Panicum virgatum</u>)	Fresh or brackish marshes, seepage areas, swamps about lakes and edges of ponds
Jointed crown grass (<u>Paspalum distichum</u>)	Brackish and freshwater marshes
Bahia grass (<u>Paspalum notatum</u>)	Pastures, roadsides and waste places
Pearl millet (<u>Pennisetum glaucum</u>)	Fields and cultivated areas
Timothy canary grass (<u>Phalaris angusta</u>)	Open ground at low altitudes
Carolina canary grass (<u>Phalaris caroliniana</u>)	Loamy usually alluvial soils near creeks, in disturbed soils along roadsides, in fallow fields and pastures, and in shallow water
Savanna panic grass (<u>Phanopyrum gymnocarpon</u>)	Wet sand in streams or shallow waters and in mud about ponds and lakes
Common Reed (<u>Phragmites australis</u>)	Young spoil banks; intermediate marsh
Annual blue-grass (Spear grass) (<u>Poa annua</u>)	Moist soils
Annual rabbits-foot grass (<u>Polypogon monspeliensis</u>)	Moist soil near fresh water , in brackish ponds, seepage and boggy areas, marshes, and wet meadows along streams
Giant plume grass (<u>Saccharum giganteum</u>)	Savannass, ditches and woodland borders
American cupscale (<u>Sacciolepis striata</u>)	Freshwater marsh; scrub/shrub; intermediate marsh
Yellow bristle-grass (<u>Setaria geniculata</u>)	In mud along streams, salt and freshwater marshes, in mud and shallow water about ponds and lakes

Species	Habitat Types
Yellow fox-tail (<u>Setaria glauca</u>)	Wet soil on edge of ponds, lakes and streams, in wet meadows, ditches and gravel bars along streams
Giant bristle-grass (<u>Setaria magna</u>)	Marshes, wet places, moist ditches, and bayous
Marsh bristle grass (<u>Setaria parviflora</u>)	Marshes and bayous
Johnson grass (<u>Sorghum halepense</u>)	Fields, roadsides and waste places
Big cordgrass (<u>Spartina cynosuroides</u>)	In muck at tidally submerged shores of brackish bays and river-mouths; also in marshes
Saltmeadow cordgrass (<u>Spartina patens</u>)	Intermediate marsh
Prairie wedgescale (<u>Sphenopholis obtusata</u>)	In moist swales, in water of creeks, in seepage areas and wet soils
Swamp wedgescale (<u>Sphenopholis pensylvanica</u>)	Marshes and low wet places
Smutgrass (<u>Sporobolus indicus</u>)	Mud and moist loam, low prairies and swales, in shallow water about ponds and springy areas
St. Augustine grass (<u>Stenotaphrum secundatum</u>)	Moist, especially mucky soil near the seashore
Giant cutgrass (southern wild rice) (<u>Zizaniopsis miliacea</u>)	Freshwater marshes in monospecific stands; scrub/shrub
Eastern narrow leaf sedge (<u>Carex amphibola</u>)	In moist soils, woodlands, in wet soils along streams in forests, alluvial forests, and ravines
Oval leaf sedge (<u>Carex cephalophora</u>)	Frequent in moist sandy soils at the base of hills and in wet pasture lands
Cherokee sedge (<u>Carex cherokeensis</u>)	Low woods
Raven foot sedge (<u>Carex crus-corvi</u>)	In mud on edge of lakes, ponds and streams, and in shallow water

Species**Habitat Types**

Thin fruit sedge (<u>Carex flaccosperma</u>)	In moist sandy soil in wooded areas, swampy grounds, and wet woodlands
Shoreline sedge (<u>Carex hyalinolepis</u>)	In wet meadows, swamps, ditches, edges of sloughs, lakes, ponds and mud of streams
Blunt broom sedge (<u>Carex tribuloides</u>)	In swampy or low wet meadows and woods of alluvial soils
Saw-grass (<u>Cladium jamaicense</u>)	Often associated with <u>Panicum dichotomum</u> in freshwater marshes
Royal flatsedge (<u>Cyperus elegans</u>)	In moist calcareous soil, edges of lakes, ponds, and tanks, and wet gravel creek beds
Redroot flatsedge (<u>Cyperus erythrorhizos</u>)	Abundant in marshy places, sand flats, and in shallow water of lakes and ponds
Chufa (<u>Cyperus esculentus</u>)	Abundant in disturbed loamy or sandy soils, and in shallow waters of lakes and ponds
Nutgrass (<u>Cyperus haspan</u>)	Freshwater marsh; scrub/shrub
Rice field flatsedge (<u>Cyperus iria</u>)	Wet clay in coastal rice-growing areas, in water of freshwater canals, and on edge of ponds
Pond flatsedge (<u>Cyperus ochraceus</u>)	Abundant in shallow water and mud, and edge of lakes and ponds
Fragrant flatsedge (<u>Cyperus odoratus</u>)	In mud of swamps, ditches and streams, and at edges of lakes and creeks
Sharpscale flatsedge (<u>Cyperus oxylepis</u>)	Infrequent in coastal areas of Texas and Louisiana
Strawcolored flatsedge (<u>Cyperus strigosus</u>)	Freshwater marsh; scrub/shrub; intermediate marsh
Southern flatsedge (<u>Cyperus thysiflorus</u>)	Rare in rich loam and shaded river woods
Green flatsedge (<u>Cyperus virens</u>)	Abundant in moist places, in shallow water, and on edges of lakes, ponds, and streams

Species	Habitat Types
Narrow-leaf whitetop (<u>Dichromena colorata</u>)	Swales, ditches and wet places
Creeping spike-rush (<u>Eleocharis fallax</u>)	Freshwater marsh
Yellow spike-rush (<u>Eleocharis flavescens</u>)	Freshwater marsh
Small fruit spike-rush (<u>Eleocharis microcarpa</u>)	On sandy loams, in mud and shallow water of ponds and streams, and depressions in savannass
Sand spike-rush (<u>Eleocharis montevidensis</u>)	In moist soil, in shallow water streams and ponds, and in wet granitic sands
Common spike-rush (<u>Eleocharis palustris</u>)	Marshes, veranl pools, wet meadows, ditches, flooded lands, and alkaline mud
Hairy-umbrella sedge (<u>Fuirena squarrosa</u>)	Freshwater marsh; scrub/shrub
Short-bristle horned beak sedge (<u>Rhynchospora corniculata</u>)	Frequent in mud, on edge of lakes, and along edge of swamps
Chairmaker's bulrush (<u>Scirpus americanus</u>)	Low often moist ground, in water and near seepage areas
California bulrush (<u>Scirpus californicus</u>)	Sedge association in freshwater marsh
Woolgrass (<u>Scirpus cyperinus</u>)	Wet or boggy places, in water and muddy places
Drooping bulrush (<u>Scirpus lineatus</u>)	Meadows, swales, edge of lakes and ponds, and in low wettish thickets
Rufous bulrush (<u>Scirpus pendulus</u>)	Marshes and ditches
Dwarf Palmetto (<u>Sabal minor</u>)	Mixed deciduous hardwood
Green dragon (<u>Arisaema dracontium</u>)	Rich wet woodlands and alluvial soils in woods and thickets

Species	Habitat Types
Elephant's ear (<u>Colocasia antiquorum</u>)	Along streams in freshwater marshes
Water-lettuce (<u>Pistia stratiotes</u>)	Freshwater marsh
Duckweed (<u>Lemna minor</u>)	Freshwater marsh; scrub/shrub; intermediate marsh
Great duck weed (<u>Spirodela polyrhiza</u>)	Freshwater marsh
Water-meal (<u>Wolffia colombiana</u>)	Wooded swamp
Sword bogmat (<u>Wolffiella gladiata</u>)	Freshwater marsh
Tongue-shaped bogmat (<u>Wolffiella lingulata</u>)	Freshwater marshes and ponds
Spanish moss (<u>Tillandsia usneoides</u>)	Within trees on old spoil banks
Climbing dayflower (<u>Commelina diffusa</u>)	In floodplain woods, stream beds, and wet clays about ponds
Whitemouth dayflower (<u>Commelina erecta</u>)	Dry, usually sandy soils
Virginia dayflower (<u>Commelina virginica</u>)	In low woods and in water of pools
Bluejacket (<u>Tradescantia ohiensis</u>)	In wet meadows, prairies and thickets
Water hyacinth (<u>Eichhornia crassipes</u>)	Freshwater marsh
Pickerel weed (<u>Pontederia cordata</u>)	Freshwater marsh
Soft rush (<u>Juncus effusus</u>)	Freshwater marsh

Species	Habitat Types
Poverty rush (<u>Juncus tenuis</u>)	Wet sands in woods, in wet soils on edge of ponds, lakes and streams
Meadow garlic (<u>Allium canadense</u>)	Roadsides, wet meadows, woods and fields
Swamp lily (<u>Crinum americanum</u>)	Swamps, marshes, edge of water in ditches and lakes
Carolina spiderlily (<u>Hymenocallis occidentalis</u>)	In wet sandy areas, meadows, swamps and marshes
Yellow star-grass (<u>Hypoxis</u>)	Wet woods, swamps, bottomlands
Crow poison (<u>Nothoscordum bivalve</u>)	Usually in moist soils in prairies and open woods
Fringed greenbriar (<u>Smilax bona-nox</u>)	Most abundant in cut-over habitats
Chinaroot (<u>Smilax hispida</u>)	Alluvial woods, swamp forests and stream banks
Horsebriar (<u>Smilax rotundifolia</u>)	Deciduous woods and usually moist thickets
Copper iris (Red-flag) (<u>Iris fulva</u>)	In marshes and wet meadows, ditches and on stream banks
Giant blue iris (<u>Iris giganticaerulea</u>)	Freshwater habitats
Pale-yellow iris (<u>Iris pseudacorus</u>)	Ponds and open woods
Annual blue-eyed grass (<u>Sisyrinchium rosulatum</u>)	Lawns, meadows, and roadsides
Indian shot (<u>Canna flaccida</u>)	About lakes and in marshes and swamps along the coast
Green fly orchid (<u>Epidendrum conopseum</u>)	Found on magnolia, tupelo gum, and some oaks on the trunks in shady areas

Species	Habitat Types
Water-spider orchid (<u>Habenaria repens</u>)	In streams, ditches, swamps, on the margins of ponds and lakes
Marsh ladies tresses (<u>Spiranthes odorata</u>)	Stoloniferous colonies in water and mud of swamps, marshes, and along wooded streams
Lizard's tail (<u>Saururus cernuus</u>)	In water or muddy soils of lakes, swamps, and streams
Eastern cottonwood (<u>Populus deltoides</u>)	Along water courses, near dwellings, roadsides, and in deep alluvial soils
Black willow (<u>Salix nigra</u>)	Old spoil banks; young spoil banks; power line corridors
Southern waxmyrtle (<u>Myrica cerifera</u>)	Cypress-tupelo; young spoil banks; power line corridors; freshwater marsh in isolated stands; scrub/shrub
Pecan (<u>Carya illinoensis</u>)	Orchard within the park
Water hickory (<u>Carya aquatica</u>)	Swamps and floodplains
American hornbeam (<u>Carpinus caroliniana</u>)	Stream banks and low woods
Laurel oak (<u>Quercus laurifolia</u>)	Low ground and sandy soils
Water oak (<u>Quercus nigra</u>)	Mixed deciduous hardwood; old spoil banks
Texas red oak (<u>Quercus texana</u>)	Bottomlands
Live oak (<u>Quercus virginiana</u>)	Mixed deciduous hardwood; old spoil banks
Sugar-berry (<u>Celtis laevigata</u>)	Mixed deciduous hardwood; old spoil banks
Water elm (<u>Planera aquatica</u>)	Mixed deciduous hardwood

Species	Habitat Types
American elm (<u>Ulmus americana</u>)	Mixed deciduous hardwood; usually in moist, fertile soil
Sliperry elm (<u>Ulmus rubra</u>)	Moist woods
White mulberry (<u>Morus alba</u>)	About dwellings, in pastures and occasionally along streams
Black mulberry (<u>Morus nigra</u>)	Near dwellings, roadsides and disturbed areas
Red mulberry (<u>Morus rubra</u>)	Rich woods
Bog hemp (<u>Boehmeria cylindrica</u>)	Scrub/shrub
Canadian clear weed (<u>Pilea pumila</u>)	In moist or wet, rich soils of woods
Heartleaf nettle (<u>Urtica chamaedryoides</u>)	Moist woods and thickets
Christmas mistletoe (<u>Phoradendron tomentosum</u>)	Widely distributed in hardwood trees
American buckwheat vine (<u>Brunnichia ovata</u>)	Woods near streams, lakes and ponds
Southern smartweed (<u>Polygonum densiflorum</u>)	Freshwater marsh
Swamp smartweed (<u>Polygonum hydropiperoides</u>)	In marshes, wet meadows, in and on the edge of water of streams, ponds and lakes
Dotted smartweed (<u>Polygonum punctatum</u> var. <u>punctatum</u>)	Freshwater marsh; intermediate marsh; scrub/shrub
Bushy knotweed (<u>Polygonum ramosissimum</u>)	In marshes, edge of streams, ponds and lakes, and seasonally wet areas
Bog smartweed (<u>Polygonum setaceum</u> var. <u>setaceum</u>)	In marshes, wet meadows, in and on the edge of water of streams, ponds and lakes

