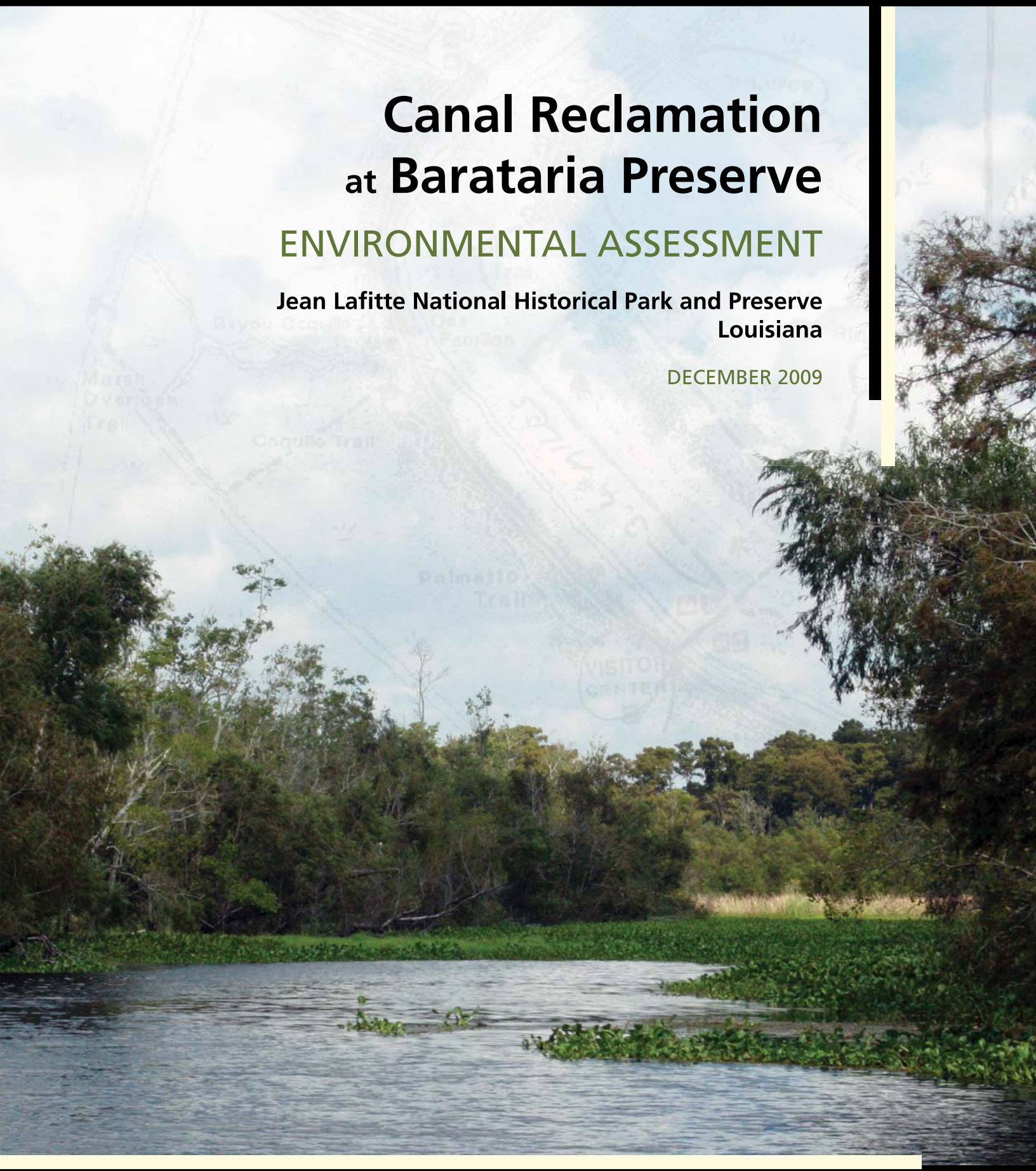
National Park Service
U.S. Department of the Interior

Canal Reclamation at Barataria Preserve

ENVIRONMENTAL ASSESSMENT

Jean Lafitte National Historical Park and Preserve
Louisiana

DECEMBER 2009



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EXECUTIVE SUMMARY

PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed project is to restore functions, resources, and values related to hydrology in the Barataria Preserve (Preserve) unit of the Jean Lafitte National Historical Park and Preserve that are affected by non-historic canals, spoilbanks, and dikes, and to increase the resiliency of Preserve ecosystems to subsidence, sea level rise, and storm events. A portion of the funding for this project may come from funds associated with the American Recovery and Reinvestment Act of 2009.

Oil and gas exploration, development, and transportation, along with residential development projects that never fully materialized, have scarred the landscape of the Preserve with man-made non-historic canals and earthen structures. More than 590 acres of the Preserve are directly affected by these non-historic canals, spoilbanks, and dikes, and more than 20 linear miles of non-historic canals throughout the Preserve have been identified for reclamation.

Currently, non-historic canals and spoilbanks in the Preserve contribute to increased rates of land loss and to the spread of invasive vegetation species. Canals and their associated spoilbanks alter hydrology and have both direct and indirect roles in Louisiana's land loss problem. Directly, canals have turned marsh into open water, and spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind the spoilbanks. This hydrologic alteration can limit sediment deposition, movement of nutrients and aquatic wildlife, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplification of tidal volumes and increased saltwater intrusion into freshwater marsh. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by invasive exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely impact the Preserve.

ALTERNATIVES CONSIDERED

The National Environmental Policy Act (NEPA) requires that federal agencies explore a range of reasonable alternatives and provide an analysis of what impacts the alternatives could have on the human environment (the natural and physical environment and the relationship of people with that environment). The alternatives under consideration must include a "no action" alternative as prescribed by 40 Code of Federal Regulations (CFR) 1502.14.

The no action alternative (alternative A) is a continuation of current conditions and "sets a baseline of existing impacts continued into the future against which to compare impacts of action alternatives" (NPS DO #12, Section 2.7). Under the no action alternative, the National Park Service (NPS) would not reclaim more than 20 miles of non-historic canals within Barataria Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands. The non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals.

Under the preferred alternative (alternative B), the NPS would reclaim more than 20 miles of non-historic canals within Barataria Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands and partially filling the open water of the canals with the degraded soil and

vegetative material. The canals would then be allowed to revert to marsh and shallow marsh pond habitat by natural processes, recreating freshwater wetlands.

Degrading developer-built spoilbanks and dikes would be accomplished from the canals and/or the spoilbanks themselves using a marsh buggy, barge-mounted excavator, or similar earth-moving equipment. Access to the reclamation areas would be via canals and/or spoilbanks. In consideration of habitat preservation/restoration and potential impacts to navigation and recreation, the NPS may use one or a combination of techniques including check meanders, vegetation removal, gapping, and revegetation. Implementation methods would be based on existing conditions of Barataria Preserve at the time of degrading and funding considerations.

This environmental assessment (EA) has been prepared in accordance with the National Environmental Policy Act of 1969 as amended; implementing regulations, 40 CFR 1500-1508; Department of the Interior (DOI) NEPA Regulations 43 CFR pt. 46 (DOI 2008), and NPS Director's Order 12 and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS, 2001a). Compliance with Section 106 of the National Historic Preservation Act of 1966 is occurring concurrently with the NEPA process, but separately from this environmental assessment.

Note to Reviewers and Respondents: If you wish to comment on the EA, you may submit comments electronically or mail them directly to the park. This EA will be on public review for 30 days**.** Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

Comments may be submitted:

• Online at www.parkplanning.nps.gov/jela (click on project and follow instructions),

• Or by mail to:

Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130

Attn: Canal Reclamation at Barataria Preserve

Table of Contents

EXECUTIVE SUMMARY iii
PURPOSE AND NEED 1
PURPOSE OF AND NEED FOR ACTION 1
OBJECTIVES 2
PROJECT LOCATION 3
PURPOSE AND SIGNIFICANCE OF JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE 3
PROJECT BACKGROUND 7
NATIONAL PARK SERVICE PLANS, POLICIES, AND ACTIONS 8
SCOPING 8
ISSUES 9
IMPACT TOPICS 9
IMPACT TOPICS ELIMINATED (OR DISMISSED) FROM FURTHER ANALYSIS AND CONSIDERATION 11
ALTERNATIVES 16
NO ACTION ALTERNATIVE (ALTERNATIVE A) 16
CANAL RECLAMATION TO NATURAL LANDSCAPE BY DEGRADING SPOILBANKS AND DIKES BUILT BY DEVELOPERS (ALTERNATIVE B, PREFERRED ALTERNATIVE) 16
MITIGATION MEASURES OF THE ACTION ALTERNATIVE 18
ALTERNATIVES CONSIDERED, BUT DISMISSED 20
THE ENVIRONMENTALLY PREFERRED ALTERNATIVE 21
ALTERNATIVES SUMMARIES 22
AFFECTED ENVIRONMENT 28
SOILS AND GEOLOGY 28
VEGETATION AND NON-NATIVE SPECIES 30
FISH AND WILDLIFE 33
SPECIAL STATUS SPECIES 35
HYDROLOGY AND WATER QUALITY 37
WETLANDS 39
VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY 40
ENVIRONMENTAL CONSEQUENCES 43
GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS 43
CUMULATIVE IMPACTS 43
IMPAIRMENT ANALYSIS 47

UNACCEPTABLE IMPACTS ON PARK RESOURCES OR VALUES 48
SOILS AND GEOLOGY 49
VEGETATION AND NON-NATIVE SPECIES 52
FISH AND WILDLIFE 56
SPECIAL STATUS SPECIES 60
HYDROLOGY AND WATER QUALITY 64
WETLANDS 68
VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY 72
COORDINATION AND CONSULTATION 75
THE SCOPING PROCESS 75
INTERNAL SCOPING 76
PUBLIC SCOPING 76
PUBLIC SCOPING COMMENTS 76
AGENCY CONSULTATION 77
RECIPIENTS OF THE ENVIRONMENTAL ASSESSMENT 78
PERMITS REQUIRED 78
LIST OF PREPARERS AND CONSULTANTS 78
REFERENCES 79

List of Figures

Figure 1. Location of Jean Lafitte National Historical Park and Preserve in Southeastern Louisiana 4
Figure 2. Location of Barataria Preserve within the Barataria Basin 5
Figure 3. Non-Historic Canals and Drillslips to be Reclaimed in Barataria Preserve 6
Figure 4. Check Meanders 17
Figure 5. Visitor Use and Non-Historic Canals to be Reclaimed at Barataria Preserve 42

List of Tables

Table 1. Impact topics retained for further evaluation and relevant laws, regulations, and policies 10
Table 2. Summary of alternatives and ability to meet project objectives 23
Table 3. Environmental impact summary by alternative 24
Table 4. Physical properties of hydrologic soil class “D” soils within the Barataria Preserve 29
Table 5. Listed species within Barataria Preserve 36
Table 6. Cumulative impacts projects and potentially affected resources 44

List of Appendices

Appendix A. Public Scoping and Agency Consultation Letters. A-1

Acronyms and Abbreviations

CFR	Code of Federal Regulations
cm	centimeter
DO	Director's Order
DOI	U.S. Department of the Interior
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
GIWWCC	Gulf Intracoastal Waterway West Closure Complex
ha	hectare
IBA	Important Bird Area
MBTA	Migratory Bird Treaty Act of 1918
NEPA	National Environmental Policy Act
NPS	National Park Service
NWI	National Wetlands Inventory
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	U.S. Geological Survey

PURPOSE AND NEED

The National Park Service (NPS) proposes to reclaim disturbed wetlands in the 25,000-acre Barataria Preserve (Preserve), a unit of the Jean Lafitte National Historical Park and Preserve (the park). These disturbed wetlands include canals and their earthen spoil deposits. The canals were dredged for the various purposes of accessing oil and gas drill sites, creating oil and gas pipeline routes, and providing borrow material for the construction of dikes meant to facilitate drainage and residential subdivision development in wetlands, which never fully materialized. These canals were constructed prior to the park's establishment and NPS ownership and before the imposition of stricter regulatory requirements under the wetland provisions of the Clean Water Act. These canals and their associated spoilbanks have had lasting effects on the landscape and environment because very few have been reclaimed. For convenience and readability, these disturbed wetland areas will hereinafter be referred to as "canals," although it should be understood that it is the purpose of this project to remediate the entire area of wetland disturbance associated with the canals, including the spoilbank areas.

The Barataria Preserve's marsh habitat formed over thousands of years in a unique deltaic system. The Preserve anchors the northeast portion of the Barataria-Terrebonne National Estuary, deemed ecologically significant by the U.S. Environmental Protection Agency (EPA) in 1990. This unique ecosystem supports a diverse and biologically rich assemblage of plants and animals and is the only example of an estuarine floating marsh in the national park system and one of only four large estuarine floating freshwater marsh systems in the world. More than 150 species of vascular plants have been identified in the floating marsh (Nolfo-Clements 2006).

The project area consists of about 25,000 acres in the upper freshwater zone of the Barataria Basin, one of the most productive estuarine wetlands in North America, and includes a portion of an abandoned delta of the Mississippi River and associated ecological zones, including natural levees, hardwood forests, baldcypress swamp, and fresh to slightly saline waters (intermediate marsh). The Preserve contains hundreds of archeological sites marking a progression of prehistoric and historic habitations (NPS 1995).

This environmental assessment (EA) analyzes the impacts that would result from the implementation of the proposed action and the no action alternative. The action alternative proposes to reclaim more than 20 miles of non-historic canals in the Preserve by degrading developer-built spoilbanks and dikes to the level of the surrounding wetlands and partially filling the canals with the degraded soil and vegetative material. The no action alternative represents the current condition and management actions. No reclamation activities would occur. This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended and implementing regulations, 40 Code of Federal Regulations (CFR) 1500-1508, and NPS Director's Order 12 (DO #12) and Handbook, *Conservation Planning, Environmental Impact Analysis, and Decision-making* (NPS 2001). Compliance with Section 106 of the National Historic Preservation Act of 1966 is occurring concurrently with the NEPA process but separate from this EA.

PURPOSE OF AND NEED FOR ACTION

The purpose of the proposed project is to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. A portion of the funding for this project may come from funds associated with the American Recovery and Reinvestment Act of 2009.

Oil and gas exploration, development, and transportation, along with residential development projects that never fully materialized, have scarred the landscape of the Preserve with man-made canals. More than 590 acres of the Preserve are directly affected by these non-historic canals, and more than 20 linear miles of non-historic canals have been identified for potential reclamation throughout the Preserve.

Currently, non-historic canals in the Preserve contribute to increased rates of land loss and to the spread of invasive exotic plants. Canals alter hydrology and have both direct and indirect roles in Louisiana's land loss problem. Directly, canals have turned marsh into open water, and their spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind the spoilbanks. This hydrologic alteration can limit sediment deposition and movement of nutrients and aquatic wildlife, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplified tidal volumes and increased saltwater intrusion into freshwater marsh. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely impact the Preserve.

Reclamation of more than 20 miles of non-historic canals is needed to help restore and maintain the integrity of the ecological and biological processes of the Preserve. Without adequate reclamation measures, canals in the Preserve would continue to stress Preserve resources and values, with continued adverse impacts on natural hydrology, ecology, water quality, and wetland functions and values. Combined with other sources of cumulative adverse impacts, man-made canals have contributed to increased rates of land loss in the Preserve, the Barataria estuary, and throughout coastal Louisiana.

OBJECTIVES

Objectives are "what must be achieved to a large degree for the action to be considered a success" (NPS DO #12) and represent more specific statements of purpose and need. All alternatives selected for detailed analysis must meet all objectives to a large degree and must resolve the purpose of and need for action. The following objectives were identified by the interdisciplinary team for this project:

- Restore wetland functions and values: hydrology (which includes water, sediment and nutrient movement); vegetation; wildlife habitat; and access for estuarine organisms to the wetlands
- Improve visitor experience
- Avoid or minimize adverse impacts to park resources and values
- Improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms)

PROJECT LOCATION

Barataria Preserve, a unit of the Jean Lafitte National Historical Park and Preserve, is located in southeastern Louisiana, approximately 15 miles from downtown New Orleans in the upper freshwater zone of the Barataria Basin (Figures 1 and 2). The Preserve houses numerous facilities including the Barataria Visitor Center, the Environmental Education Center, and numerous hiking and canoeing trails. Despite its proximity to a metropolitan area, the Preserve exhibits exceptional examples of natural and cultural resources reflective of the Mississippi River Delta. The Preserve's location also makes it vulnerable to natural and man-made forces, and the intensity of natural events is strengthened by previous man-made actions. The project location is limited to the immediate vicinity of the more than 20 miles of non-historic canals proposed for reclamation within the Preserve boundary (Figure 3).

PURPOSE AND SIGNIFICANCE OF JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE

Establishment and Purpose

Jean Lafitte National Historical Park and Preserve was established by an Act of Congress on November 10, 1978 (Public Law 95-625), to "…preserve for the education, inspiration, and benefit of present and future generations significant examples of natural and historical resources of the Mississippi River Delta region and to provide for their interpretation in such manner as to portray the development of cultural diversity in the region." Jean Lafitte National Historical Park and Preserve consists of six separate units in south Louisiana: the French Quarter Visitor Center, the Chalmette Battlefield and National Cemetery, the Barataria Preserve Unit, the Acadian Cultural Center in Lafayette, the Prairie Acadian Cultural Center in Eunice, and the Wetlands Acadian Cultural Center in Thibodaux. Each of these sites provides a diversity of valuable natural and cultural resources preserved and interpreted by the NPS.