Species	Habitat Types
Jumpseed (<u>Polygonum virginianum</u>)	In water or in seepage along streams and about lakes, and in low, rich woodlands
Curly dock (<u>Rumex crispus</u>)	In shallow water of streams, about ponds and lakes, and commonly in seasonally wet places
Fiddle dock (<u>Rumex pulcher</u>)	In mud at edge of lakes and ponds, bogs and muddy areas
Swamp dock (<u>Rumex verticillatus</u>)	Wet meadows, in water of ponds, swamps, marshes, and along edges of streams
Alligator Weed (<u>Alternanthera phileroxoides</u>)	Freshwater marsh; intermediate marsh; scrub/shrub
Southern amaranth (<u>Amaranthus australis</u>)	In salt and marshy places
American pokeweed (<u>Phytolacca americana</u>)	In rich low ground, especially in recent clearings and along roadsides in and about depressions
Rouge plant (<u>Rivina humilis</u>)	Disturbed sites, sandy soils, dunes and hammocks
Little hogweed (<u>Portulaca oleracea</u>)	On grassy slopes, moist waste areas, floodlands, dunes, and in salt marshes
Sticky chickweed (<u>Cerastium glomeratum</u>)	Fields, roadsides, and waste places
Common chickweed (<u>Stellaria media</u>)	Cultivated areas, meadows, and woodlands
Carolina fanwort (<u>Cabomba caroliniana</u>)	In lakes, ponds and quiet streams
American white waterlily (<u>Nymphaea odorata</u>)	In ponds, lakes, slow streams and ditches
Coontail (<u>Ceratophyllum demersum</u>)	Freshwater marsh; intermediate marsh
Swamp leather flower (<u>Clematis crispa</u>)	Wet soils, climbing on shrubs, along streams and low woodlands

Species	Habitat Types
Sweet autumn virgin's bower (<u>Clematis terniflora</u>)	Waste places
Devil's darning needles (<u>Clematis virginiana</u>)	Low woods and stream banks
Prairie buttercup (<u>Ranunculus platensis</u>)	Introduced species of disturbed areas
Low spearwort (<u>Ranunculus pusillus</u>)	In shallow water and mud of ditches, marshes, bogs, seepage areas and ponds
Celery-leaf buttercup (<u>Ranunculus sceleratus</u>)	Borders of lakes, streams and marshland, often thriving in brackish or alkaline sites
Three-lobed buttercup (<u>Ranunculus trilobus</u>)	Old fields, waste places and lawns
Purple meadow rue (<u>Thalictrum dasycarpum</u>)	Meadows, swamps and damp thickets, on rich wooded slopes or along wooded streams
Southern magnolia (<u>Magnolia grandiflora</u>)	Swamp forests, maritime forests and low woods
Camphor tree (<u>Cinnamomum camphora</u>)	Mixed deciduous hardwood
Redbay (<u>Persea borbonia</u>)	In woods, swamps, along streams and about seashores
Sassafras (<u>Sassafras albidum</u>)	Fence rows, woodland margins and old fields
Bluestem prickly poppy (<u>Argemone albiflora</u>)	Dry, open, often sandy places
Pennsylvania bittercress (<u>Cardamine pensylvanica</u>)	In swamps and wet woods, about springs, in seepage areas and along streams
Virginia pepperweed (<u>Lepidium virginicum</u>)	Dry or moist soil, fields, gardens and roadsides
Northern marsh yellowcress (<u>Rorippa islandica</u>)	Low, wet mostly open habitats

Species	Habitat Types
Sweetgum (<u>Liquidambar styraciflua</u>)	Mixed deciduous hardwood; Cypress-tupelo; old spoil banks; power line corridors
American sycamore (<u>Plantanus occidentalis</u>)	Low woods
Green hawthorn (<u>Crataegus viridis</u>)	Mixed deciduous hardwood
Indian strawberry (<u>Duchesnea indica</u>)	Edge of low woods and thickets, seepage areas and marshes, along roadsides, and in old fields
White avens (<u>Geum canadense</u>)	In swamps, in mud at edge of lakes and streams, and in moist rich woods
Black cherry (<u>Prunus serotina</u>)	Woodlands, pastures, and fence rows
Southern dewberry (<u>Rubus trivialis</u>)	Chiefly in dry or sandy soils
Coastal scrub wattle (<u>Acacia smallii</u>)	Poorly drained and flooded areas
Indian joint-vetch (<u>Aeschynomene indica</u>)	Wet coastal areas
Spurred butterfly pea (<u>Centrosema virginianum</u>)	Dry sandy woods and barrens
Sleeping plant (<u>Chamaecrista fasciculata</u>)	Open often disturbed habitats
Prairie bundleflower (<u>Desmanthus illinoensis</u>)	Moist or dry soil, river-banks, prairies and pastures
Hoary tick-trefoil (<u>Desmodium canescens</u>)	Moist or dry soil
Dillenius' tick-trefoil (<u>Desmodium glabellum</u>)	Dry woods
Smooth tick-trefoil (<u>Desmodium laevigatum</u>)	Dry upland woods

Species	Habitat Types
Panicled-leaf tick-trefoil (<u>Desmodium paniculatum</u>)	Dry woods
Honey locust (<u>Gleditsia tricanthos</u>)	Woods and wooded borders
Sour clover (<u>Melilotus indica</u>)	Introduced annual throughout the region
Powderpuff (<u>Mimosa strigillosa</u>)	Abundant in the Mississippi floodplain, prairie, and second growth pine land
Kudzu (<u>Pueraria lobata</u>)	Roadsides, woods and fields
Least snoutbean (<u>Rhynchosia minima</u>)	Disturbed sites
Black locust (<u>Robinia pseudoacacia</u>)	Woods and thickets
Poison bean (<u>Sesbania drummondii</u>)	Rice fields, wet pastures and ditches
Peatree (<u>Sesbania exaltata</u>)	Ditches, fields and freshwater marsh
Purple river hemp (<u>Sesbania punicea</u>)	Roadsides, ditches and waste places
Trailing fuzzy-bean (<u>Strophostyles helvula</u>)	Beaches, open woods and clearings
Crimson clover (<u>Trifolium incarnatum</u>)	Fields and roadsides
Red clover (<u>Trifolium pratense</u>)	Fields and roadsides
White clover (<u>Trifolium repens</u>)	Wet meadows, marshes, and in wet soil about ponds and along streams
Reversed clover (<u>Trifolium resupinatum</u>)	Lawn weed

Species	Habitat Types
Louisiana vetch (<u>Vicia ludoviciana</u>)	Rich woodlands and thickets
Piedmont cow-pea (<u>Vigna luteola</u>)	Freshwater marsh; intermediate marsh
Chinese wisteria (<u>Wisteria sinensis</u>)	Frequently cultivated and escaping into open woods and roadsides
Carolina crane's-bill (<u>Geranium carolinianum</u>)	Common weed of disturbed habitats including gardens, fields, pastures and roadsides
Pink wood-sorrel (<u>Oxalis corymbosa</u>)	Locally cultivated and escaped to disturbed areas
Dillen's oxalis (<u>Oxalis dillenii</u>)	Lawns, gardens, fields and waste places
Chinaberry tree (<u>Melia azedarach</u>)	Commonly cultivated, often on woodland borders and in disturbed habitats
Virginia three-seed mercury (<u>Acalypha virginica</u> var. <u>rhomboidea</u>)	Thinly wooded habitats and disturbed ground
Heartleaf sandmat (<u>Chamaesyce cordifolia</u>)	Pine-oak woods
Pillpod sandmat (<u>Chamaesyce hirta</u>)	Meadows and open woods
Spotted sandmat (<u>Chamaesyce maculata</u>)	Meadows and open woods
Eyebane (<u>Chamaesyce nutans</u>)	Dry or moist soil
Prostrate sandmat (<u>Chamaesyce prostrata</u>)	Crevices of sidewalks and waste places
Chamber bitterweed (<u>Phyllanthus urinaria</u>)	Commonly cultivated and in disturbed habitats
Chinese tallow tree (<u>Sapium sebiferum</u>)	Species that grows well in a variety of habitats from wetlands to sands

Species**Habitat Types**

Greater water-starwort (<u>Callitriche heterophylla</u>)	Pools, low gradient streams, bayous and ditches
Eastern poison ivy (<u>Toxicodendron radicans</u>)	Stream bottoms and swampy lowlands
Dahoon (<u>Ilex cassine</u>)	Swamps, cypress ponds and near bays
Possumhaw (<u>Ilex decidua</u>)	In woods often bordering streams, ravines, and swamps
Yaupon (<u>Ilex vomitoria</u>)	In low woods, hammocks, and sandy pine lands; occasionally in swamps and floodplains
Boxelder (<u>Acer negundo</u>)	Mixed deciduous hardwood and stream banks
Red maple (<u>Acer rubrum</u> ssp. <u>drummondii</u>)	Mixed deciduous hardwood; cypress-tupelo; old spoil banks; scrub/shrub
Love in a puff (<u>Cardiospermum halicacabum</u>)	Exotic escaped from cultivation that grows in moist thickets to shaded disturbed habitats
Goldenrain tree (<u>Koeleruteria paniculata</u>)	Often cultivated and found growing in disturbed habitats
Alabama supplejack (<u>Berchemia scandens</u>)	Swamps and wet woods chiefly on the coastal plain
Peppervine (<u>Ampelopsis arborea</u>)	Along streams, in and on edge of forest swamps, and in waste places
Heartleaf peppervine (<u>Ampelopsis cordata</u>)	In rich woodlands and bottomlands along rivers and streams
Virginia creeper (<u>Parthenocissus quinquefolia</u>)	Moist soil
Graybark grape (<u>Vitis cinerea</u>)	River and creek banks, in marshes, about lakes, bottomlands, and pond margins
Muscadine (<u>Vitis rotundifolia</u>)	Moist soil

Species	Habitat Types
Halberd-leaf rose-mallow (<u>Hibiscus laevis</u>)	Marshes, and shallow water of ponds and streams
Crimson-eyed rosemallow (<u>Hibiscus moscheutos</u> ssp. <u>lasiocarpus</u>)	In marshes and low wet areas on the edges of woods, ditches and along low gradient streams
Salt-Marsh Mallow (<u>Kosteletzkya virginica</u>)	Freshwater marsh; intermediate marsh
Three-lobed false mallow (<u>Malvastrum coromandelianum</u>)	Weed of disturbed sites
Carolina bristlemallow (<u>Modiola caroliniana</u>)	In water and mud on edge of lakes and in salt marshes, and lawns
Cuban jute (<u>Sida rhombifolia</u>)	In sandy-clayey soils in meadows, brushlands, low open woods and alluvial soils
St. Andrew's Cross (<u>Hypericum hypericoides</u> var. <u>hypericoides</u>)	Mostly in light sandy soils in open pine-hardwood and hardwood forests; also in thickets and bogs
Greater Marsh St. Johnswort (<u>Triadenum walteri</u>)	In or on the edge of water along streams, in bogs and swamps, and about ponds and lakes
Primrose-leaved violet (<u>Viola primulifolia</u>)	Pond and stream margins, bogs, savannas, ditches, thickets and low wet woods
Southern coastal violet (<u>Viola septemloba</u>)	Wet lowland forests, often by streams, swamps, and pine savannas
Hooded blue violet (<u>Viola sororia</u>)	Alluvial woods and wooded slopes
Purple passion flower (<u>Passiflora incarnata</u>)	Fields, roadsides fence rows, and thickets
Yellow passion flower (<u>Passiflora lutea</u>)	Mixed deciduous woodlands and thickets
Valley redstem (<u>Ammannia coccinea</u>)	In mud of ditches, ponds, marshes, lakes and streams
Columbian waxweed (<u>Cuphea carthagenensis</u>)	On edge of low wet woods and swamps

Species**Habitat Types**

Winged lythrum (<u>Lythrum alatum</u> var. <u>lanceolatum</u>)	Meadows, prairies, marshes, about lakes and ponds, ditches and depressions
Wing-leaf primrose willow (<u>Ludwigia decurrens</u>)	Swamps and shallow water
Anglestem waterprimrose (<u>Ludwigia leptocarpa</u>)	Freshwater marsh; scrub/shrub
Mexican primrose willow (<u>Ludwigia octovalvis</u>)	In swamps, marshes and other wet places
Uruguayan water-primrose (<u>Ludwigia uruguayensis</u>)	Freshwater marsh
King's-cureall (<u>Oenothera biennis</u>)	Fields and waste places
Pinkladies (<u>Oenothera speciosa</u>)	Roadsides and dry open places
Parrot's-feather (<u>Myriophyllum aquaticum</u>)	Pools, lakes, ponds, bayous and ditches
Devil's-walkingstick (<u>Aralia spinosa</u>)	Upland and low woods, marshes and savannas
Hairy fruit chervil (<u>Chaerophyllum tainturieri</u>)	In prairies, wet woodlands, and alluvial thickets
Spotted water hemlock (<u>Cicuta maculata</u> var. <u>maculata</u>)	In swamps and other wet places
Umbrella pennywort (<u>Hydrocotyle umbellata</u>)	Freshwater marsh; scrub/shrub; intermediate marsh
Whorled marsh pennywort (<u>Hydrocotyle verticillata</u>)	In open marshes and wet areas
Carolina grasswort (<u>Lilaeopsis attenuata</u>)	Open mud flats of fresh water marshes
Herbwilliam (<u>Ptilimnium capillaceum</u>)	Open bottom land, marshes, low pastures and wet roadsides ditches

Species	Habitat Types
Canadian black snake root (<u>Sanicula canadensis</u>)	Mixed deciduous woods, road banks, fence rows, and waste places
Roughleaf dogwood (<u>Cornus drummondii</u>)	Mixed deciduous hardwoods
Water tupelo (<u>Nyssa aquatica</u>)	Cypress-Tupelo
Scarlet pimpernel (<u>Anagallis arvensis</u>)	Wet sands in prairies and flat lands
Seaside brook-weed (<u>Samolus valerandi</u> ssp. <u>parviflorus</u>)	In wet soils and about various types of wet rocks, along streams and in marshes
Buckthorn bully (<u>Sideroxylon lycioides</u>)	Low woods, thickets, and river banks
Common persimmon (<u>Diospyros virginiana</u>)	Dry deciduous forests, pine lands, and old fields
American snowbell (<u>Styrax americanus</u>)	Swamp forests, alluvial woods, and stream banks
Carolina Ash (<u>Fraxinus caroliniana</u>)	Low woods, swamps and along rivers
Green ash (<u>Fraxinus pennsylvanica</u>)	Mixed deciduous hardwood; cypress-tupelo
Pumpkin ash (<u>Fraxinus profunda</u>)	Low woods, usually in swamps and along rivers
Japanese privet (<u>Ligustrum japonicum</u>)	Waste places
Glossy privet (<u>Ligustrum lucidum</u>)	Waste places and field borders
Lax hornpod (<u>Mitreola petiolata</u>)	In moist soil in seepage, along ditches and streams, in mud of marshes and swamps, and about ponds and lakes
Juniper-leaf (<u>Polyprenum procumbens</u>)	Old fields, thin woodlands, roadsides and waste places