The Crescent City District consists of the French Quarter site (which houses administrative offices and a visitor center), the Chalmette National Cemetery (the final resting place for more than 15,000 soldiers), and the Chalmette Battlefield (the site of the 1815 Battle of New Orleans), which is managed as a historically significant cultural landscape. The Acadian District interprets the Acadian culture of the Mississippi River Delta region. The 25,000-acre Barataria Preserve is the largest natural area managed by Jean Lafitte National Historical Park and Preserve.

Significance

Park significance statements capture the essence of a park's importance to the nation's natural and cultural heritage. Understanding park significance helps managers make decisions that preserve the resources and values necessary to the park's purpose. The significance of the Jean Lafitte National Historical Park and Preserve is reflected in the following statements, as presented in the Resource Management Plan (NPS 1997):

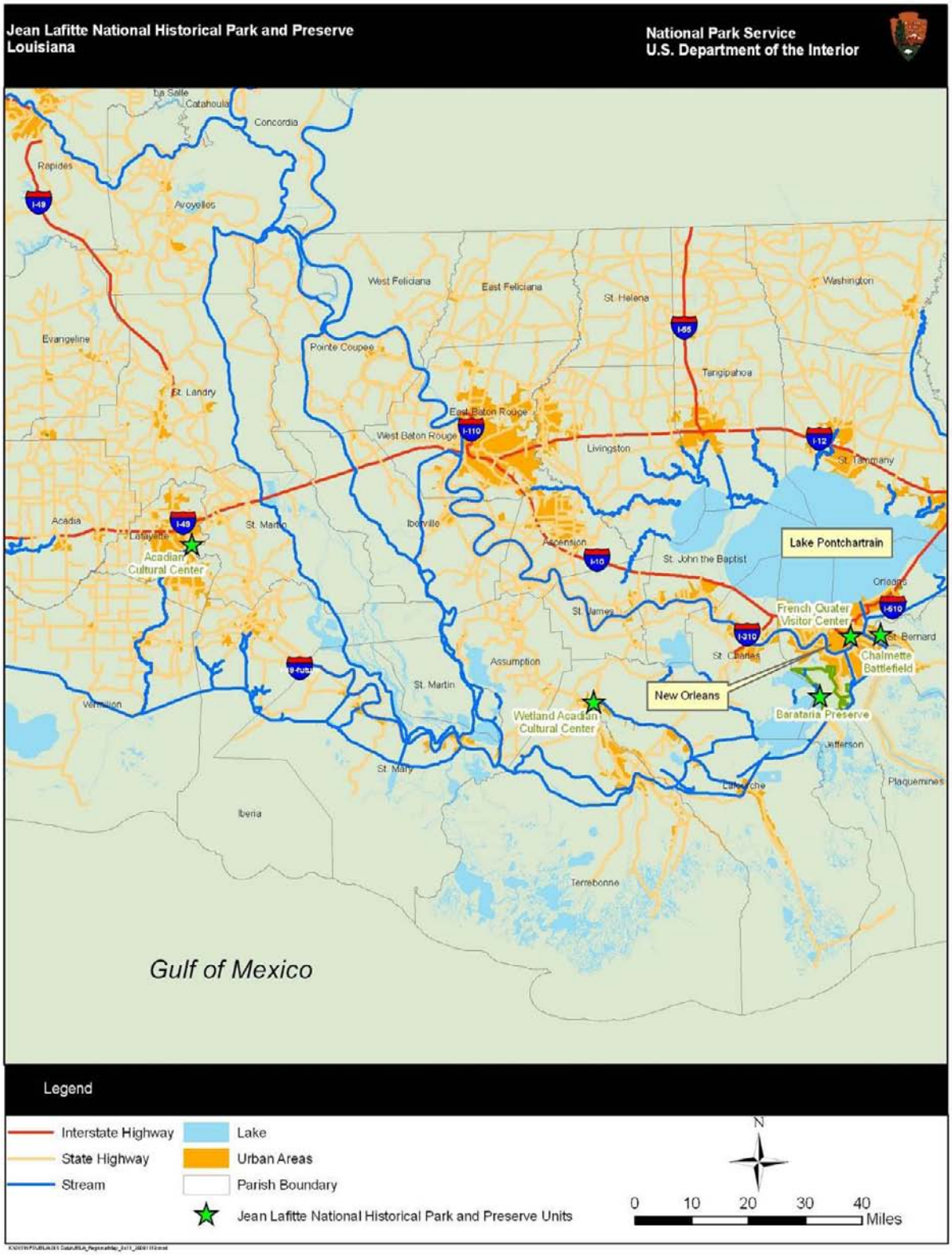

Figure 1. Location of Jean Lafitte National Historical Park and Preserve in Southeastern Louisiana

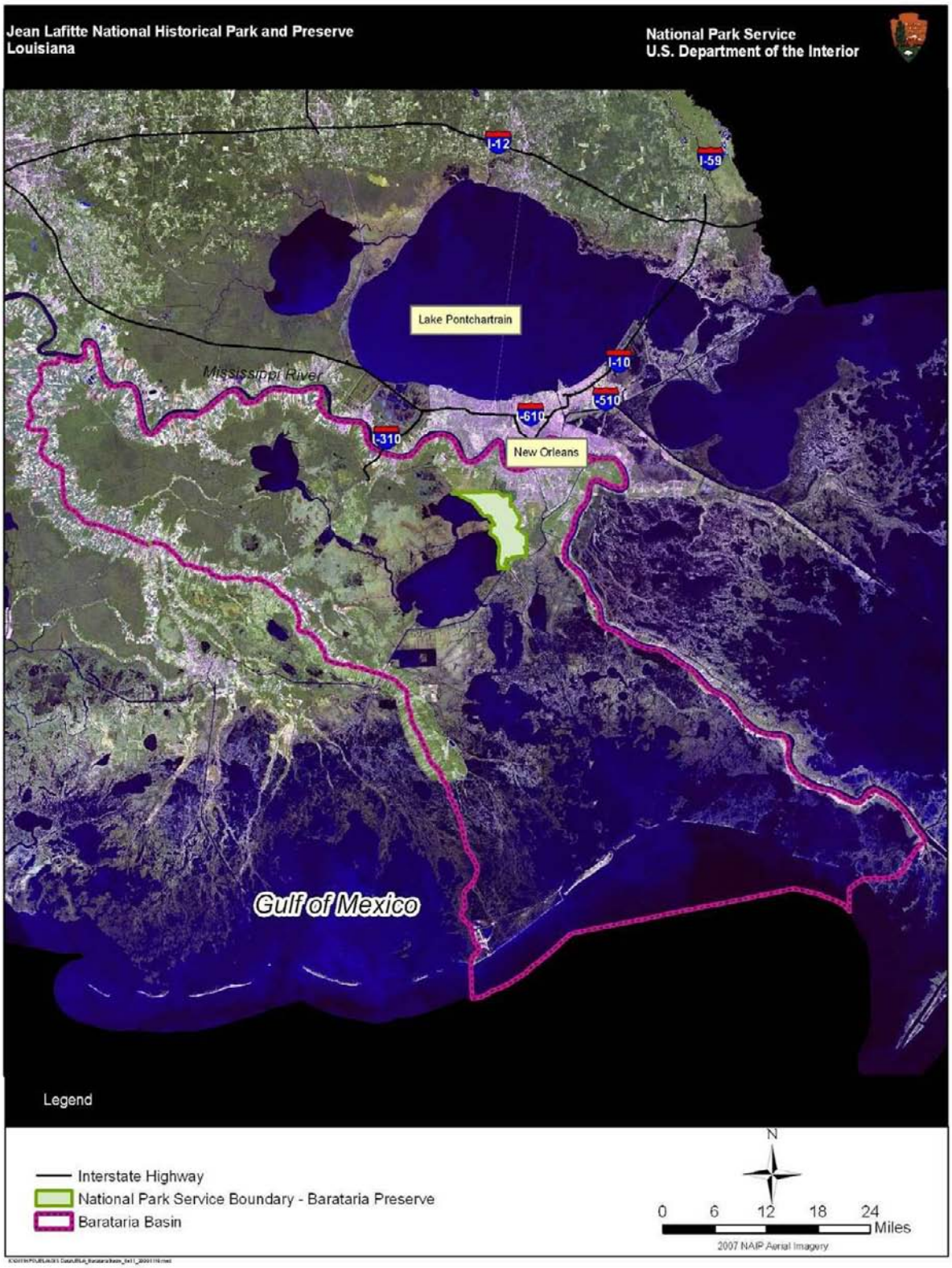

Figure 2. Location of Barataria Preserve within the Barataria Basin

Figure 3. Non-Historic Canals and Drillslips to be Reclaimed in Barataria Preserve

“In creating Jean Lafitte, Congress recognized the lower Mississippi River Delta Region as an area of pivotal national significance, both in terms of its natural and its historic resources. The region comprises the largest and most productive estuarine and wetland system on the continent: barrier islands, alluvial ridges, bottomlands, swamps, fresh to saline marshes, beaches, mudflats, lakes, rivers, bayous, and coastal bays.”

“Jean Lafitte National Historical Park and Preserve’s mandate is to celebrate the totality of the delta region’s character through the preservation and interpretation of natural and historical resources. Obviously the park cannot manage or contribute to the preservation and interpretation of all of the diverse resources of the delta region. Therefore, representative examples were chosen to demonstrate the character of the region as a whole and preserved within the park’s units.

The delta’s regional character is a product of its climate, geography, geology, bountiful resources, and the mixing of many diverse peoples. These forged a cultural and environmental symbiosis reflected in the language, architecture, food, music, festivals, customs, and life-ways that make the Delta Region a distinctive and significant component of the United States.

The park focuses its interpretive effort on the interrelationship between people and the natural environment. In profoundly important ways, this unique environment shaped the development of the region’s unique culture. In an equally profound sense, people have modified the environment of the delta. The interplay of culture and nature in the delta is a paramount theme because the Delta environment forced the development of unique cultural adaptations not found elsewhere in the United States.

However, the modifications of deltaic processes instituted by people have had systemic effects of such magnitude that the very delta is threatened with physical disappearance and with it, the culture that depends upon it. In response, a concerted effort among citizens, businesses, and governments at every level has been undertaken to halt and reverse this environmental catastrophe. The park is part of this partnership, not only to help in the preservation of these resources, but also to help in the interpretation of the effort.”

PROJECT BACKGROUND

Exploratory oil and gas wells drilled in the Preserve from the 1950s to the 1980s required construction of a widespread network of canals through emergent and forested wetlands and creation of spoilbanks as dredging occurred. Other canals were dredged as corridors for oil and gas pipelines. Abandoned, unreclaimed canals have had lasting effects on the landscape and environment.

Other areas of the Preserve are affected by canals dredged in the early 1970s to provide borrow material for the construction of dikes. The dikes were built to facilitate drainage and residential development in wetlands, which never fully materialized. Like canals constructed in support of oil and gas exploration and development, the canal and dike systems were never reclaimed and have caused long-term effects on the environment within the Preserve.

Within the Preserve, the canals under consideration for reclamation are recent additions to the landscape and are not considered historic resources. The presence of these canals exaggerates the impact of many current chronic stresses on coastal Louisiana. Canals alter natural hydrological functions, disrupt sheet flow of fresh water and nutrients, amplify tidal volumes, and serve as conduits for saltwater intrusion into freshwater marsh. These effects on freshwater marsh or forested swamp systems result in declining plant viability and potential long-term changes in species

composition. The majority of spoilbanks and dikes of these canals are dominated by the invasive Chinese tallow tree (*Triadica sebifera*), and the existence of the canals facilitates tallow seed distribution into the marsh and associated scrub-shrub habitats that are readily colonized by the tallow tree. The dominance of Chinese tallow prevents the growth of native plants, thus reducing the habitat value for native wildlife.

Backfilling abandoned canals and degrading dikes and spoilbanks has been widely used as a restoration technique in wetland habitats in southeastern Louisiana and has been used successfully in the Preserve. The NPS initiated the preparation of this EA to examine issues and alternatives for a solution to the detrimental effects these canals have on the natural and biological resources in the Preserve.

NATIONAL PARK SERVICE PLANS, POLICIES, AND ACTIONS

Created and approved in 1982, the *Jean Lafitte National Historical Park and Preserve General Management/Development Plan* guides the overall management and use of park resources. The general management portion of the plan outlines overall interpretation of the park's natural and cultural resources, visitor use, development, and administration. The development concept portion refines proposals for the developed areas and discusses the spectrum of existing and new facilities that would allow opportunities for recreation to continue for future generations. Designated management zones for park lands and waters indicate what park operations and management functions, visitor uses, and developments are appropriate in different locations. These zones are based on the park's authorizing legislation, NPS policies, the nature of the park's resources, and established uses.

A 1995 amendment to the General Management Plan was created and approved to address changes and issues concerning cooperating agreements, resource additions, natural resource management, and visitor use and general development. Among other things, the plan amendment guides the direction for natural resource management and interpretation in the Preserve. The amendment also re-examines some of the actions proposed in the 1982 plan, substituting new proposals where appropriate.

The *Jean Lafitte National Historical Park and Preserve Resource Management Plan* created in December 1997 identifies natural and cultural resources and their location in the context of Louisiana's Mississippi River Delta Region and describes and evaluates current resource management activities. The Resource Management Plan serves as the park's primary planning document for addressing critical resource issues and problems. The overall resource management goals for the Jean Lafitte National Historical Park and Preserve are to protect representative examples of the natural and historical resources of Louisiana's Mississippi River Delta Region and adjacent areas of Acadiana through NPS ownership and conservation through partnerships that promote such protections and to provide the means and opportunities for people to experience those resources and understand how they contribute to the development of a unique culture.

SCOPING

Two internal scoping meetings were held on September 24, 2009, and October 8, 2009. The meetings were conducted by an interdisciplinary team of NPS staff from both Jean Lafitte National Historical Park and Preserve and the Denver Service Center. The September meeting included a discussion on purpose, need, and objectives for the project; various alternatives; potential environmental impacts;

past, present, and reasonably foreseeable future projects that may have cumulative effects; and possible mitigation measures. During the October meeting, team members conducted a site visit to view the project area and the areas that would be affected by the action.

On September 30, 2009, the NPS published a scoping brochure detailing their intentions to prepare an EA for Canal Reclamation at Barataria Preserve in the Jean Lafitte National Historical Park and Preserve. The NPS wished to determine the scope of issues to be addressed in the EA, identify significant issues related to canal reclamation at the Preserve, and obtain feedback on initially proposed alternatives. The NPS conducted a 30-day public scoping period (ending October 31, 2009) and invited the public to send written comments to the Superintendent or to enter them online at www. parkplanning.nps.gov/jela. A press release was also sent to *The Times Picayune* on October 5, 2009. During the 30-day scoping period, 32 pieces of correspondence were received. Comments included both support for and against the project, a suggested new alternative to spread the degraded spoil material across the marsh instead of placing it in the canals, requests to remove certain canals from the project, concerns about continued access to private properties, including concern about the continued ability of companies to exercise their mineral rights in the Preserve, concerns about potential impacts, and suggestions for resource topics to include in the analysis. More information about the nature of the comments can be found in the "Coordination and Consultation" chapter of this EA.

ISSUES

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations, as well as problems that may arise from the implementation of any of the alternatives. Potential issues associated with this project were identified by the park staff, input from other agencies consulted, the initial scoping meeting, and the public during the public scoping period.

The primary concern of the park, as identified during the internal scoping meetings, is to protect Preserve resources and ensure their continued use and enjoyment for park visitors. Other identified issues and concerns are listed below.

Natural Resources: Activities associated with the construction project activities affect natural resources such as soils, water quality, vegetation, and wildlife.

Visitor Use and Experience: Concerns raised during scoping included access to areas open for hunting within the Preserve, the length of time the project would take, the impact of other projects that could be occurring at the same time (U.S. Army Corps of Engineers [USACE] aquatic vegetation spraying, canoe trail debris removal, and Bayou aux Carpes acquisition/mitigation), administrative boat use, and mitigation focused on visitor use and experience.

IMPACT TOPICS

Issues describe problems or concerns associated with current impacts from environmental conditions or current operations as well as problems that may arise from the implementation of any of the alternatives. Park staff identified potential issues associated with the implementation of the reclamation activities during internal scoping. A primary concern is to ensure that any alternative considered would allow for minimal disturbance of the existing Preserve functions, resources, and values. Issues and concerns identified during scoping were grouped into impact topics that are discussed in the "Affected Environment" chapter and analyzed in the "Environmental Consequences"

chapter of this EA. Table 1 describes each of the topics that are considered in the analysis. The narrative that follows provides a justification as to why particular topics were dismissed from analysis.