Species	Habitat Types
Coastal rose-gentian (<u>Sabatia calycina</u>)	Ditches and shaded river swamps and bottoms
Aquatic milkweed (<u>Asclepias perennis</u>)	Low swampy ground, frequently with bald cypress, alluvial woods, sloughs and ditches
Angular-fruit milk vine (<u>Matelea gonocarpa</u>)	Rich woods and thickets
Carolina pony's foot (<u>Dichondra carolinensis</u>)	Damp open ground, in mud on edge of lakes and ponds, edge of swamps and marshes, and lawns
Morning glory (<u>Ipomoea</u> X <u>leucantha</u>)	Cultured hybrid that escapes to disturbed habitats
Redstar (<u>Ipomoea coccinea</u>)	Cultivated and fallow fields, roadsides and waste places
Tie-vine (<u>Ipomoea cordatotriloba</u> var. <u>cordatotriloba</u>)	Thickets, fields, wet depressions and flats, roadsides and disturbed ground
Salt-marsh morning glory (<u>Ipomoea sagittata</u>)	Freshwater marsh; intermediate marsh
Hairy clustervine (<u>Jacquemontia tamnifolia</u>)	Cultivated fields and roadsides
Small-flower baby-blue-eyes (<u>Nemophila aphylla</u>)	Damp rich woods
Salt heliotrope (<u>Heliotropium curassavicum</u>)	In sandy soil along beaches, about ponds, and saline flats
Tuberous gromwell (<u>Lithospermum tuberosum</u>)	Mixed deciduous forests
Largeseed forget-me-not (<u>Myosotis macrosperma</u>)	Moist woods
American beauty berry (<u>Callicarpa americana</u>)	Woods, moist thickets, wet slopes, low rich bottomlands and edge of swamps
Hedgeflower (<u>Lantana camara</u>)	Escaped cultured species found on roadsides and waste places

Species	Habitat Types
Turkey-tangle frog-fruit (<u>Phyla nodiflora</u>)	Wet or moist soil, fields, thickets and beaches
Brazilian vervain (<u>Verbena brasiliensis</u>)	Waste places, dry sandy soil, coastal prairies, in swamps and marshes and seepy banks of ponds
Tuberous vervain (<u>Verbena rigida</u>)	Widespread throughout the south on waste grounds and roadsides
White vervain (<u>Verbena utricifolia</u>)	Low rich or open woods, wet meadows, thickets, river floodplains, pastures and stream sides
Giraffehead (<u>Lamium amplexicaule</u>)	Pastures, fields, roadsides, lawns and waste places
Motherwort (<u>Leonurus cardiaca</u>)	Pastures, roadsides and waste places
Taperleaf water-horehound (<u>Lycopus rubellus</u>)	In marshes, swamps, bogs, meadows, ditches, seepage areas and shallow water
Virginia water-horehound (<u>Lycopus virginicus</u>)	Alluvial thickets along streams, sloughs, and lakes, wet meadows, and along ditches
Blood sage (<u>Salvia coccinea</u>)	Disturbed sites
Lyre-leaf sage (<u>Salvia lyrata</u>)	Roadsides, meadows and open wood lands
Mousesear (<u>Stachys crenata</u>)	In shaded rocky or gravelly soils in woods, ravines, prairies, and in mud on edge of ponds and lakes
Smooth hedge-nettle (<u>Stachys tenuifolia</u>)	Rich bottomlands, lake shores, muddy bayous, swamps, marshes, low woods and wet meadows
Seaside-petunia (<u>Calibrachoa parviflora</u>)	In moist or wet soil in streambeds, near lakes, shallow streams, along beaches and muddy flats
Cutleaf ground-cherry (<u>Physalis angulata</u>)	Common weed in cultivated fields, roadsides, and fence rows
American black night shade (<u>Solanum americanum</u>)	A weed in disturbed habitats

Species	Habitat Types
Carolina horsenettle (<u>Solanum carolinense</u>)	Fields and waste places; especially in sandy soil
Purple false fox-glove (<u>Agalinis purpurea</u>)	Moist sandy soil in bogs, seepage areas, moist prairies, open pinelands, and barrens along shores
Herb-of-grace (<u>Bacopa monnieri</u>)	Freshwater marsh; intermediate marsh; scrub/shrub
Japanese mazus (<u>Mazus japonicus</u>)	Lawns, roadsides, and wet bottom lands
Axilflower (<u>Mecardonia acuminata</u>)	In ditches, bogs, wet depressions, swamps, and pine flatlands
Baby jump up (<u>Mecardonia vandellioides</u>)	In mud and water of ditches, lagoons, ponds and streams, and in moist soils of depressions
Sharpwing monkey flower (<u>Mimulus alatus</u>)	In wet areas, about lakes and in marshes, and in wet mud of ponds
Oilfield-toadflax (<u>Nuttallanthus canadensis</u>)	Fallow fields, roadsides and waste places
Wand mullein (<u>Verbascum virgatum</u>)	Sand hills, sandy roadsides and waste places
Necklace weed (<u>Veronica peregrina</u>)	In water of tanks and streams, open flatwoods, swamps, marshes and wet meadows
Birdeye speedwell (<u>Veronica persica</u>)	Gardens, lawns, roadsides, and waste places
Crossvine (<u>Bignonia capreolata</u>)	Moist woods
Trumpet creeper (<u>Campsis radicans</u>)	Moist woods, fence rows, and road sides
Humped bladderwort (<u>Utricularia gibba</u>)	Freshwater marsh
Gulf Swampweed (<u>Hygrophila lacustris</u>)	Freshwater marsh; scrub/shrub

Species	Habitat Types
Lance-leaved water willow (<u>Justicia ovata</u> var. <u>lanceolata</u>)	In wet and swampy grounds and edge of water in low woods and marshes
Britton's wild petunia (<u>Ruellia brittoniana</u>)	Waste places
Violet wild petunia (<u>Ruellia nudiflora</u>)	Cultivated species that is found in disturbed areas
Common plantain (<u>Plantago major</u>)	In marshes, wet meadows, in water on edge of streams, ponds, and lakes, and wet gravel bars along streams
Common buttonbush (<u>Cephalanthus occidentalis</u>)	Freshwater marsh
Virginia buttonweed (<u>Diodia virginiana</u>)	In swamps, wet meadows, marshes, coastal prairies and in mud along streams and about ponds
Sticky-willy (<u>Galium aparine</u>)	In rich woods, thickets, prairies, seashores and waste ground, and in seepage along streams
Stiff marsh bedstraw (<u>Galium tinctorium</u>)	Freshwater marsh; intermediate marsh
Japanese Honeysuckle (<u>Lonicera japonica</u>)	Floodplain woods
Common elderberry (<u>Sambucus canadensis</u>)	Swamp forests, alluvial woods and pastures
Narrow-cell cornsalad (<u>Valerianella stenocarpa</u>)	Low moist places
Texas gourd (<u>Cucurbita texana</u>)	In debris and piles of driftwood, often climbing into trees, and along rivers
Guadalupe cucumber (<u>Melothria pendula</u>)	In sandy and moist rich soils, wettish thickets, banks and canals of streams, and near the coast
Cardinal-flower (<u>Lobelia cardinalis</u>)	In wet or moist soil, open places along streams, in meadows and along roadsides, about springs and ponds, in swamps where shade is not too dense

Species**Habitat Types**

Clasping-leaf Venus'-looking-glass
(Triodanis perfoliata)

Roadsides, fields and gardens

Clasping-leaf Venus'-looking glass
(Triodanis perfoliata var. biflora)

Roadsides, fields and gardens, but less frequent than preceding species

Opposite-leaf spotflower
(Acmella americana)

In mud along streams, bayous, lakes and ditches

White snake root
(Ageratina altissima var. altissima)

Rich woods usually mesic

Annual ragweed
(Ambrosia artemisiifolia)

Fields, roadsides, pastures and waste places

Western ragweed
(Ambrosia cumanensis)

Along streams, roadsides, uncultivated lands, and marshy flats; abundant on the coastal plain

Giant ragweed
(Ambrosia trifida)

Abundant in seasonally moist stream bottoms, and overflow areas

Calico aster
(Aster lateriflorus)

In swamps, wet depressions in prairies, borders of streams, ponds and sloughs

Willowleaf aster
(Aster praealtus)

In marshes, seepages in wet meadows, prairie swales, ditches, and moist banks

Annual saltmarsh aster
(Aster subulatus var. ligulatus)

In shallow water of ditches and pools, wet mud flats, marshes and floodplains and in the coastal saline marshes

Perennial saltmarsh aster
(Aster tenuifolius)

Brackish marshes; scrub/shrub

Groundsel-tree
(Baccharis halimifolia)

Power line corridors

Spanish-needles
(Bidens bipinnata)

In rich alluvial soils and other wet places

Smooth beggar tick
(Bidens laevis)

Scattered near and in water of sloughs, lakes, and streams, in marshes and wet meadows

Hairy beggarticks
(Bidens pilosa)

Waste places

Species	Habitat Types
Straggler daisy (<u>Calyptracarpus vialis</u>)	Frequent in low, wet woods at the water's edge of low gradient streams and bayous
Yellow thistle (<u>Cirsium horridulum</u>)	In wet meadows and depressions, edge of streams and seepage areas
Clasping-coneflower (<u>Dracopis amplexicaulis</u>)	Moist or wet places
False daisy (<u>Eclipta alba</u>)	In the mud at edges of freshwater bodies
Carolina elephant's foot (<u>Elephantopus carolinianus</u>)	Dry woods
Philadelphia fleabane (<u>Erigeron philadelphicus</u>)	In many habitats but usually bogs and marshes
Dog-fennel (<u>Eupatorium capillifolium</u>)	Open places, often in fields and pastures
Blue mist-flower (<u>Eupatorium coelestinum</u>)	In moist wooded sandy areas, edges of ponds, along streams and in seepage areas
Late flowering thorough-wort (<u>Eupatorium serotinum</u>)	Mostly in bottomlands and moist woods; sometimes in drier open places
Firewheel (<u>Gaillardia pulchella</u>)	Sandy fields, roadsides and beach dunes
Purple-head (<u>Helenium flexuosum</u>)	Alluvial pastures, wet meadows, and ditches
Sump Weed (<u>Iva frutescens</u>)	Young spoil banks; brackish marshes, particularly along drainage ditches
Annual marsh elder (<u>Iva annua</u>)	Fields
Potato dwarf-dandelion (<u>Krigia dandelion</u>)	Roadsides, fields, pastures, lawns and waste places
Canada lettuce (<u>Lactuca canadensis</u>)	In marshes, alluvial thickets, muddy seepage banks, and on sandy gravel bars along streams

Species	Habitat Types
Woodland lettuce (<u>Lactuca floridana</u>)	Along streams, in wet thickets and alluvial woods, swampy grounds, and wet sands
Climbing hemp vine (<u>Mikania scandens</u>)	Frequent in river bottoms and other moist woods, and swampy back waters
Santa Maria feverfew (<u>Parthenium hysterophorus</u>)	Waste places
Sweet scent (<u>Pluchea odorata</u>)	Brackish marshes
Carolina desert chicory (<u>Pyrrhopappus carolinianus</u>)	Fields, dry woods, and bottomlands
Cress-leaf ragwort (<u>Senecio glabellus</u>)	Moist or wet shady places
Hairy leaf-cup (<u>Smallanthus uvedalia</u>)	Woods and meadows on the coastal plain
Canadian goldenrod (<u>Solidago canadensis</u> var. <u>scabra</u>)	Freshwater marsh, old fields, pastures and meadows
Seaside goldenrod (<u>Solidago sempervirens</u>)	Frequent in marshy often slightly brackish swales and ditches
Spiny-leaf sow-thistle (<u>Sonchus asper</u>)	Roadsides, fields, pastures and waste places
White crownbeard (<u>Verbesina virginica</u>)	Old fields, pastures, meadows, road banks and wooded slopes
Giant iron weed (<u>Veronia gigantea</u>)	Swamp forests and marshes
Rough cocklebur (<u>Xanthium strumarium</u>)	Low marshy lands and mud flats about lakes
Oriental false hawk's beard (<u>Younga japonica</u>)	Moist open places

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APPENDIX 2. FISH SPECIES OF KNOWN OR PROBABLE OCCURANCE IN JEAN LAFITE NATIONAL HISTORICAL PARK AND PRESERVE IN JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA

Species	Habitat
Atlantic stingray* (<u>Dasyatis sabina</u>)	From the inshore Gulf shelf to freshwater
Alligator gar* (<u>Lepisosteus spatula</u>)	Larger lakes, rivers and brackish waters of the Gulf Coast
Longnose gar (<u>Lepisosteus osseus</u>)	Lakes, bayous, oxbows and river backwaters
Shortnose gar (<u>Lepisosteus platostomas</u>)	Lakes, oxbows and larger rivers
Spotted gar * (<u>Lepisosteus oculatus</u>)	Clear waters of lakes, bayous, oxbows and lotic backwaters
Bowfin* (<u>Amia calva</u>)	Swamps, sloughs, borrow pits, lakes, ditches and sluggish streams
Ladyfish* (<u>Elops saurus</u>)	Juveniles widespread in open water bays to freshwater
American eel* (<u>Anguilla rostrata</u>)	Males near coastal waters, while females ascend to the source of most river systems
Gulf menhaden* (<u>Brevoortia patronus</u>)	Widespread from fresh to saline water
Gizzard shad* (<u>Dorosoma cepedianum</u>)	Large rivers, reservoirs, lakes, swamps, floodwater pools and estuaries
Threadfin shad (<u>Dorosoma petenese</u>)	Large rivers, reservoirs and lakes
Bay anchovy* (<u>Anchoa mitchilli</u>)	Widespread in open bays and estuaries