Table 1. Impact topics retained for further evaluation and relevant laws, regulations, and policies

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
Soils and Geology	The proposed action would degrade developer-built spoilbanks and dikes resulting in disturbances to the soils. Soil disturbances could also result from the use of equipment necessary to move large volumes of material. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Management Policies*
Vegetation and Non-native Species	The proposed action could result in the removal of native vegetation. Several forms of vegetation located in the proposed project area could be affected by the proposed reclamation activities, as some vegetation may need to be removed or disturbed to carry out the proposed action. Project-related disturbances may occur to live vegetation from the use of large equipment. Moreover, since equipment would be operating in waterways, there may be disturbance to floating and rooted aquatic vegetation. The project would reduce habitat typically dominated by exotic invasive vegetation. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Organic Act*; NPS *Management Policies*; Resource Management Guidelines (NPS-77); *Federal Noxious Weed Control Act*; Executive Order 13112; Invasive Species (1999)
Fish and wildlife	The rich estuarine environment of coastal Louisiana supports an abundance and diversity of wildlife. The Preserve's ecological complex of terrestrial and aquatic habitats provides a generous supply of habitat for resident and migratory wildlife. Activities necessary to carry out the proposed action would involve increased human activity and the use of heavy equipment. This would create disturbances and may temporarily displace wildlife from the area. Canal and spoilbank vegetation habitat would be converted to wetland. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Organic Act*; NPS *Management Policies*; Resource Management Guidelines (NPS-77); *Fish and Wildlife Coordination Act of 1934* (PL 85-624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Special Status Species	The U.S. Fish and Wildlife Service (USFWS) determined the proposed action alternative would not impact federally listed species (USFWS 2009). However, migratory birds such as neotropical species may be impacted by the removal of vegetation on the spoilbanks. Therefore, during scoping the interdisciplinary team decided this impact topic would be retained for further analysis in this EA.	*Fish and Wildlife Coordination Act of 1934* (PL 85-624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Hydrology and Water Quality	In-stream work would be necessary for reclamation activities, potentially resulting in	*Clean Water Act*; *Fish and Wildlife Coordination Act of 1934* (PL 85-

Impact Topic	Reasons for Retaining Impact Topic	Relevant Laws, Regulations, and Policies
	adverse impacts on water quality. There could be beneficial effects resulting from decreased erosion of the canal banks. Therefore, this impact topic was retained for further analysis in this EA.	624) as amended; Executive Order 12088; NPS *Management Policies,* NPS-77
Wetlands	More than 95% of the Preserve is classified as emergent and forested wetlands according to the 1992 USFWS National Wetlands Inventory (NWI) (Cowardin et al. 1979). The proposed project activities could impact wetlands through the use of heavy equipment, potentially resulting in the compaction of wetland soils and destruction of some wetland vegetation. There would be long-term beneficial impacts to the areas experiencing spoilbank removal and partial filling. The spoilbanks present an artificial area of high elevation and mineral soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow, and primarily native wetland species are expected to recolonize the area after spoil material removal. Partial filling of open water areas with material from the spoilbanks is expected to create additional areas of submerged and emergent vegetation. Therefore, this topic was retained for further analysis in this EA.	Executive Order 11990 Protection of Wetlands, NPS *Management Policies* and Procedural Manual DO #77-1: Wetland Protection, *Clean Water Act* Sections 404 and 401
Visitor Experience, Health and Safety	The proposed action could disturb visitors during construction due to reduced access and noise from construction. The visitor experience could be affected. Temporary recreational area closures and increased noise and pollution levels may result under this alternative. Therefore, this impact topic was retained for further analysis in this EA.	NPS *Management Policies*

IMPACT TOPICS ELIMINATED (OR DISMISSED) FROM FURTHER ANALYSIS AND CONSIDERATION

The following impact topics were eliminated from further analysis in this EA. A brief rationale for dismissal is provided for each topic. With mitigation, potential impacts to these resources would be negligible and localized.

Floodplains

Executive Order 11988 *Floodplain Management* requires all federal agencies to avoid construction within the 100-year floodplain unless no other practicable alternative exists. The NPS, under the direction of *Management Policies 2006* and DO #77-2: *Floodplain Management* would strive to preserve floodplain values and minimize hazardous floodplain conditions. According to DO #77-2, certain construction within a 100-year floodplain requires preparation of a Statement of Findings for floodplains. For restoration projects that restore to grade without any fill materials, a Statement of Findings for floodplains is not required. Coordination with the NPS' Water Resources Division

confirmed that if this project would result in a net beneficial impact to the floodplain, it would not be necessary to develop a floodplain Statement of Findings. The proposed action would restore more natural conditions within the Preserve; would not place humans or Preserve infrastructure at increased flood risk; and, therefore, would not require a Statement of Findings.

The proposed action is consistent with NPS policy that dictates the preservation of floodplain values and functions as it would be providing beneficial impacts to floodplain functions and values over the long term. The proposed action specifically supports the NPS policy that states "[NPS] will protect and preserve the natural resources and functions of floodplains, and restore when practicable, natural floodplain values previously affected by land use activities within floodplains." Since this alternative is consistent with NPS policy and does not involve the development or occupancy of floodplains, this impact topic has been dismissed from further consideration.

Prime and Unique Farmland

The Council on Environmental Quality (1980) states that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's (USDA's) Natural Resource Conservation Service as prime farmlands or unique farmlands. Prime farmland defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. Unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops, such as fruits, vegetables, and nuts.

Within the project area, there are lands designated as prime farmlands (USDA 2004). However, these areas have not been in agricultural production since the early 1900s. While park rangers interpret previous farming practices and agricultural uses, there are no plans to put these lands back in production. Therefore, the topic of prime and unique farmlands has been dismissed from further consideration.

Air Quality

The Clean Air Act of 1963 (U.S.C. 7401 et seq.) was established to promote public health and welfare by protecting and enhancing the nation's air quality. The act establishes specific programs that provide special protection for air resources and air quality related values associated with NPS units. Section 118 of the Clean Air Act requires a park unit to meet all federal, state, and local air pollution standards. Further, the Clean Air Act provides that the federal land manager has an affirmative responsibility to protect air quality related values (including visibility, plants, animals, soils, water quality, cultural and historic resources and objects, and visitor health) from adverse air pollution impacts. The Preserve is located in an area classified by the EPA as "in attainment" for all six criteria air pollutants.

The proposed action could result in increases in fugitive dust and emissions from construction vehicles and equipment used to degrade the spoilbanks. However, any impacts would be localized and negligible. Due to the project location, environmental conditions, and the temporary nature of the activities, any emissions and fugitive dust would rapidly dissipate, and emission levels would not be higher than those produced by vehicles and equipment during normal park operations.

Any impacts of reclaiming the non-historic canals on climate change would be mainly due to emissions of nitrous oxides and carbon dioxide from the burning of fossil fuel in vehicles and construction equipment, which can affect global warming. However, these impacts would be

temporary and negligible. Removing vegetation from spoilbanks would decrease the amount of vegetation that could remove carbon dioxide from the atmosphere, but this decrease would be negligible and would be offset once wetland vegetation reestablished itself. For these reasons, air quality was dismissed as an impact topic from this analysis.

Archeological Resources and Historic Structures

Because of pre-construction surveys and avoidance mitigation, the NPS determined that there would be no adverse impacts to archeological sites in the project area. The NPS would conduct a Phase I survey for archeological sites in the project area, focusing especially on areas where canal segments have intersected or cut into natural waterways or historic canals, and on canal segments in recently acquired lands. The archeologist who conducts this survey would visit: (1) the state site files office to determine if there are previously identified archeological sites in the newly acquired lands and obtain copies of all associated site forms; (2) all spoilbanks and dikes to be impacted, especially those in the newly acquired lands; and (3) all intersections of canals and spoilbanks in the project area with natural waterways and/or historic canals and perform a pedestrian survey (if above water), and, if deemed necessary, conduct limited subsurface testing.

Known sites identified in the Phase I survey would be flagged for avoidance by the archeologist during the survey and removed from the project area. Should the action alternative be implemented, the park would have staff from the Southeast Archeological Center complete the pre-construction Phase I survey as implementation is funded for each part of the project area. This mitigation would also cover historic structures if any are discovered during the survey(s). If evidence of archeological sites or historic structures is inadvertently discovered during construction activities, work in the area would cease, and qualified NPS personnel would assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribe. Based on these factors, archeological resources were dismissed as an impact topic from this analysis.

Cultural Landscapes

None of the canals targeted for reclamation are identified as contributing elements to the historical features of the Barataria Unit National Historic District, which was placed on the National Register of Historic Places in 1989. A draft cultural resources report which, when final, would be used as the basis for an amended National Register nomination for the district (Swanson 2008) also did not identify any project canals as contributing elements, despite the fact that Pipeline Canal, Tarpaper Canal, and the drillslip on the east bank of Bayou Bardeaux between Lakes Cataouatche and Salvador are all slightly more than 50 years old and, therefore, could have been considered contributing resources if they were significant. Canals in the entire Preserve are a category of cultural landscape features that either contributes (historic) or does not contribute (non-historic) to the nomination. None of the historic canal features, the Kenta, Delery-Ross, Wood's Place, Millaudon, Dugue's, Labranche, and Waggaman Canals, along with meander cut-offs of Bayou Segnette, are included in the project area. However, parts of the project area overlap with segments of historic canals that have been already modified by the non-historic land uses which the project seeks to reclaim.

Ethnographic Resources

Ethnographic resources within the Preserve are associated with American Indian tribes, African American communities, Isleño people, and other traditional users of the resources in the Preserve.

These ethnographic resources include plants, animals, and physical features identified as having religious, subsistence, occupational, or other significance by one or more of these groups. The NPS has not received any information regarding effects to ethnographic resources from park users or Indian tribes contacted as part of the initial public scoping process for the project. While ethnographically significant plants, such as wild onion (*Allium canadense*), muscadine grape (*Vitis rotundifolia*), dewberry (*Rubus* sp.), and sneezeweed (*Helenium* sp.), do occur in the Preserve, American Indian tribes are not collecting them within the Preserve boundaries. Most fish and wildlife species of ethnographic significance were utilized as food sources or for fur and include species still commercially important to the region as well as game species. The project is likely to beneficially affect fish and shellfish populations by creating shallow water habitat. The park has had no response from scoping indicating that any physical features or locations within the Preserve that would be affected by the project have significance to any associated group. Based on these factors, ethnographic resources were dismissed as an impact topic from this analysis.

Museum Collections

The park's museum collection is not likely to be affected by the project because it would not result in the intentional excavation of archeological sites. However, a small number of artifacts may be collected as part of the pre-construction Phase I cultural resources survey and become part of the collection. Based on these factors, museum collections were dismissed as an impact topic from this analysis.

Soundscapes

According to NPS *Management Policies 2006*, park natural soundscape resources encompass all the natural sounds that occur in parks, including the physical capacity for transmitting those natural sounds and the interrelationships among park natural sounds of different frequencies and volumes. Examples of natural sounds include sounds produced by natural and physical processes including territorial calls of birds and wind passing through forests. As a result of the proposed action, natural soundscapes may be interrupted by the sound of project workers, heavy equipment, and vessels on a temporary and negligible basis. The frequency, duration, and magnitude of noise from the project would not exceed those already produced by park staff and visitors during normal park operations and recreational activities. For these reasons, soundscapes is dismissed from further analysis.

Land Use

The proposed action of reclaiming non-historic canals within the Preserve would not alter land use designations in the Preserve. Within the boundaries of the Preserve there are land holdings that are subject to mineral reservations that allow operators owning those property rights the right of access to the surface to explore for and develop the mineral interest. Oil and gas activities that are associated with the exploration and development of nonfederal oil and gas rights located within NPS boundaries are governed by the National Park Service Nonfederal Oil and Gas Rights and Regulations found in 36 CFR 9B (9B regulations). According to the regulations, the right to conduct oil and gas operations in units of the national park system is based on ownership rights and obtaining NPS authorization to conduct the operation (36 CFR § 9.30[a]). While the NPS must recognize the property rights of operators owning the mineral reservations, it must also fulfill its mandate from Congress through the Organic Act of 1916 to manage units of the national park system “to conserve the scenery and the natural and historic objects and wildlife therein and to provide for the enjoyment of the same in such

a manner and by such a means as will leave them unimpaired for the enjoyment of future generations" (16 U.S.C. § 1).

None of the oil and gas access canals and drillslips identified for reclamation under the proposed action are active, and all are abandoned. The 9B regulations are reasonable time, place, and manner regulations that assist park managers in carrying out park mandates while allowing oil and gas operators to exercise their property rights. Because reclaiming abandoned access canals and drillslips would not prevent operators owning mineral reservations from exercising their property rights in the future, the topic of land use was dismissed from further analysis.

Socioeconomics

The proposed action would neither change local or regional land use nor appreciably impact local business or other agencies. Contracted work for this project would be temporary, and any potential increase in workforce revenue would be temporary and negligible. Local businesses (gas stations, restaurants, canoe rentals, swamp boat tours, and shops) may benefit from additional visitors to the Preserve, but any increase is expected to be negligible and lasting only as long as project activities occur.

A swamp tour company is located immediately adjacent to the Preserve, and its boats are stored and operated in canals owned by the United States in the Bayou aux Carpes area that are proposed for reclamation; however, its ability to continue its commercial venture would not be adversely impacted. With the NPS' recent acquisition of Bayou aux Carpes, some of the canals visited by the tour boat company are now within the Preserve boundaries, and the NPS would coordinate with the tour boat company to allow it to continue its operations in the Bayou aux Carpes area under the terms of a commercial use authorization. So as not to interfere with navigation in the canals used by the tour boat company, cut woody vegetation in these canals would be placed parallel to the banks of the canal or chipped in place. Additionally, the viewing experience of the tour boat company's patrons would be enhanced by restoring spoilbank habitat consisting of invasive exotic trees back to native wetlands. Because there would be beneficial impacts and no adverse impacts to the socioeconomic environment, this topic was dismissed from further analysis.

Park Management and Operations

Park operations and management, including operational efficiency, staffing needs, interagency relations for NPS law enforcement, maintenance, and commercial use permittees, would not be affected by actions proposed in the alternatives. The park anticipates some operational changes with regard to the vessels that can be used to access reclaimed canals in the long term. However, the park currently has the capability to operate in the shallow water environments that would be created by the project, and this is not expected to change. Therefore, this topic was dismissed from further analysis.

ALTERNATIVES

NEPA requires that federal agencies explore a range of reasonable alternatives and provide an analysis of what impacts the alternatives would have on the human environment (the natural and physical environment and the relationship of people with that environment). The alternatives under consideration must include a "no action" alternative as prescribed by 40 CFR 1502.14.

This chapter describes two alternatives: the no action alternative and the proposed action (reclamation of more than 20 miles of non-historic canals within the Preserve). Alternatives considered but dismissed from further analysis are described, and the reasons for dismissal are provided. Analyses for selecting the environmentally preferred alternative and the NPS preferred alternative are also provided.

NO ACTION ALTERNATIVE (ALTERNATIVE A)

The no action alternative is a continuation of current conditions and "sets a baseline of existing impacts continued into the future against which to compare impacts of action alternatives" (NPS DO #12, Section 2.7). Under the no action alternative, the NPS would not degrade developer-built spoilbanks and dikes to the level of the surrounding wetlands for more than 20 miles of non-historic canals within the Preserve. The non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. Should the no action alternative be selected, the NPS would continue to maintain and protect the natural resources, functions, and values within the Preserve and would respond to future needs and conditions associated with the canals and coastal wetlands without extensive actions or changes in the present course.

CANAL RECLAMATION TO NATURAL LANDSCAPE BY DEGRADING DEVELOPER-BUILT SPOILBANKS AND DIKES (ALTERNATIVE B, PREFERRED ALTERNATIVE)

Under alternative B, the NPS would reclaim more than 20 miles of non-historic canals within the Preserve by degrading developer-built spoilbanks and dikes to meet the level of the surrounding wetlands and partially filling the open water of the canals with the degraded soil and vegetative material. The canals would then be allowed to revert to marsh and shallow water habitat by natural processes, recreating freshwater wetlands. Figure 3 under Project Location in the "Purpose and Need" chapter of this EA shows the non-historic canals and drillslips considered for reclamation.

Degrading developer-built spoilbanks and dikes would be accomplished from the canals and /or the spoilbanks using a marsh buggy, barge-mounted excavator, or similar earth-moving equipment. Access to the reclamation areas would be via canals and/or spoilbanks. In consideration of habitat restoration/preservation and potential impacts to navigation and recreation, the NPS may also use one or a combination of the following techniques. The techniques implemented would be based on existing conditions in the Preserve at the time of degrading and funding considerations.

Check Meanders: In areas where canals identified for reclamation meet a maintained navigable waterway, that is, the Bayou Segnette Waterway, check meanders would likely be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation. The check meander would be installed in the canal upstream of the confluence with the navigable waterway and would consist of a double earthen plug with small openings on either end to allow for water exchange and aquatic access for fish and wildlife (Figure 4). The check meander would be