Species	Habitat
Common carp* (<u>Cyprinus carpio</u>)	Reservoirs, lakes, sluggish streams, rivers and ditches
Golden shiner* (<u>Notemigonus crysoleucas</u>)	Lakes, ponds, sloughs, reservoirs and quiet pools of streams
River shiner (<u>Notropis blennius</u>)	Large rivers but avoiding areas of strong currents
Blacktail shiner (<u>Notropis venustus</u>)	From placid waters of lakes and bayous to swift waters of rivers and streams
River carpsucker (<u>Carpoides carpio</u>)	Impoundments, backwaters, oxbows and pools of low gradient streams
Bigmouth buffalo (<u>Ictiobus cyprinellus</u>)	Lakes, rivers, oxbows and sloughs
Smallmouth buffalo (<u>Ictiobus bubalus</u>)	Lakes, rivers, oxbows and large rivers
Spotted sucker (<u>Minytrema melanops</u>)	Larger impoundments to small creeks
Lake chubsucker (<u>Erimyzon sucetta</u>)	Lakes, bayous, oxbows and backwater pool areas of rivers and streams
Creek chubsucker (<u>Erimyzon oblongus</u>)	Smaller rivers, streams, creeks and rarely in impoundments
Blacktail redhorse (<u>Moxostoma poecilurum</u>)	Larger impoundments, streams and rivers
Black bullhead* (<u>Ameiurus melas</u>)	Farm ponds, lakes, oxbows and streams
Yellow bullhead * (<u>Ameiurus natalis</u>)	Farm ponds, lakes and backwaters of streams and rivers
Sea catfish (<u>Arius felis</u>)	Bays, large canals, bayous and marsh lakes

Species	Habitat
Blue catfish* (<u>Ictalurus furcatus</u>)	Lakes, ponds, bayous, canals and larger streams
Channel catfish* (<u>Ictalurus punctatus</u>)	Lakes, ponds, bayous, streams and rivers
Flathead catfish* (<u>Pylodictis olivaris</u>)	Reservoirs, large rivers, and low gradient streams
Redfin pickerel (<u>Esox americanus</u>)	Natural lakes, sloughs, borrow pits, ditches and sluggish steams
Chain pickerel (<u>Esox niger</u>)	Non flowing waters with abundant vegetation; complimentary species to the grass pickerel
Pirate perch * (<u>Aphredoderus sayanus</u>)	Sluggish waters of swamps, borrow pits, marshes over organic debris substrate
Atlantic needlefish* (<u>Strongylura marina</u>)	Bays, lakes to freshwater often ascending rivers
Sheephead minnow* (<u>Cyprinodon variegatus</u>)	Protected marsh waters and along shorelines
Golden topminnow* (<u>Fundulus chrysotus</u>)	Lentic environs along shores in backwaters and pools of slower moving streams and rivers
Starhead topminnow (<u>Fundulus notti</u>)	Lakes, ponds and quiet backwaters with streams
Marsh killifish* (<u>Fundulus confluentus</u>)	Protected marsh areas, bayous, canals, ditches and ponds
Gulf killifish* (<u>Fundulus grandis</u>)	Widespread in protected marshes and along shorelines
Bayou killifish* (<u>Fundulus pulvereus</u>)	Protected marsh areas, ditches, canals, and ponds
Saltmarsh killifish (<u>Fundulus jenkinsi</u>)	Protected marsh areas

Species	Habitat
Rainwater killifish* (<u>Lucania parva</u>)	Protected marsh areas and along shorelines
Blackspotted topminnow (<u>Fundulus olivaceus</u>)	Quiet waters near rooted aquatics or leaf litter
Blackstripe topminnow (<u>Fundulus notatus</u>)	Quiet waters near rooted aquatic plants
Mosquitofish* (<u>Gambusia affinis</u>)	Quiet waters of lakes, ponds, river back waters and oxbows among aquatic plants
Least killifish* (<u>Heterandria formosa</u>)	Fresh and brackish water swamps, bayous and roadside ditches with abundant vegetation
Sailfin molly* (<u>Poecilia latipinna</u>)	Marshes, lowland streams and swamps
Tidewater silverside* (<u>Menidia beryllina</u>)	Shorelines of bays and estuaries
Brook silverside (<u>Labidesthes sicculus</u>)	Lakes, bayous, oxbows, borrow pits, streams and rivers
Gulf pipefish (<u>Syngnathus scovelli</u>)	Along shorelines and areas with dense vegetation ascending into freshwater
Flier* (<u>Centrarchus macropterus</u>)	Lakes, bayous, ponds and swamps
Banded pygmy sunfish* (<u>Elassoma zonatum</u>)	Older ponds, lakes, borrow pits, bayous and lotic backwater with abundant aquatic plants
Green sunfish* (<u>Lepomis cyanellus</u>)	Lakes, ponds, bayous, rivers, oxbows and streams
Warmouth * (<u>Lepomis gulosus</u>)	Impoundments, bayous, oxbows, sloughs, swamps, and low gradient streams
Orangespotted sunfish* (<u>Lepomis humilis</u>)	Borrow pits, drainage ditches, small bayous and low gradient silty streams

Species	Habitat
Bluegill* (<u>Lepomis macrochirus</u>)	Lakes, ponds, bayous, oxbows and with aquatic vegetation
Dollar sunfish (<u>Lepomis marginatus</u>)	Pools of creeks, small to medium rivers and swamps over sand to mud bottoms
Longear sunfish (<u>Lepomis megalotis</u>)	Reservoirs, lakes, streams and rivers associated with aquatic vegetation
Redear sunfish* (<u>Lepomis microlophus</u>)	Lakes, ponds and protected pools in streams
Spotted sunfish* (<u>Lepomis punctatus</u>)	Lakes, bayous and streams with structure
Bantam sunfish* (<u>Lepomis symmetricus</u>)	Lakes, bayous and lotic backwaters associated with aquatic vegetation
Largemouth bass* (<u>Micropterus salmoides</u>)	Lakes, ponds, reservoirs, sluggish streams or river backwaters
Spotted bass (<u>Micropterus punctulatus</u>)	Lakes, reservoirs, streams and main channels of large rivers
White crappie (<u>Pomoxis annularis</u>)	Larger lakes, ponds, rivers and streams
Black crappie* (<u>Pomoxis nigromaculatus</u>)	Clearer lakes, rivers and streams
Freshwater drum (<u>Aplodinotus grunniens</u>)	Lakes, rivers and large impoundments
Spotted seatrout* (<u>Cynoscion nebulosus</u>)	Bayous and shallow marsh lakes in brackish to saline environments
Spot* (<u>Leiostomus xanthurus</u>)	Protected marsh waters as juveniles and spreading to open bays and estuaries as maturation progresses
Red drum* (<u>Sciaenops ocellata</u>)	Brackish to saline marshes, ponds and passes

Species**Habitat**

Striped mullet* (<u>Mugil cephalus</u>)	Widespread from brackish lakes and canals to freshwater ditches, bayous and streams
White mullet (<u>Mugil curema</u>)	Occasional inhabitant of open water areas and near shore typically as juveniles
Fat sleeper* (<u>Dormitator maculatus</u>)	Canals, ditches and bayous
Freshwater goby (<u>Gobionellus shufeldti</u>)	Widespread in fresh to brackish water
Naked goby (<u>Gobiosoma bosci</u>)	Widespread in fresh to brackish water
Southern flounder* (<u>Paralichthys lethostigma</u>)	Common over soft mud bottoms in bays
Hogchoker* (<u>Trinectes maculatus</u>)	Common in bays and shallow gulf

***Indicates that the species has been identified within the park**

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**APPENDIX 3. HERPETOFAUNAL SPECIES OF KNOWN OR PROBABLE OCCURRENCE
IN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE IN
JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA.**

Species	Habitat
Western lesser siren* (<u>Siren intermedia nettingi</u>)	Variety of shallow water habitats
Central newt* (<u>Notophthalmus viridescens louisianensis</u>)	Swales, swamplands and wooded ponds in river bottoms
Three-toed amphiuma* (<u>Amphiuma tridactylum</u>)	Any unpolluted, mucky place within its range
Two-toed amphiuma (<u>Amphiuma means</u>)	Ditches, sloughs, pools, ponds, rice fields, swamps, and streams
Smallmouth salamander* (<u>Ambystoma texanum</u>)	Any area where moisture is abundant
Southern dusky salamander* (<u>Desmognathus auriculatus</u>)	Below fall line around springs, swamps or muddy streams
Dwarf salamander* (<u>Eurycea quadridigitata</u>)	Under logs and debris in low, damp places
Gulf Coast toad* (<u>Bufo valliceps valliceps</u>)	Roadside ditches to barrier beaches
Fowler's toad* (<u>Bufo woodhouseii fowleri</u>)	In sandy areas around lakes or river valleys
Woodhouse's toad* (<u>Bufo w. woodhouseii</u>)	Marshes, swales, river bottoms, irrigated areas, and urban areas
Southern toad* (<u>Bufo terrestris</u>)	Bottomlands and uplands especially where sandy soils exist
Northern cricket frog* (<u>Acris c. crepitans</u>)	Edges of small, shallow streams and ponds

Species	Habitat
Spring peeper* (<u>Pseudacris crucifer</u>)	Marshes, swamps and pools on low bushes and grasses in wooded areas
Green tree frog* (<u>Hyla cinerea</u>)	Any place well supplied with water and dampness
Bird-voiced tree frog* (<u>Hyla avivoca</u>)	Permanent wooded swamps; creeks and larger waterways of the south
Squirrel tree frog* (<u>Hyla squirella</u>)	Buildings, gardens, fields and open woods
Cope's gray tree frog* (<u>Hyla chrysoscelis</u>)	Ubiquitous in permanent and temporary water; found on trees and bushes in woodland edges
Gray tree frog* (<u>Hyla versicolor</u>)	Ubiquitous in permanent and temporary water; found on trees and bushes in woodland edges
Upland chorus frog * (<u>Pseudacris triseriata feriarum</u>)	Grassy swales, moist woodlands, river bottom swamps, ponds, bogs and marshes
Southern chorus frog* (<u>Pseudacris nigrita nigrita</u>)	Pine flatwoods, wet meadows, ditches, and moist woodlands
Eastern narrowmouth toad* (<u>Gastrophryne carolinensis</u>)	Fields, woodlands and margins of any water body
Bullfrog* (<u>Rana catesbeiana</u>)	Marshes, ponds, lakes and rivers
Pig frog* (<u>Rana gyrilio</u>)	Strongly aquatic; at edges of lakes, marshes, and cypress bays
Bronze frog* (<u>Rana c. clamitans</u>)	Swamps, brooks, streams, ponds, and edges of lakes
Southern leopard frog* (<u>Rana utricularia</u>)	Rivers, lakes, streams, marshes and ponds
Greenhouse frog (<u>Eleutherodactylus p. planirostris</u>)	Gardens, greenhouses, dumps, and small stream valleys

Species	Habitat
Stinkpot turtle* (<u>Sternotherus odoratus</u>)	Any permanent water
Razorback musk turtle* (<u>Sternotherus carinatus</u>)	Streams and river swamps
Mississippi mud turtle* (<u>Kinosternon subrubrum hippocrepis</u>)	Bayous, lagoons and river swamps
Yellow mud turtle* (<u>Kinosternon f. flavescens</u>)	Mud bottoms of pools, ponds, marshes, canals and cattle tanks
Common snapping turtle* (<u>Chelydra s. serpentina</u>)	Any aquatic situation preferably with mud and vegetation
Alligator snapping turtle* (<u>Macrolemys temminckii</u>)	Deep water of rivers, oxbows, sloughs, swamps and sluggish streams
Gulf Coast box turtle* (<u>Terrapene carolina major</u>)	Open woodlands, thickets, and woodland edges
Mississippi map turtle (<u>Graptemys kohnii</u>)	Slow moving rivers and lakes with dense vegetation
Southern painted turtle* (<u>Chrysemys picta dorsalis</u>)	Ponds, marshes, ditches, edges of lakes, backwater streams, and river pools
Red-eared slider* (<u>Trachemys scripta elegans</u>)	Prefers muddy bottomed, quiet water with dense vegetation
Eastern river cooter* (<u>Pseudomys concinna concinna</u>)	Rivers, ditches and cattle tanks
Cooter (<u>Pseudemys floridana</u>)	Sluggish or unmoving waters
Eastern chicken turtle* (<u>Deirochlys r. reticularia</u>)	Lentic waters of ponds, marshes and sloughs
Western chicken turtle* (<u>Deirochlys reticularia miaria</u>)	Lentic waters of ponds, marshes, and sloughs

Species	Habitat
Midland smooth softshell* (<u>Apalone m. mutica</u>)	Lakes, ponds and rivers
Mississippi diamondback terrapin* (<u>Malaclemys terrapin pileata</u>)	Marshes and estuaries of gulf coast
Western spiny softshell * (<u>Apalone spinifera hartwegi</u>)	Small streams, rivers, ponds and lakes
Green anole* (<u>Anolis carolinensis</u>)	From wooded areas, cypress swamps and in shrubbery near human dwellings
Mediterranean gecko* (<u>Hemidactylus t. turcicus</u>)	Near human habitation where insects congregate
Ground skink* (<u>Scincella lateralis</u>)	Dry pine or deciduous woods, clearings to moist streambanks
Five-lined skink* (<u>Eumeces fasciatus</u>)	Dry to damp woods, brushy areas, rotten logs and stumps
Broad-headed skink* (<u>Eumeces laticeps</u>)	From swamp forests to empty urban lots strewn with debris
Slender glass lizard* (<u>Ophisaurus attenuatus</u>)	Oak and pine woodlands, fields, grassy areas and brush piles
Eastern glass lizard* (<u>Ophisaurus ventralis</u>)	Wet meadows and grasslands; pine flatwoods
Diamondback water snake* (<u>Nerodia r. rhombifer</u>)	Near water of ponds, swamps, lakes, and cattle tanks
Mississippi green water snake* (<u>Nerodia cyclopion</u>)	Edges of lakes and ponds, swamps, marshes and rice fields
Yellow-bellied water snake* (<u>Nerodia erythrogaster flavigaster</u>)	Near water of ponds, swamps and lakes
Broad-banded water snake* (<u>Nerodia fasciata confluens</u>)	Permanent aquatic ponds, marshes, and lakes