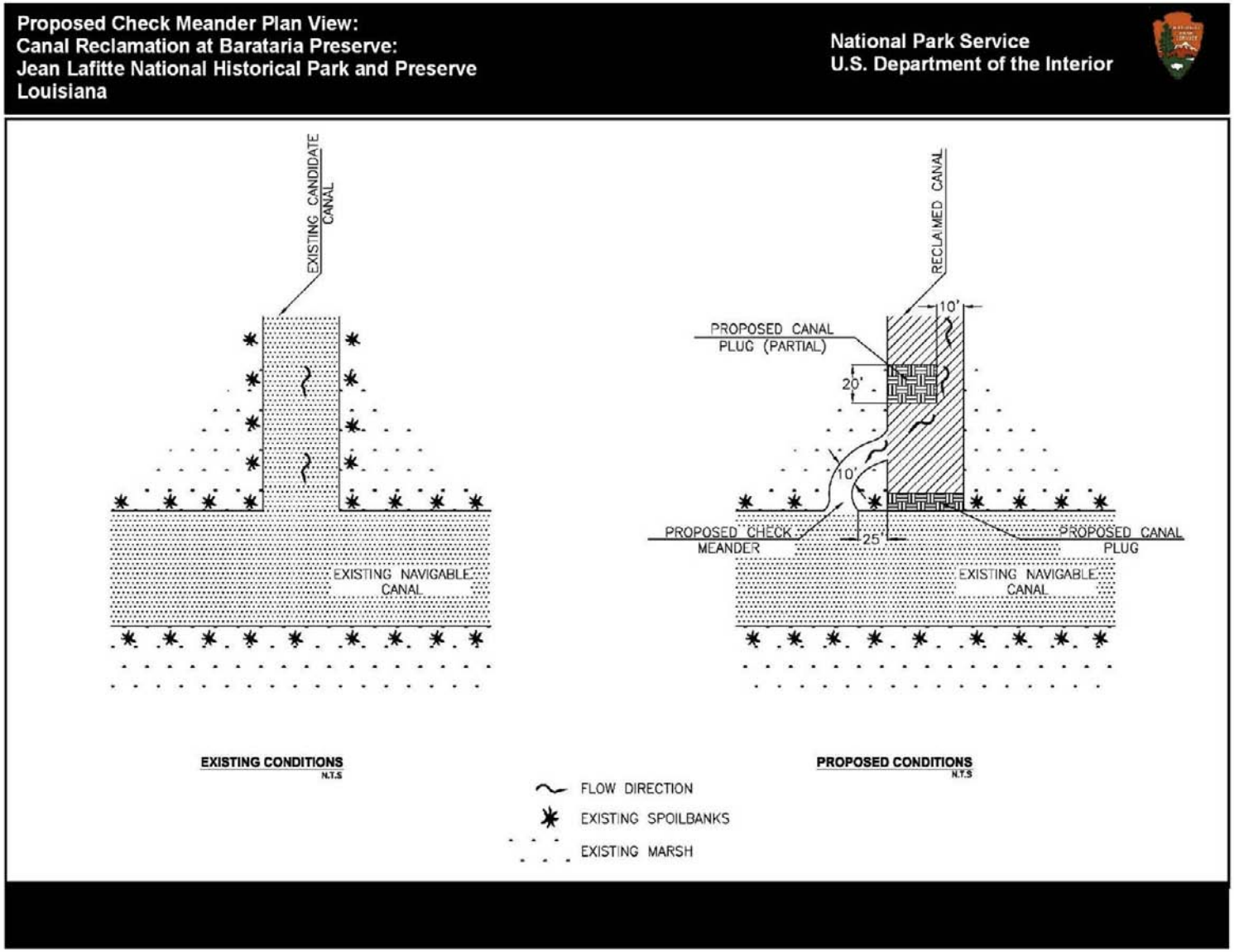

Figure 4. Check Meanders

constructed using only spoilbank material available from the canal itself. The purpose of the check meander would be to prevent the discharge of woody vegetation and sediment from the partially filled canal into the navigable channel and to protect the reclaimed canal from direct wave action and tidal surges from the navigable channel. Check meanders constructed as part of past reclamation projects in the Preserve have withstood multiple hurricane tidal surges/releases.

Vegetation Removal: In non-historic canals where pushing woody vegetation into the open water may interfere with navigation such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal, and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by commercial swamp tours, cut woody vegetation may be placed parallel to the banks of the canal or chipped in place. Woody vegetation may also be chipped in place in canals or drillslips that meet a navigable waterway to prevent large woody debris from drifting into the navigable waterway.

Gapping: Gapping is a technique whereby spoilbanks would be intermittently breached to restore hydrological connections between the canal and the surrounding marsh or wetland. Gapping would likely be used in areas throughout the project area where it would be too costly to degrade an entire developer-built spoilbank or dike due to the amount of material present. The gapped material would be used to partially fill the open water area of the canal.

Revegetation: Some reclaimed areas that are adjacent to forested wetlands may be revegetated with native woody species such as baldcypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatic*).

MITIGATION MEASURES OF THE ACTION ALTERNATIVE

The following mitigation measures would be implemented under the action alternative:

General

- NPS personnel would identify spoilbanks and canals to be degraded and partially filled and would regularly monitor the work.
- To minimize possible petrochemical spills from construction equipment, the contractor would regularly monitor and check equipment to identify and repair any leaks
- Spill containment materials would be staged near the action area for use to contain or collect any accidental fuel or chemical spills from construction equipment.
- Upon discovery, any fuel or chemical spills associated with construction activities would be immediately contained and reported to the NPS.
- Fueling of vehicles and equipment would take place outside the Preserve whenever possible; if fueling within the Preserve is required, no less than two persons would attend these activities, and fueling would be completed over a physical barrier, such as a tarp, and absorbent materials.

Soils and Geology

- To eliminate impacts to soils outside of the immediate project areas, equipment access to the areas to be degraded would be via the canals and/or spoilbanks.

Vegetation

- Weed control measures (e.g., cleaning/washing of vehicles/vessels, equipment, and personal equipment before entering/re-entering the Preserve) would be implemented to help minimize the potential for the introduction and spread of nonnative species.
- To eliminate potential impacts to marsh vegetation caused by driving over it, construction equipment would access the project areas via the canals and/or spoilbanks.

Fish and Wildlife / Special Status Species

- Construction activities would be timed to avoid nesting activities of bird species.

Water Resources

- Boats operating in the canals during reclamation activities would use only four stroke engines.

Wetlands

- Ground crews would be instructed by park staff on how to avoid damaging any part or whole of wetland vegetation in the Preserve other than the vegetation to be removed on the spoilbanks.
- The NPS would regularly monitor to ensure non-spoilbank wetland vegetation is not damaged during reclamation activities.

Cultural Resources

- A Phase 1 survey would be conducted for archeological sites in the project area by qualified staff from the Southeast Archeological Center prior to any construction activities. The archeologist would visit: (1) the state site files office to determine if there are previously identified archeological sites in the newly acquired lands and obtain copies of all associated site forms; (2) all spoilbanks and dikes to be impacted, especially those in the newly acquired lands; and (3) all intersections of canals and spoilbanks in the project area with natural waterways and/or historic canals and perform a pedestrian survey (if above water), and, if deemed necessary, conduct limited subsurface testing.
- Known archeological sites, including those identified in the Phase I survey, would be flagged for avoidance by the archeologist and removed from the project area.
- If evidence of archeological sites or historic structures is inadvertently discovered during construction activities, work in the area would cease, and qualified NPS personnel would assess the sites and recommend an appropriate course of action to the Park Superintendent in consultation with the State Historic Preservation Office and any potentially affected Indian Tribes.

Visitor Use and Experience

- Where canals identified for reclamation meet the maintained navigable Bayou Segnette Waterway, check meanders would likely be designed and installed to prevent degraded material from drifting into the navigable waterway and potentially impeding navigation.

- To avoid impacts to navigation caused by pushing woody vegetation into Tarpaper Canal, Horseshoe Canal, Pipeline Canal and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by commercial swamp tours, cut woody vegetation would either be placed parallel to the banks of the canal or chipped in place.
- Temporary canal closures would be put into place in areas where construction activities are occurring to eliminate any potential impacts to the health and safety of Preserve visitors.

ALTERNATIVES CONSIDERED, BUT DISMISSED

During the internal and public scoping process, the NPS received a number of suggestions for alternatives. The NPS considered the following alternatives, but deemed them to be unreasonable for the reasons provided. The options below were not carried forward for analysis in this EA.

Complete Plugs

Under this option, spoilbanks would be degraded, and material obtained from them would be used to construct complete plugs at the opening of canals. The plugged water channels would be left to naturally accumulate debris and return to pre-disturbance conditions. This option was dismissed because completely plugging a canal would cut off the exchange of water in and out of the canal and adjacent marsh, altering the local hydrology regime. This would result in a detrimental effect on water quality due to stagnation and a subsequent decrease in dissolved oxygen caused by decaying vegetation. These conditions would severely stress aquatic organisms currently inhabiting the channels by altering water chemistry and disrupting access. This option would therefore not meet the purpose and need of this project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

Completely Filling Canals

Under this option, canals would be partially filled with material acquired from degraded spoilbanks and then supplemented with additional dredged material obtained from an off-site source to completely fill the remaining open water of the canal. Monitoring of a previous pilot study conducted in 2001 – 2002 on two canals in the Preserve comparing this reclamation method with the method of using only degraded spoilbank material to partially fill a canal indicated that there was not a large ecological difference between the two methods after 3 years (Baustian et al. 2008). Results of the monitoring indicated that just using the spoilbank material effectively began the restoration process, while the addition of dredged sediment provided mixed restoration results. There was no appreciable difference in the amount of marsh established in the open water portions of the canals and both methods had 65% of their former spoil areas re-established as marsh. While the additional sediment used to completely fill one canal led to shallower canal depths, it also slowed soil restoration and allowed vegetation typical of young spoilbanks (e.g., black willow [*Salix nigra*]) to recolonize portions of the former spoil areas. Due to the additional construction costs of dredging and transporting additional sediments to completely fill the canal, this method cost eight times more than the method using available spoilbank material. Because completely filling a canal with supplemental dredge material does not achieve greater ecological results than just using spoilbank material yet costs eight times more, this alternative was dismissed from further analysis.

Degrading Spoilbanks onto the Marsh

Under this option, degraded spoilbank material (soil and vegetation) would be placed on the marsh instead of in the canals, thus leaving the canals as open water. Placing the degraded material on the marsh would directly destroy the type of wetland habitat that the project is trying to restore. By not partially filling the canals with spoilbank material, wetland vegetation would not be able reestablish itself in the canals and the canals would remain deeper, open water habitat. The open water habitat of the canals would continue to contribute to the loss of wetland habitat in the Preserve by, among other things, allowing saltwater intrusion into the freshwater wetlands. This option was dismissed because it did not not meet the purpose and need of this project to restore functions, resources, and values related to hydrology in the Preserve that are affected by non-historic canals and to increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

THE ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative is defined by the Council on Environmental Quality as the alternative that would promote the national environmental policy as expressed in NEPA Section 101. This includes:

1. Fulfilling the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assuring for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;
3. Attaining the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserving important historic, cultural and natural aspects of our national heritage and maintaining, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieving a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities; and
6. Enhancing the quality of renewable resources and approaching the maximum attainable recycling of depletable resources.