Species	Habitat
Gulf salt marsh snake (<u>Nerodia clarkii clarkii</u>)	Gulf coastal salt meadows, swamps, and marshes; rarely enters freshwater habitats
Delta crayfish snake* (<u>Regina rigida deltae</u>)	Near edges of lakes, ponds, streams, swamps and marshes
Graham's crayfish snake* (<u>Regina grahamii</u>)	Edges of creeks, sloughs, ponds, ditches under logs
Marsh brown snake* (<u>Storeria dekayi limnetes</u>)	Salt marshes on levees
Florida red-belly snake* (<u>Storeria occipitomaculata obscura</u>)	Open woods, bogs from sea level to mountains
Eastern garter snake* (<u>Thamnophis s. sirtalis</u>)	Fields, marshes, meadows, gardens and roadsides often near water
Gulf Coast ribbon snake* (<u>Thamnophis proximus orarius</u>)	Near most permanent water of lakes, streams, swamps and rivers
Eastern hognose snake (<u>Heterodon platyrhinos</u>)	Open woods, uplands, hillsides, fields and dry, sandy areas
Mississippi ringneck snake* (<u>Diadophis punctatus stictogenys</u>)	Woodlands, near water, rock-covered hillsides and field edges
Western mud snake* (<u>Farancia abacura reinwardtii</u>)	Marshes, swamps and ditches
Blackmask racer* (<u>Coluber constrictor latrunculus</u>)	Bottomland hardwoods and cypress regions
Rough green snake* (<u>Opheodrys aestivus</u>)	Streamside and roadside near small trees and bushes
Texas rat snake* (<u>Elaphe obsoleta lindheimeri</u>)	Dry or moist woods to rocky canyons
Speckled king snake* (<u>Lampropeltis getula holbrooki</u>)	Woods, hayfields, pastures, meadows, roadsides and near water

Species**Habitat**

Louisiana milk snake* (<u>Lampropeltis triangulum amaura</u>)	Fields, open woods, river bottoms under logs or in stumps
Southern copperhead* (<u>Agkistrodon c. contortrix</u>)	Hillsides, upland woods, swamps and cypress-bordered streams
Western cottonmouth* (<u>Agkistrodon piscivorus leucostoma</u>)	Lakes, streams, sloughs, swamps, marshes and rivers
Timber rattlesnake* (<u>Crotalus horridus</u>)	Cane thickets and swamplands
Western pigmy rattlesnake* (<u>Sistrurus miliarius streckeri</u>)	Bottomlands, swamps, marshes and wet prairies
American alligator* (<u>Alligator mississippiensis</u>)	Ponds, swamps and rivers near water

*Denotes that the species has been identified within the park

APPENDIX 4. AVIAN SPECIES OF KNOWN OR PROBABLE OCCURANCE IN JEAN LAFITE NATIONAL HISTORICAL PARK AND PRESERVE IN JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA.

Species	Status	Habitat
Red-throated loon (<u>Gavia stellata</u>)	Scarce winter migrant	Bays, estuaries, lakes, ponds and ocean
Common loon* (<u>Gavia immer</u>)	Uncommon winter migrant	Lakes, ponds and rivers; oceans and bays in winter
Western grebe (<u>Aechmophorus occidentalis</u>)	Casual winter resident	Lakes, inlets and bays
Horned grebe* (<u>Podiceps auritus</u>)	Scarce winter resident	Marshes, ponds and lakes
Eared grebe (<u>Podiceps nigricollis</u>)	Rare winter resident	Open bays and ocean
Pied-billed grebe* (<u>Podilymbus podiceps</u>)	Uncommon resident	Lakes, ponds, sluggish streams
American white pelican* (<u>Pelecanus erythrorhynchos</u>)	Rare migrant	Marshy lakes and coastal lagoons
Brown pelican* (<u>Pelecanus occidentalis</u>)	Casual migrant	Sandy coastal beaches and lagoons
Double-crested cormorant* (<u>Phalacrocorax auritus</u>)	Common winter resident	Lakes, rivers, swamps and coasts
Olivaceous cormorant (<u>Phalacrocorax olivaceus</u>)	Common winter resident	Freshwater marshes, ponds and lakes
Anhinga* (<u>Anhinga anhinga</u>)	Uncommon resident	Freshwater ponds and swamps with thick vegetation
Magnificent* Frigatebird (<u>Fregata magnificens</u>)	Rare resident	Coast

Species	Status	Habitat
Great blue heron* (<u>Ardea herodias</u>)	Common resident	Lakes, ponds, rivers and marshes
American bittern* (<u>Botaurus lentiginosus</u>)	Uncommon winter resident	Freshwater and brackish marshes and marshy lake shores
Cattle egret* (<u>Bubulcus ibis</u>)	Common resident	Dry land in open fields, breeds near water with other herons
Green-backed heron** (<u>Butorides striatus</u>)	Locally common summer resident	Lake margins, streams, ponds and marshes
Great egret* (<u>Casmerodius albus</u>)	Locally common resident	Freshwater and salt marshes, marshy ponds and tidal flats
Little blue heron* (<u>Egretta caerulea</u>)	Rare resident	Freshwater swamps, lagoons and thickets
Reddish egret* (<u>Egretta rufescens</u>)	Uncommon local resident	Salt and brackish marshes, breeds among willows and shrubs
Snowy egret* (<u>Egretta thula</u>)	Irregular summer resident	Salt marshes, ponds, rice fields and shallow coastal bays
Tricolored heron* (<u>Egretta tricolor</u>)	Irregular migrant	Swamps, bayous, coastal ponds, salt marshes, mud flats and lagoons
Least bittern** (<u>Ixobrychus exilis</u>)	Rare resident	Freshwater marshes where cattails and reeds predominate
Black-crowned night heron* (<u>Nycticorax nycticorax</u>)	Irregularly, fairly	Marshes, swamps and wooded streams common resident
Yellow-crowned night heron* (<u>Nyctanassa violacea</u>)	Uncommon summer resident	Wooded swamps and coastal thickets
Wood stork (<u>Mycteria americana</u>)	Rare migrant	On or near coasts
Roseate Spoonbill (<u>Ajaia ajaia</u>)	Rare, local resident	Salt to shallow freshwater marshes

Species	Status	Habitat
White ibis** (<u>Eudocimus albus</u>)	Scarce summer resident	Marshy sloughs, mud flats, lagoons, and swamp forests
White-faced ibis* (<u>Plegadis chihi</u>)	Scarce summer resident	Salt marshes, brushy coastal islands, and freshwater marshes
Glossy ibis* (<u>Plegadis falcinellus</u>)	Scarce migrant	Marshes, swamps, flooded fields, coastal bays and estuaries
Wood duck* (<u>Aix sponsa</u>)	Fairly common resident	Wooded rivers, ponds, swamps, and freshwater marshes
Pintail* (<u>Anas acuta</u>)	Uncommon winter resident	Marshes, prairie ponds and salt marshes in winter
American wigeon* (<u>Anas americana</u>)	Common winter resident	Marshes, ponds, and shallow lakes
Northern shoveler* (<u>Anas clypeata</u>)	Uncommon winter resident	Marshes, prairie potholes, salt brackish marshes
Green-winged teal* (<u>Anas crecca</u>)	Locally common winter resident	Marshes, ponds and marshy lakes
Cinnamon teal (<u>Anas cyanoptera</u>)	Scarce migrant	Ponds, marshes, reservoirs and sluggish streams
Blue-winged teal* (<u>Anas discors</u>)	Locally common winter migrant	Marshes, shallow ponds and lakes
Mottled duck** (<u>Anas fulvigula</u>)	Common year-round resident	Freshwater or saltwater marshes; mostly coastal
Mallard* (<u>Anas platyrhynchos</u>)	Common winter resident	Ponds, lakes and marshes
American black duck (<u>Anas rubripes</u>)	Rare winter resident	Marshes, lakes, streams, coastal mud flats and estuaries
Gadwall* (<u>Anas strepera</u>)	Locally common winter resident	Freshwater marshes, ponds, rivers, and locally in salt marshes
Greater white-fronted goose* (<u>Anser albifrons</u>)	Common winter resident	Salt marshes, coastal bays, grain fields and freshwater marshes

Species	Status	Habitat
Lesser scaup* (<u>Aythya affinis</u>)	Common winter resident	Lakes, rivers, ponds, marshes and saltwater bays
Redhead* (<u>Aythya americana</u>)	Uncommon winter resident	Lakes, bays and often salt water in winter
Ring-necked duck* (<u>Aythya collaris</u>)	Common winter resident	Wooded lakes, ponds and rivers
Greater scaup* (<u>Aythya marila</u>)	Scarce winter resident	Lakes, bays, ponds and often wintering on saltwater bays
Canvasback* (<u>Aythya valisineria</u>)	Uncommon winter resident	Lakes, bays and estuaries
Canada goose* (<u>Branta canadensis</u>)	Common winter resident	Lakes, bays rivers and marshes; often feeding in stubble fields
Bufflehead* (<u>Bucephala albeola</u>)	Uncommon winter resident	Mainly on salt bays and estuaries
Common goldeneye* (<u>Bucephala clangula</u>)	Scarce winter resident	Mainly along the coast in bays and inlets
Snow goose* (<u>Chen caerulescens</u>)	Common winter resident	Salt marshes, coastal bays, grain fields and freshwater marshes
Ross' goose (<u>Chen rossii</u>)	Rare winter resident	Salt marshes, coastal bays, grain fields and freshwater marshes
Oldsquaw (<u>Clangula hyemalis</u>)	Rare winter resident	Open bays and inshore waters
Trumpeter swan* (<u>Cygnus buccinator</u>)	Uncommon resident	Marshy lakes and bays
Tundra swan (<u>Cygnus columbianus</u>)	Rare accidental	Marshy lakes and bays
Fulvous tree duck (<u>Dendrocygna bicolor</u>)	Common winter resident	Wooded streams and ponds
Black-bellied tree duck (<u>Dendrocygna autumnalis</u>)	Uncommon winter resident	Wooded streams and ponds

Species	Status	Habitat
Hooded merganser* (<u>Lophodytes</u> <u>cucullatus</u>)	Common winter resident	Wooded ponds, lakes, rivers and tidal channels
White-winged Scoter* (<u>Melanitta fusca</u>)	Rare winter resident	Coastal bays
Surf scoter* (<u>Melanitta</u> <u>perspicillata</u>)	Rare winter resident	Almost entirely on the ocean and in large coastal bays
Common merganser (<u>Mergus merganser</u>)	Rare winter resident	Wooded rivers, ponds, and wintering on saltwater bays
Red-breasted merganser* (<u>Mergus serrator</u>)	Uncommon winter resident	Principally on the ocean and salt bays
Masked duck (<u>Oxyura dominica</u>)	Scarce winter resident	Freshwater marshes, lakes, ponds saltwater bays and rivers
Ruddy duck* (<u>Oxyura jamaicensis</u>)	Uncommon winter resident	Freshwater marshes, lakes, ponds salt bays and rivers
Turkey vulture* (<u>Cathartes aura</u>)	Common resident	Mainly deciduous forests, woodland and adjacent farmlands
Black vulture* (<u>Coragyps atratus</u>)	Common resident	Open country; breeds in light woodlands and thickets
Cooper's hawk* (<u>Accipiter cooperii</u>)	Uncommon summer resident	Deciduous and coniferous forests, especially those with clearings
Sharp-shinned hawk* (<u>Accipiter striatus</u>)	Fairly common summer resident	Dense coniferous forests and sometimes in deciduous forests
Golden eagle (<u>Aquila chrysaetos</u>)	Rare accidental migrant	Mainly deciduous mountain forests; most any habitat during migration
White-tailed hawk (<u>Buteo albicaudatus</u>)	Rare accidental migrant	Coastal prairie, grassland or scrub in semiarid country
Harlan's hawk (<u>Buteo harlani</u>)	Rare winter resident	Deciduous forest and adjacent open country
Red-tailed hawk* (<u>Buteo jamaicensis</u>)	Common resident	Deciduous forest and adjacent open country

Species	Status	Habitat
Rough-legged hawk (<u>Buteo lagopus</u>)	Scarce winter migrant	Open plains, agricultural areas and marshes
Red-shouldered hawk* (<u>Buteo lineatus</u>)	Locally fairly common resident	Deciduous woodlands especially with standing water
Broad-winged hawk* (<u>Buteo platypterus</u>)	Rare resident	Chiefly deciduous woodland
Ferruginous hawk (<u>Buteo regalis</u>)	Rare accidental migrant	Open grasslands of the Great Plains
Swainson's hawk (<u>Buteo swainsoni</u>)	Sporadic migrant	Open plains, grasslands and prairie
Northern Harrier* open grasslands (<u>Circus cyaneus</u>)		Common winter resident Marshes and
Swallow-tailed kite* (<u>Elanoides forficatus</u>)	Uncommon spring migrant	Woodlands near marshes or swamps
Bald eagle* (<u>Haliaeetus leucocephalus</u>)	Rare winter resident	Lakes, rivers, marshes and seacoasts
Mississippi kite* (<u>Ictinia mississippiensis</u>)	Scarce summer resident	Open woodland and mixed scrub near water
Osprey* (<u>Pandion haliaetus</u>)	Casual winter resident	Lakes, rivers and seacoasts
Harris' hawk (<u>Parabuteo unicinctus</u>)	Rare accidental migrant	Semiarid regions in scrub
Caracara (<u>Caracara cheriway</u>)	Rare accidental winter resident	Prairies, savannahs, and semi-arid areas
Merlin* (<u>Falco columbarius</u>)	Rare winter migrant	Coniferous forests
Prairie falcon (<u>Falco mexicanus</u>)	Rare accidental migrant	Prairies and occasional over wooded areas
Peregrine falcon* (<u>Falco peregrinus</u>)	Scarce migrant	Open country, especially along rivers, near lakes and the coast

Species	Status	Habitat
American kestrel* (<u>Falco sparverius</u>)	Uncommon resident	Towns, cities, parks, farm lands and open country
Northern bobwhite (<u>Colinus virginianus</u>)	Fairly common resident	Pastures, grassy roadsides and farm lands
Wild turkey* (<u>Meleagris gallopavo</u>)	Rare resident	Open woodlands and forests with scattered natural clearings
Ringneck pheasant (<u>Phasianus colchicus</u>)	Rare, introduced resident	Farmlands, pastures and grassy woodland edges
Greater prairie chicken (<u>Tympanuchus cupido</u>)	Rare to locally abundant	Undisturbed tall-grass prairie
Attwater's prairie chicken (<u>Tympanuchus cupido attwateri</u>)	Rare resident	Coastal tall-grass prairie
Whooping Crane (<u>Grus americana</u>)	Extremely rare migrant	Winters on coastal prairie
Sandhill Crane (<u>Grus canadensis</u>)	Rare migrant	Prairies and grain fields during migration and winter
Yellow rail (<u>Coturnicops noveboracensis</u>)	Rare resident	Grassy marshes and wet meadows
American coot* (<u>Fulica americana</u>)	Common winter resident	Open ponds, marshes, saltwater bays and inlets
Common gallinule** (<u>Gallinula chloropus</u>)	Uncommon resident	Freshwater marshes and ponds with cattails and other aquatic plants
Black rail (<u>Laterallus jamaicensis</u>)	Rare resident	Coastal salt marshes, more rarely in inland freshwater marshes
Purple gallinule** (<u>Porphyrola martinica</u>)	Uncommon resident	Freshwater marches with lily pads, pickerel weed and other aquatics
Sora* (<u>Porzana carolina</u>)	Uncommon migrant	Flooded fields, wood flats and freshwater marshes

Species	Status	Habitat
King rail** (<u>Rallus elegans</u>)	Locally rare resident	Freshwater marshes, borrow ditches and salt marshes
Virginia rail* (<u>Rallus limicola</u>)	Rare migrant	Cattails and reeds or fresh and brackish marshes
Clapper rail (<u>Rallus longirostris</u>)	Uncommon accidental resident	Saltwater marshes
Snowy plover (<u>Charadrius alexandrius</u>)	Rare migrant	Flat sandy beaches; alkali beds; sandy areas with little vegetation
Piping plover (<u>Charadrius melodus</u>)	Rare migrant	Mud flats, flooded fields, lake-shores and ponds
Semipalmated plover* (<u>Charadrius semipalmatus</u>)	Common migrant	Shallow pools in salt marshes, lake shores in the interior
Killdeer* (<u>Charadrius vociferus</u>)	Common resident	Open country; plowed fields, golf courses and short grass prairies
Wilson's plover (<u>Charadrius wilsonia</u>)	Scarce winter migrant	Sand beaches and mud flats
Lesser golden plover* (<u>Pluvialis dominica</u>)	Scarce spring migrant	Coastal beaches, mud flats, inland prairies and plowed fields
Black-bellied plover* (<u>Pluvialis squatarola</u>)	Scarce migrant	Mud flats, lake shores, ponds and flooded fields
Black-necked stilt** (<u>Himantopus mexicanus</u>)	Uncommon migrant	Salt marshes, shallow coastal bays, and occasional freshwater marshes
American avocet* (<u>Recurvirostra americana</u>)	Uncommon migrant	Freshwater marshes, lakes and salt and brackish marshes
Spotted sandpiper* (<u>Actitis macularia</u>)	Common migrant	Open country and wooded areas with water nearby
Ruddy turnstone (<u>Arenia interpres</u>)	Rare accidental	Rocky, pebbly, and sandy coasts and beaches

Species	Status	Habitat
Upland sandpiper* (<u>Bartramia longicauda</u>)	Rare migrant	Mudflats and lakeshores in migration
Sanderling (<u>Calidris alba</u>)	Common migrant	Ocean beaches, sandbars, occasional mud flats, inland lakes and river shores
Dunlin* (<u>Calidris alpina</u>)	Rare migrant	Beaches, extensive mud and sand flats, inland lake and river shore
Baird's sandpiper* (<u>Calidris bairdii</u>)	Rare migrant	Inland areas with grassy pools, wet meadows, lake and river shores Red
Knot (<u>Calidris canutus</u>)	Rare migrant	Tidal flats and rocky shores, beaches in inland areas
White-rumped sandpiper* (<u>Calidris fuscicollis</u>)	Locally common migrant	Flats, grassy pools, wet meadows and shores in winter
Purple sandpiper (<u>Calidris maritima</u>)	Rare migrant	Rocky coasts and promontories
Western sandpiper* (<u>Calidris mauri</u>)	Spring and fall migrant	Shores, mud flats, grassy pools and wet meadows
Pectoral sandpiper* (<u>Calidris melanotos</u>)	Common migrant	Wet, short-grass areas, grassy pools, salt creeks and meadows
Least sandpiper* (<u>Calidris minutilla</u>)	Common migrant	Grassy pools, bogs, open marshes, flooded fields and mud flats
Semipalmated sandpiper* (<u>Calidris pusillus</u>)	Rare migrant	Lake and river shores, flats, salt marsh pools and coastal beaches
Willet (<u>Catoptrophorus semipalmatus</u>)	Uncommon migrant	Coastal beaches, freshwater and salt marshes, lake shores and wet prairies
Common snipe* (<u>Gallinago gallinago</u>)	Common winter resident	Freshwater marshes, ponds, flooded meadows and fields
American oystercatcher (<u>Haematopus palliatus</u>)	Uncommon migrant	Sandy and pebbly beaches, mud flats borders of salt marshes

Species	Status	Habitat
Short-billed dowitcher* (<u>Limnodromus</u> <u>griseus</u>)	Common migrant	Mud flats, creeks, salt marshes and tidal estuaries
Long-billed dowitcher * (<u>Limnodromus</u> <u>scolopaceus</u>)	Common migrant	Mud flats, marshy pools, and margins of freshwater ponds
Marbled godwit* (<u>Limosa</u> <u>fedoa</u>)	Rare migrant	Salt marshes, tidal creeks, mud flats and sea beaches
Hudsonian godwit (<u>Limosa</u> <u>haemastica</u>)	Rare migrant	Chiefly mud flats
Stilt sandpiper (<u>Micropalama</u> <u>himantopus</u>)	Uncommon migrant	Grassy pools and shores of ponds and lakes
Whimbrel* (<u>Numenius</u> <u>phaeopus</u>)	Casual winter migrant	Flooded fields and mud flats
Red-necked phalarope (<u>Phalaropus</u> <u>lobatus</u>)	Rare migrant	Open ocean, beaches, flats, lake and river shores
Wilson's phalarope* (<u>Phalaropus</u> <u>tricolor</u>)	Scarce migrant	Prairie pools and marshes, lake and river shores; coastal pools
American woodcock* (<u>Scolopax</u> <u>minor</u>)	Scarce resident	Moist woodland and thickets near open fields
Lesser yellowlegs* (<u>Tringa</u> <u>flavipes</u>)	Uncommon migrant	Marshy ponds, lake and river shore
Greater yellowlegs* (<u>Tringa</u> <u>melanoleuca</u>)	Uncommon migrant	Pools, lakeshores and tidal and flats
Solitary sandpiper* (<u>Tringa</u> <u>solitaria</u>)	Casual migrant	Inland ponds, bogs, wet swampy places and woodland streams
Buff-breasted sandpiper* (<u>Tryngites</u> <u>subruficollis</u>)	Uncommon migrant	Short-grass fields, meadows and prairies

Species	Status	Habitat
Black tern* (<u>Chlidonias niger</u>)	Common migrant	Freshwater marshes, marshy lakes and sandy coasts
Herring gull* (<u>Larus argentatus</u>)	Uncommon migrant	Lakes, rivers, estuaries and beaches
Laughing Gull* (<u>Larus atricilla</u>)	Common year-round resident	Coastal; may wander slightly inland
Ring-billed gull* (<u>Larus delawarensis</u>)	Uncommon winter resident	Lakes, rivers and beaches in the winter
Franklin's gull (<u>Larus pipixcan</u>)	Fairly common migrant	Lakes, rivers, ponds and marshes
Bonaparte's gull* (<u>Larus philadelphia</u>)	Uncommon winter resident	Mud flats, lakes ponds and flooded fields
Pomarine jaeger* (<u>Stercorarius pomarinus</u>)	Rare migrant	Coastal areas
Bridled tern* (<u>Sterna anaethetus</u>)	Rare migrant	Coastal
Least tern* (<u>Sterna antillarum</u>)	Rare migrant	Sandy and pebbly beaches along the coast; sandbars in large rivers; often in landfills
Caspian tern* (<u>Sterna caspia</u>)	Rare vagrant	Shores of lakes and large rivers; along seacoast
Forster's tern* (<u>Sterna forsteri</u>)	Rare migrant	Salt and freshwater marshes
Common tern* (<u>Sterna hirundo</u>)	Rare migrant	Lakes, ponds, rivers, coastal beaches and islands
Royal tern* (<u>Sterna maxima</u>)	Rare accidental	Sandy beaches
Gull-billed tern* (<u>Sterna nilotica</u>)	Rare accidental	Coastal marshes and beaches
Sandwich tern* (<u>Sterna sandvicensis</u>)	Rare accidental	Coastal beaches and islands

Species	Status	Habitat
Black skimmer* (<u>Rynchops niger</u>)	Rare resident	Coast
Inca dove (<u>Columbina inca</u>)	Rare resident	Farmlands, parks, gardens and open country with scattered trees and shrub
Rock dove* (<u>Columba livia</u>)	Common resident	City parks, suburban gardens and farmland
Common ground-dove (<u>Colombiana passerina</u>)	Rare resident	Open areas, fields, gardens, farm land and roadsides
Mourning dove* (<u>Zenaidra macroura</u>)	Common resident	Open fields, parks and lawns with many trees and shrubs
Yellow-billed cuckoo* (<u>Coccyzus americanus</u>)	Common summer resident	Moist thickets, overgrown pastures and sparse woodlands
Black-billed cuckoo* (<u>Coccyzus erythrophthalmus</u>)	Rare migrant	Moist thickets, orchards, willows and overgrown pastures
Groove-billed Ani * (<u>Crotophaga sulcirostris</u>)	Rare accidental	Arid agricultural land especially where there are cattle
Roadrunner (<u>Geococcyx californianus</u>)	Uncommon resident	Open arid country with plenty of thickets
Common barn-owl* (<u>Tyto alba</u>)	Uncommon resident	Often around human habitations in open to partly open country
Long-eared owl (<u>Asio otus</u>)	Scarce accidental	Deciduous and evergreen forests
Short-eared owl (<u>Asio flammeus</u>)	Scarce winter migrant	Freshwater and salt marshes, open grassland, prairies and dunes
Burrowing owl (<u>Athene cunicularia</u>)	Rare accidental	Plains, deserts, fields and air ports
Great horned owl* (<u>Bubo virginianus</u>)	Uncommon resident	Ubiquitous, frequenting forest desert, open country, swamps and parks

Species	Status	Habitat
Screech owl* (<u>Otus asio</u>)	Common resident	Open deciduous woods, orchards, suburban areas and lakeshores
Barred owl* (<u>Strix varia</u>)	Uncommon resident	Low wet woods and swamp forest
Chuck-will's widow* (<u>Caprimulgus carolinensis</u>)	Common resident	Open woodland and clearings near farming country
Whip-poor-will* (<u>Caprimulgus vociferus</u>)	Uncommon summer resident	Dry open woodland near fields
Common nighthawk* (<u>Chordeiles minor</u>)	Uncommon summer resident	Aerial, but open country generally; also cities and towns
Chimney swift* (<u>Chaetura pelagica</u>)	Common summer resident	Breeds and roosts in chimneys
Buff-bellied hummingbird* (<u>Amazilia yucatanensis</u>)	Rare resident	Wood margins and thickets
Ruby-throated hummingbird* (<u>Archilochus colubris</u>)	Common summer lands	Suburban gardens, parks and wood
Rufous hummingbird* (<u>Selasphorus rufus</u>)	Rare resident	Wood margins and thickets
Belted kingfisher* (<u>Ceryle alcyon</u>)	Common resident	Rivers, lakes and saltwater estuaries
Ivory-billed woodpecker (<u>Campephilus principalis</u>)	Rare resident	Deep forests
Northern flicker* (<u>Colaptes auratus</u>)	Common resident	Open country with trees; parks and rural estates
Pileated woodpecker* (<u>Dryocopus pileatus</u>)	Uncommon resident	Dense forests and borders

Species	Status	Habitat
Golden-fronted woodpecker (<u>Melanerpes aurifrons</u>)	Common resident	Open woods in dry country and river bottoms with trees
Red-bellied woodpecker* (<u>Melanerpes carolinus</u>)	Common resident	Open and swamp woodland; parks and feeders during migration
Red-headed woodpecker* (<u>Melanerpes erythrocephalus</u>)	Common resident	Open country, farms, rural roads, open woodlands and golf courses
Red cockaded woodpecker (<u>Picoides borealis</u>)	Rare resident	Pine forests, especially yellow and longleaf
Downy woodpecker* (<u>Picoides pubescens</u>)	Common resident	Wood lots, parks and gardens
Ladder-backed woodpecker (<u>Picoides scalaris</u>)	Uncommon vagrant	Arid areas with thickets and trees
Hairy woodpecker* (<u>Picoides villous</u>)	Common resident	Deciduous forest
Yellow-bellied sapsucker* (<u>Sphyrapicus varius</u>)	Common resident	Young, open deciduous or mixed forest with clearings; also parks, yards and gardens
Olive-sided flycatcher* (<u>Contopus borealis</u>)	Fairly common migrant	Near openings, burns, ponds and bogs
Western wood pewee (<u>Contopus sordidulus</u>)	Uncommon migrant	Open woodland, woodland edges and orchards
Eastern wood pewee* (<u>Contopus virens</u>)	Fairly common summer resident	Forest, open woodland, orchards, shade trees and roadsides
Alder flycatcher* (<u>Empidonax alorum</u>)	Uncommon fall migrant	Mature deciduous forests; often near water

Species	Status	Habitat
Yellow-bellied flycatcher* (<u>Empidonax flaviventris</u>)	Fairly common migrant	Willow thickets and second growth woodlands
Least flycatcher* (<u>Empidonax minimus</u>)	Fairly common migrant	Open country, shade trees, parks, orchards, roadsides and forest edge
Willow flycatcher* (<u>Empidonax traillii</u>)	Uncommon migrant	Swampy thickets; upland pastures and old abandoned orchards
Acadian flycatcher* (<u>Empidonax virescens</u>)	Uncommon summer resident	Wooded ravines; beech-maple forests
Great crested flycatcher* (<u>Myiarchus crinitus</u>)	Fairly common summer	Open forest, orchards and large trees near agrarian land
Vermilion flycatcher (<u>Pyrocephalus rubinus</u>)	Rare winter resident	Trees and shrubs in open river bottoms and along roadsides
Eastern phoebe* (<u>Sayornis phoebe</u>)	Uncommon resident	Open woodland near streams; bridges cliffs and buildings with ledges
Scissor-tailed flycatcher* (<u>Tyrannus forficata</u>)	Common summer resident	Open country along roadsides; ranches with scattered trees and bushes; fence wires and posts
Eastern kingbird* (<u>Tyrannus tyrannus</u>)	Common summer resident	Open country, farms, orchards, roadsides, lake shores and rivers
Western kingbird* (<u>Tyrannus verticalis</u>)	Scarce migrant	Open country; ranches, roadsides, streams and ponds with trees
Horned lark (<u>Eremophila alpestris</u>)	Scarce winter resident	Plains, fields, airports and beaches
Cliff swallow* (<u>Hirundo pyrrhonota</u>)	Uncommon summer resident	Open country, buildings, cliffs, lake shores and marshes
Barn swallow* (<u>Hirundo rustica</u>)	Uncommon summer resident	Agricultural land, suburban areas, marshes and lake shores

Species	Status	Habitat
Purple martin * (<u>Progne subis</u>)	Common summer	Open woodland, residential areas and agricultural land
Bank swallow* (<u>Riparia riparia</u>)	Uncommon migrant	Rivers and streams near sand banks
Southern rough- winged swallow* (<u>Stelgidopteryx</u> <u>ruficollis</u>)	Uncommon summer resident	Streams and rivers in the vicinity of man-made structures and banks
Tree swallow* (<u>Tachycineta bicolor</u>)	Common migrant	Rivers and streams near sand banks
American crow* (<u>Corvus</u> <u>brachyrhynchos</u>)	Common resident	Woodlands, farmland and suburban areas
Fish crow* (<u>Corvus ossifragus</u>)	Uncommon resident	Low coastal country, lakes, rivers, and swamps
Blue jay* (<u>Cyanocitta</u> <u>cristata</u>)	Common resident	Oak forest, parks and yards
Tufted titmouse* (<u>Parus bicolor</u>)	Common resident	Swamp or moist woodland and shade trees; city parks
Carolina chickadee* (<u>Parus carolinensis</u>)	Common resident	Deciduous woodlands and residential areas
Red-breasted nuthatch* (<u>Sitta canadensis</u>)	Scarce winter resident	Coniferous forests
White-breasted nuthatch (<u>Sitta carolinensis</u>)	Fairly common resident	Deciduous and mixed forest
Brown-headed nuthatch (<u>Sitta pusilla</u>)	Common resident	Coniferous and mixed forests
Brown creeper* (<u>Certhia americana</u>)	Uncommon winter resident	Deciduous and mixed woodlands

Species	Status	Habitat
Marsh wren* (<u>Cistothorus palustris</u>)	Scarce resident	Fresh and brackish marshes with cattails, bulrushes or sedges
Sedge wren* (<u>Cistothorus platensis</u>)	Uncommon winter resident	Grassy freshwater marshes, brackish marshes and wet meadows
Bewick's wren (<u>Thryomanes bewickii</u>)	Uncommon winter resident	Thickets, brush piles, hedgerows, open woodlands, and scrubby areas
Carolina wren* (<u>Thryothorus ludovicianus</u>)	Common resident	Woodland thickets, ravines and rocky slopes with brush
House wren* (<u>Troglodytes aedon</u>)	Common winter resident	Parks, woodland edges, farmlands and residential areas
Winter wren* (<u>Troglodytes troglodytes</u>)	Uncommon winter resident	Dense tangles and thickets in coniferous and mixed forests
Veery* (<u>Catharus fuscescens</u>)	Scarce migrant	Moist deciduous woodlands and willow thickets
Hermit thrush* (<u>Catharus guttata</u>)	Uncommon winter migrant	Coniferous and mixed forests; deciduous woodlands and thickets
Gray-cheeked thrush * (<u>Catharus minima</u>)	Uncommon migrant	Coniferous and mixed forests
Swainson's thrush* (<u>Catharus ustulatus</u>)	Uncommon migrant	Coniferous forests and willow thickets
Wood thrush * (<u>Hylocichla mustelina</u>)	Fairly common resident	Moist deciduous woodlands with a thick understory, parks and gardens
Eastern bluebird* (<u>Sialia sialis</u>)	Common resident	Open farm lands with scattered trees
American robin* (<u>Turdus migratorius</u>)	Common resident	Gardens, agrarian lands, cities and open woodland
Blue-gray gnatcatcher* (<u>Poliophtila caerulea</u>)	Fairly common summer	Open, moist woodland and brushy streamside thickets

Species	Status	Habitat
Ruby-crowned kinglet* (<u>Regulus calendula</u>)	Uncommon winter resident	Coniferous and deciduous forests; also thickets in winter
Golden-crowned kinglet* (<u>Regulus satrapa</u>)	Uncommon winter resident	Old, dense conifer stands, deciduous forest and thickets
Gray catbird* (<u>Dumetella</u> <u>carolinensis</u>)	Uncommon summer resident	Thickets and brush, gardens and residential areas
Northern mockingbird* (<u>Mimus polglottos</u>)	Common resident	Parks, residential areas, farmlands and open country with thickets
Sage thrasher (<u>Oreoscoptes</u> <u>mentanus</u>)	Rare accidental	Dense thickets and lowland scrub
Brown thrasher* (<u>Toxostoma rufum</u>)	Fairly common resident	Thickets, fields with scrub and woodland borders
American pipit (<u>Anthus rubescens</u>)	Winter migrants	Open fields
Water pipit* (<u>Anthus spinoletta</u>)	Fairly common winter resident	Beaches, barren fields, agrarian land and golf courses
Sprague's pipit (<u>Anthus spragueii</u>)	Scarce migrant	Short-grass plains and plowed fields
Cedar waxwing* (<u>Bombycilla</u> <u>cedrorum</u>)	Irregularly common winter resident	Open woodlands, orchards and residential areas
Loggerhead shrike* (<u>Lanius</u> <u>ludovicianus</u>)	Fairly common resident	Grasslands, orchards, open areas with trees, open grassy woodlands
Starling* (<u>Sturnus vulgaris</u>)	Common resident	Cities, farmlands, ranches and suburban areas
Bell's vireo (<u>Vireo bellii</u>)	Uncommon summer	Dense bottomland thickets, willow scrub and mesquite
Yellow-throated vireo* (<u>Vireo flavifrons</u>)	Fairly common summer resident	Forest edge in tall deciduous trees along streams, roadsides, orchards and parks

Species	Status	Habitat
Warbling vireo* (<u>Vireo gilvus</u>)	Fairly common migrant	Deciduous woodlands near streams; isolated groves and shade trees
White-eyed vireo* (<u>Vireo griseus</u>)	Uncommon resident	Dense swampy thickets and hillsides with blackberry and briar tangles
Red-eyed vireo* (<u>Vireo olivaceus</u>)	Common summer resident	Deciduous forest and shade trees in residential areas
Philadelphia vireo* (<u>Vireo philadelphicus</u>)	Rare migrant	Open second growth woodlands; clearings; river and lake thickets
Solitary vireo* (<u>Vireo solitarius</u>)	Uncommon migrant	Coniferous and mixed forests
Evening grosbeak (<u>Coccothraustes vespertinus</u>)	Rare winter resident	Coniferous and deciduous woodland; suburban areas
Black-throated blue warbler* (<u>Dendroica caerulescens</u>)	Rare migrant	Mixed deciduous and evergreen wood lands with thick undergrowth
Bay-breasted warbler* (<u>Dendroica castanea</u>)	Fairly common migrant	Coniferous and mixed forests
Cerulean warbler* (<u>Dendroica cerulea</u>)	Scarce migrant	Open woodland near streams and
Yellow-rumped warbler* (<u>Dendroica coronata</u>)	Fairly common migrant	Coniferous and mixed forests
Prairie warbler* (<u>Dendroica discolor</u>)	Scarce summer resident	Open scrub, old pastures and hillsides
Yellow-throated warbler* (<u>Dendroica dominica</u>)	Uncommon migrant	Dry uplands to swampy places of pine, oak, sycamore and cypress
Blackburnian warbler* (<u>Dendroica fusca</u>)	Uncommon migrant	Mixed forests

Species	Status	Habitat
Magnolia warbler* (<u>Dendroica magnolia</u>)	Fairly common migrant	Any place where shrubbery or trees occur
Palm warbler* (<u>Dendroica palmarum</u>)	Rare winter resident	Open places, weedy fields and borders of marshes
Chestnut-sided warbler* (<u>Dendroica pensylvanica</u>)	Uncommon migrant	Young, open second-growth woodlands and scrub
Yellow warbler* (<u>Dendroica petechia</u>)	Common migrant	Most thickets along streams and in swampy areas and gardens
Pine warbler* (<u>Dendroica pinus</u>)	Fairly common resident	Pine forests
Blackpoll warbler * (<u>Dendroica striata</u>)	Rare migrant	Coniferous forests and tall trees
Cape May warbler* (<u>Dendroica tigrina</u>)	Rare migrant	Woodlands in migration
Black-throated green warbler* (<u>Dendroica virens</u>)	Uncommon migrant	Open stands of pine and various habitats during migration
Common yellowthroat** (<u>Geothlypis trichas</u>)	Common migrant	Moist thickets and grassy marshes
Worm-eating warbler* (<u>Helmitheros vermivorus</u>)	Rare summer resident	Chiefly dry wooded hillsides
Blue grosbeak* (<u>Guiraca caerulea</u>)	Rare summer resident	Brushy, moist pastures and roadside thickets
Yellow-breasted chat* (<u>Icteria virens</u>)	Common summer resident	Dense thickets, dry brushy hillsides and streamside tangles
Swainson's warbler* (<u>Limnothlypis swainsonii</u>)	Scarce summer resident	Wooded swamps and southern cane-brakes; rhododendron thickets
Black & white warbler* (<u>Mniotilta varia</u>)	Locally common summer resident	Primary and secondary deciduous forest; parks, gardens and lawns with trees and shrubs

<u>Species</u>	<u>Status</u>	<u>Habitat</u>
Connecticut warbler (<u>Oporornis agilis</u>)	Rare migrant	Low wet woods and damp thickets
Kentucky warbler* (<u>Oporornis formosus</u>)	Uncommon summer resident	Low, moist woodland with abundant undergrowth; often in ravines
Mourning warbler* (<u>Oporornis philadelphia</u>)	Scarce migrant	Forest clearings with briars; wet woods with thick undergrowth
Parula warbler* (<u>Parula americana</u>)	Uncommon migrant	Coniferous and mixed woodlands
Lazuli bunting (<u>Passerina amoena</u>)	Rare migrant	Dry, brushy ravines and slopes; cleared areas and weedy pastures
Painted bunting* (<u>Passerina ciris</u>)	Scarce migrant	Brushy tangles, hedgerows, briar patches, woodland edges and swampy thickets
Indigo bunting* (<u>Passerina cyanea</u>)	Fairly common summer resident	Brushy slopes, old pastures, overgrown farmland, woodland clearings and forest-field ecotone
Rose-breasted grosbeak* (<u>Pheucticus ludovicianus</u>)	Common migrant	Woodland-open field ecotone with tall shrubs; old orchards
Black-headed grosbeak (<u>Pheucticus melanocephalus</u>)	Very scarce migrant	River bottoms, lake shores and swampy places
Prothonotary warbler* (<u>Prothonotaria citrea</u>)	Uncommon summer resident	Wooded swamps, flooded bottomland forest and streams with dead trees
Ovenbird* (<u>Seiurus aurocapillus</u>)	Uncommon migrant	Mature, dry forest with little underbrush
Louisiana waterthrush* (<u>Seiurus motacilla</u>)	Uncommon local summer resident	Hillside brooks, river swamps and along sluggish streams

Species	Status	Habitat
Northern waterthrush* (<u>Seiurus noveboracensis</u>)	Common migrant	Wooded swamps, lake shores and cool bogs
American redstart* (<u>Setophaga ruticilla</u>)	Common summer resident	Second-growth woodlands; thickets with saplings
Dickcissel* (<u>Spiza americana</u>)	Uncommon summer resident	Open country in grain or hay fields and in weed patches
Bachman's Warbler* (<u>Vermivora bachmanii</u>)	Rare resident	Woodlands
Golden-winged warbler* (<u>Vermivora chrysoptera</u>)	Uncommon migrant	Moist situations of sapling stage, old fields and pastures
Blue-winged warbler* (<u>Vermivora pinus</u>)	Rare migrant	Sapling stage old field and pasture thickets in heavy forests
Tennessee warbler* (<u>Vermivora peregrina</u>)	Uncommon migrant	Open mixed woodlands; brushy areas during migration
Orange-crowned warbler* (<u>Vermivora celata</u>)	Uncommon winter resident	Thickets and brushy woodlands
Nashville warbler* (<u>Vermivora ruficapilla</u>)	Fairly common migrant	Woodland edges, thickets in open mixed forest or brushy borders of swamps
Hooded warbler* (<u>Wilsonia citrina</u>)	Fairly common summer resident	Mature, moist forest ravines with luxuriant undergrowth; wooded swamps
Wilson's warbler* (<u>Wilsonia pusilla</u>)	Fairly common migrant	Moist woodland thickets along streams and bogs
Canada warbler* (<u>Wilsonia canadensis</u>)	Common migrant	Cool, moist woodland with thick undergrowth
Bobolink (<u>Dolichonyx oryzivorus</u>)	Rare migrant	Prairies, meadows and marshes

Species	Status	Habitat
Western meadowlark (<u>Sturnella neglecta</u>)	Rare migrant	Meadows, plains and prairies
Eastern meadowlark (<u>Sturnella magna</u>)	Common summer resident	Meadows, pastures, prairies and open country generally
Orchard oriole* (<u>Icterus spurius</u>)	Common summer resident	Orchards, parks, gardens and trees along lakes and rivers
Northern oriole* (<u>Icterus galbula</u>)	Uncommon summer	Deciduous woodland and shade trees
Yellow-headed blackbird (<u>Xanthocephalus xanthocephalus</u>)	Uncommon migrant	Freshwater marshes
Red-winged blackbird** (<u>Agelaius phoeniceus</u>)	Common summer resident	Marshes, swamps, wet and dry meadows, and pastures
Rusty blackbird* (<u>Euphagus carolinus</u>)	Uncommon winter resident	Wooded swamps and damp woods with pools
Brewer's blackbird (<u>Euphagus cyanocephalus</u>)	Uncommon winter resident	Wooded swamps and damp woods with pools
Common grackle* (<u>Quiscalus aviscula</u>)	Common winter resident	Lawns, parks, fields, and open woodland
Great-tailed grackle (<u>Quiscalus mexicanus</u>)	Scarce resident	Marshes along the coast and inland farmlands
Boat-tailed grackle** (<u>Quiscalus major</u>)	Uncommon resident	Marshes along the coast
Bronzed cowbird (<u>Molothrus aeneus</u>)	Common resident	Forested regions; especially cut over areas
Brown-headed cowbird* (<u>Molothrus ater</u>)	Common resident	Fields, woodland edges, suburban areas and agrarian areas
Scarlet tanager* (<u>Piranga olivacea</u>)	Uncommon migrant	Mature oak and pine woodland

Species	Status	Habitat
Summer tanager* (<u>Pranga rubra</u>)	Common summer resident	Open woodlands and shade trees
Northern cardinal* (<u>Cardinalis cardinalis</u>)	Common resident	Woodland edges, thickets, brushy swamps and gardens
Green-tailed towhee (<u>Pipilo chlorura</u>)	Casual resident	Brushy thickets
Rufous-sided towhee* (<u>Pipilo erythrophthalmus</u>)	Common winter resident	Thickets and brushy woodland edges
Lark bunting (<u>Calamospiza melanocorys</u>)	Casual winter resident	Open plains and fields
Sharp-tailed sparrow* (<u>Ammospiza caudacuta</u>)	Uncommon winter resident	Drier grassy portions of salt marsh and inland to grassy, freshwater marshes
Henslow's sparrow (<u>Ammodramus henslowii</u>)	Rare winter resident	Moist or dry grassland with scattered weeds and small shrubs
LeConte's sparrow* (<u>Ammodramus caudacutus</u>)	Uncommon winter resident	Moist grassland and boggy dry fields in winter
Grasshopper sparrow (<u>Ammodramus savannarum</u>)	Rare winter resident	Open grassy and weedy meadows, pastures and plains
Seaside sparrow (<u>Ammospiza maritima</u>)	Rare accidental	Exclusively grassy salt marsh
Lark sparrow* (<u>Chondestes grammacus</u>)	Uncommon resident	Grassland with scattered bushes and trees; open country generally
Savannah sparrow* (<u>Passerculus sandwichensis</u>)	Common winter resident	Fields, prairies, salt marshes grassy dunes
Vesper sparrow (<u>Poocetes gramineus</u>)	Fairly common winter resident	Fields, pastures and roadsides in farming country

Species	Status	Habitat
Bachman's sparrow (<u>Aimophila</u> <u>aestivalis</u>)	Uncommon resident	Dry, open pine or oak woods, weedy fields and pastures
Dark-eyed junco* (<u>Junco hyemalis</u>)	Common winter resident	Coniferous or mixed forests, fields, gardens, parks and roadway thickets
Tree sparrow (<u>Spizella arborea</u>)	Uncommon winter resident	Fields, weedy woodland edges and roadside thickets
Chipping sparrow* (<u>Spizella passerina</u>)	Common resident	Grassy woodland edges, gardens, city parks, brushy pastures and lawn
Clay-colored sparrow (<u>Spizella pallida</u>)	Rare migrant	Brushy grasslands and prairies
Field sparrow* (<u>Spizella pusilla</u>)	Fairly common resident	Abandoned fields and pastures overgrown with weeds, scattered bushes and small saplings
Harris' sparrow (<u>Zonotrichia</u> <u>querula</u>)	Common winter resident	Dense river-bottom thickets; woodland borders, clearings and brush piles
White-crowned sparrow* (<u>Zonotrichia</u> <u>leucophrys</u>)	Common winter resident	Open woods and gardens
White-throated sparrow* (<u>Zonotrichia</u> <u>albicollis</u>)	Common winter resident	Brushy undergrowth in coniferous woodland, pastures and suburbs
House sparrow* (<u>Passer domesticus</u>)	Common resident	Cities, towns and agrarian land
Fox sparrow (<u>Passerella illiaca</u>)	Fairly common winter resident	Dense woodland thickets, weedy pastures and brushy roadsides
Lincoln's sparrow (<u>Melospiza lincolnii</u>)	Common winter resident	Brushy bogs, pastures, willow or alder thickets
Swamp sparrow* (<u>Melospiza</u> <u>georgiana</u>)	Common winter resident	Freshwater marshes, wooded swamps, weedy fields, parks and brush piles

Species	Status	Habitat
Song sparrow* (<u>Melospiza melodia</u>)	Common winter resident	Thickets, pastures, city parks and undergrowth in gardens
Lapland longspur (<u>Calcarius lapponicus</u>)	Scarce winter resident	Open windswept fields and grassy coastal dunes; coastal parking lots
Smith's longspur (<u>Calcarius pictus</u>)	Casual winter resident	Open grassy plains
Chestnut-collared longspur (<u>Calcarius ornatus</u>)	Scarce winter resident	Dry elevated prairies and short grass plains
Pine siskin* (<u>Carduelis pinus</u>)	Uncommon winter resident	Coniferous and mixed woodlands, alder thickets and brushy pastures
Purple finch* (<u>Carpodacus purpureus</u>)	Uncommon winter resident	Mixed and coniferous woodlands; ornamental garden conifers
American goldfinch* (<u>Carduelis tristis</u>)	Fairly common winter resident	Brushy thickets, weedy grasslands and nearby trees

* Denotes that the species has been identified within the park

** Species that has been identified and breeds within the park

APPENDIX 5. MAMMALS OF KNOWN OR PROBABLE OCCURRENCE IN JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE IN JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA.

Species	Habitat
Opossum* (<u>Didelphis virginiana</u>)	Deciduous woodlands, prairies, marshes and farmlands
Alston mouse opossum (<u>Marmosa alstoni</u>)	Small forests with tangles of vines and marshes
Mexican mouse opossum (<u>Marmosa mexicana</u>)	
Eastern mole* (<u>Scalopus aquaticus</u>)	Moist loamy soils
Short-tailed shrew* (<u>Blarina brevicauda</u>)	Forested areas and their associated meadows and openings
Least shrew* (<u>Cryptotis parva</u>)	Grasslands generally but occasionally under logs and leaf litter in moist forested areas
Southeastern myotis* (<u>Myotis austroriparius</u>)	Hollow trees, abandoned houses and culverts
Nine-banded armadillo* (<u>Dasypus novemcinctus</u>)	Various habitats where the soil is suitable
Eastern pipistrelle* (<u>Pipistrellus subflavus</u>)	Woodlands
Big brown bat (<u>Eptesicus fuscus</u>)	Forested areas in hollow trees and crevices in buildings
Red bat* (<u>Lasiurus borealis</u>)	Forested areas and orchards
Seminole bat* (<u>Lasiurus seminolus</u>)	Forested areas in association with Spanish moss
Northern yellow bat * (<u>Lasiurus intermedius</u>)	Forested areas

Species	Habitat
Evening bat* (<u>Nycticeius humeralis</u>)	Forested areas in hollow trees
Rafinesque's big-eared bat* (<u>Plecotus rafinesquii</u>)	Buildings, cisterns and culverts
Brazilian free-tailed bat* (<u>Tadarida brasillensis</u>)	Old buildings and hollow trees
Red fox* (<u>Vulpes fulva</u>)	Various woodland habitats
Gray fox* (<u>Urocyon cinereoargenteus</u>)	Inhabitant of wooded areas, particularly mixed hardwood forests
Coyote* (<u>Canis latrans</u>)	Desert scrub to grasslands into forested areas
Red wolf* (<u>Canis rufus</u>)	Formerly from eastern Texas, now apparently restricted to Gulf Coast counties
Louisiana Black Bear* (<u>Ursus americanus luteolus</u>)	Heavily wooded areas and canebrakes
Raccoon* (<u>Procyon lotor</u>)	Broad-leaf woodlands and mixed pine forests
Ringtail * (<u>Bassariscus astutus</u>)	Less common in woodlands preferring rocky areas
Long-tailed weasel (<u>Mustela frenata</u>)	Variety of habitats from woodlands, thickets and grasslands
Mink* (<u>Mustela vison</u>)	Associated with watercourses and lakes
River otter* (<u>Lutra canadensis</u>)	Lakes and larger streams
Eastern spotted skunk* (<u>Spilogale putorius</u>)	Woodlands to tall grass prairies
Striped skunk* (<u>Mephitis mephitis</u>)	Wooded or brushy areas and associated farmlands

Species	Habitat
Hog-nosed skunk* (<u>Conepatus mesoleucus</u>)	Foothill and partly timbered or brushy sections
Mountain lion* (<u>Felis concolor coryi</u>)	Almost every kind of habitat within their range
Bobcat* (<u>Lynx rufus</u>)	Thickets to rocky outcrops
Feral hog* (<u>Sus scrofa</u>)	Forested areas and thickets where introduced or escaped from farmlands
White-tailed deer* (<u>Odocoileus virginianus</u>)	Brushlands to forested areas
Bison (<u>Bison bison</u>)	Prairies to wooded areas
Thirteen-lined ground squirrel * (<u>Spermophilus tridecemlineatus</u>)	Short to tall grass prairies, field borders
Eastern gray squirrel * (<u>Sciurus carolinensis</u>)	Bottomlands and hammocks of live and water oaks to mixed hardwood uplands
Fox squirrel* (<u>Sciurus niger</u>)	Variety of forested habitats preferring upland forests of more open mixed hardwood
Southern flying squirrel* (<u>Glaucomys volans</u>)	Forested areas where den trees are available
Plains pocket gopher* (<u>Geomys bursarius</u>)	Sandy soils where the topsoil is 4 inches or more in depth
Hispid pocket mouse* (<u>Perognathus hispidus</u>)	Sandy or other friable soil covered with scattered to moderate herbaceous vegetation
Beaver* (<u>Castor canadensis</u>)	Along streams, rivers, lakes and ponds
Eastern harvest mouse* (<u>Reithrodontomys humulis</u>)	Ecotones and early successional stages, climax grasslands
Fulvous harvest mouse* (<u>Reithrodontomys fulvescens</u>)	Grassy areas with shrub-type vegetation climax grasslands

Species	Habitat
Pygmy mouse* (<u>Baiomys taylori</u>)	Low grassy and weeded areas
White-footed mouse* (<u>Peromyscus leucopus</u>)	Various habitats within woodlands
Cotton mouse* (<u>Peromyscus gossypinus</u>)	Woodland habitats along watercourses near open fields
Golden mouse* (<u>Ochrotomys nattali</u>)	Arboreal in forested habitats
Marsh rice rat* (<u>Oryzomys palustris</u>)	Marshy areas with grasses and sedges
Hispid cotton rat* (<u>Sigmodon hispidus</u>)	Tallgrass areas of bluestem, cordgrass or sedges
Eastern wood rat* (<u>Neotoma floridana</u>)	Swamplands, forested uplands to arid plains
Pine vole* (<u>Pitymys pinetorum</u>)	Woodland areas where leaf litter and lodged grasses affords protection
Muskrat * (<u>Ondatra zibethicus</u>)	Marshy areas of creeks, rivers and lakes
House mouse* (<u>Mus musculus</u>)	Various habitats particularly near human habitation
Roof rat * (<u>Rattus rattus</u>)	Various commensal habitats associated with man
Norway rat* (<u>Rattus norvegicus</u>)	Various commensal habitats associated with man
Nutria* (<u>Myocastor coypus</u>)	Swamps, marshes and along rivers and lakes
California jackrabbit* (<u>Lepus californicus</u>)	Coastal tallgrass prairies to desert mountains
Eastern cottontail (<u>Sylvilagus floridanus</u>)	Brushlands and marginal, ecotonal areas

Species**Habitat**

Swamp rabbit*
(Sylvilagus aquaticus)

Poorly drained river bottoms and coastal
marshes

* Denotes that the species has been identified within the park