Simply put, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources (Council on Environmental Quality, *NEPA's 40 Most Asked Questions*, 6a).

The no action alternative is not the environmentally preferred alternative because it would not improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 2, 3, and 4) as well as alternative B nor would it fulfill the responsibilities of each generation as trustee of the environment by improving the degraded condition of the Preserve wetlands (NEPA criteria 1). Failure to reclaim the canals would allow the disruption of natural patterns of water movement to continue, degrade water quality, result in continued erosion, and preserve habitat for invasive floating vegetation.

After completing the environmental analysis, the NPS identified alternative B as the environmentally preferred alternative in this EA because it best meets the definition established by the Council on Environmental Quality. This alternative was selected based on the following criteria:

- it would restore wetland functions and values: hydrology (which includes water, sediment and nutrient movement); vegetation; wildlife habitat; and access for estuarine organisms by reclaiming more than 20 miles of non-historic canals within the Preserve (NEPA criteria 1, 2, 3, and 4);
- it would improve visitor experience by restoring the coastal wetland landscape allowing visitors to enjoy a more natural system, representative of the historic wetlands and ecosystems present prior to the canals(NEPA criteria 2);
- it would avoid or minimize adverse impacts to park resources and values (NEPA 1, 2, and 4); and
- it would improve the resiliency of Preserve ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms) (NEPA criteria 1, 2, 3, and 4).

The “Environmental Consequences” chapter of this EA describes the effects on each impact topic under each alternative. Table 3 summarizes these impacts.

ALTERNATIVES SUMMARIES

Table 2 summarizes the major components of alternatives A and B and compares the ability of these alternatives to meet the project objectives identified in the “Purpose and Need” chapter of this EA.

Table 3 summarizes the anticipated environmental impacts for alternatives A and B. Only these impact topics that have been carried forward for further analysis are included. The “Environmental Consequences” chapter provides a more detailed explanation of these impacts.

Table 2. Summary of alternatives and ability to meet project objectives

Alternative Elements	Alternative A – No Action	Alternative B (Preferred Alternative) – Canal Reclamation to Natural Landscape by Degrading Spoilbanks and Dikes Built by Developers
Project Objectives	**Meets Project Objectives?**	**Meets Project Objectives?**
Restore wetland functions and values: hydrology, including water, sediment, and nutrient movement; vegetation; and wildlife habitat and access for estuarine organisms.	Does not meet objective. The presence of the canals would continue to alter historic hydrologic functions by allowing rapid tidal exchanges, disrupting the flow of freshwater nutrients, and providing a conduit for saltwater intrusion. The threat to vegetation, wildlife, and estuarine organisms would continue to influence the abundance, composition, and diversity of native species. Wetland functions and values would not be restored.	Fully meets objective. The canals would be allowed to revert to marsh and shallow water habitat by natural processes recreating wetlands and restoring natural functions and values. Primarily native wetland species would recolonize the area creating additional areas of submerged and emergent vegetation, further increasing available habitat for wildlife and estuarine organisms.
Improve visitor experience	Does not meet objective. There would be no improvement to visitor use because current conditions would remain the same.	Partially meets objective. Visitors would enjoy a more natural system, representative of the historic wetlands and ecosystems present prior to the canals.
Avoid or minimize adverse impacts to park resources and values	Does not meet objective as non-historic canals and spoilbanks in the park contribute to increased rates of land loss and to the spread of invasive vegetation species, alter hydrology, and increase saltwater intrusion into freshwater marsh. Without adequate reclamation measures, canals and spoilbanks in the park would continue to stress park resources and values, with continued adverse effects on natural hydrology, ecology, water quality, and wetland functions and values.	Fully meets objectives. Reclamation of more than 20 miles of non-historic canals would minimize adverse effects including land loss and spread of invasive species, enhance historic hydrology patterns, and reduce saltwater intrusion into freshwater marsh.
Improve the resiliency of park ecosystems in the face of subsidence and climate change impacts (sea level rise and intensified tropical storms)	Does not meet objective. The presence of the canals would continue to alter historic hydrologic functions by allowing rapid tidal exchanges, and providing a conduit for saltwater intrusion into freshwater marsh. The threat to vegetation, wildlife, and estuarine organisms would continue to influence the abundance, composition, and diversity of native species. Wetland functions and values would not be restored.	Fully meets objective. The canals would be allowed to revert to marsh and shallow water habitat by natural processes recreating wetlands and restoring natural functions and values. The reclaimed area would attenuate tidal flows, diminish saltwater intrusion into freshwater marsh, reduce habitat fragmentation, and result in greater ecosystem resiliency.

Table 3. Environmental impact summary by alternative

Impact Area	Alternative A	Alternative B
Soils and Geology	Alternative A would result in long-term negligible adverse impacts to soils and geology. Cumulative impacts would be short-term moderate and long-term negligible to moderate adverse with the no action alternative contributing only negligibly to adverse cumulative impacts. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under the no action alternative.	Under alternative B construction activities would result in short-term negligible adverse impacts and long-term beneficial impacts to soils and geology. Cumulative impacts when combined with the project impacts would be short-term negligible to moderate adverse, long-term minor to moderate adverse and long-term beneficial with alternative B contributing a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative B.
Vegetation and Non-native species	Alternative A would have long-term moderate adverse effects to vegetation associated with open water non-historic canals. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term negligible to moderate adverse and long-term beneficial on vegetation with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do	Alternative B would result in short-term minor adverse impacts to floating and terrestrial vegetation from construction activities. However, there would be beneficial impacts to vegetation by degrading spoilbanks and dikes and partially filling open water canals. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse and long-term beneficial effects to Preserve vegetation. Because there would be no major adverse impacts on vegetation, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not

Impact Area	Alternative A	Alternative B
	not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under the no action alternative.	prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative B.
Fish and Wildlife	Under alternative A, there would be long-term moderate adverse impacts to wildlife since there would be no reclamation of canals and habitat would remain degraded. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial to fish and wildlife with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative A.	Alternative B would result in short-term negligible to minor adverse impacts and long-term beneficial impacts. Cumulative impacts for alternative B would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial with alternative B adding a negligible adverse increment and a beneficial increment to overall cumulative impacts on fish and wildlife. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative B.
Special Status Species	Under alternative A, there would be long-term moderate adverse impacts to special status species. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial to park special status species. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major, adverse impacts on special status species, there would be no impairment of park resources	Alternative B would result in short-term minor adverse impacts and long-term beneficial impacts. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as long-term beneficial to special status species populations because of increased habitat with reclaimed canals. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts.

Impact Area	Alternative A	Alternative B
	and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under the no action alternative.	Because there would be no major adverse impacts on special status species, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under alternative B.
Hydrology and Water Quality	Alternative A would have long-term moderate adverse effects to hydrology and water resources associated with open water non-historic canals. Cumulative impacts for alternative A would have long-term moderate adverse impacts and long-term beneficial impacts on hydrology and water resources. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on hydrology and water resources, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water resources under the no action alternative.	Alternative B would result in short-term minor adverse impacts as well as long-term beneficial impacts to hydrology and water. Overall cumulative impacts would be short-term minor adverse and long-term moderate adverse in addition to long-term beneficial. Alternative B would add a slight adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on hydrology and water resources, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water resources under alternative B.
Wetlands	Alternative A would result in long-term moderate adverse impacts to wetlands from risks associated with non-historic canals. Cumulative impacts for alternative A would be short-term minor adverse and long-term moderate adverse and short- and long-term beneficial to wetlands. Alternative A would add a slight adverse	Alternative B would result in short-term negligible to minor adverse and long-term beneficial impacts to wetlands. Cumulative impacts to wetlands under this alternative would be short-term negligible to minor adverse, long-term moderate

Impact Area	Alternative A	Alternative B
	increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under the no action alternative.	adverse, and long-term beneficial to wetlands. Alternative B would contribute a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under alternative B.
Visitor Use and Experience Including Health and Safety	Alternative A would result in localized short-term negligible adverse impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative A would add a negligible adverse increment to overall cumulative impacts. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative A.	Alternative B would result in localized short-term negligible to minor adverse and long-term minor adverse impacts and long-term beneficial impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative B would contribute a slight adverse increment and a beneficial increment to the overall cumulative impacts to visitor use and experience. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative B.

AFFECTED ENVIRONMENT

The affected environment describes existing conditions for those elements of the natural and cultural environments that would be affected by implementation of the actions considered in this *Canal Reclamation at Barataria Preserve Environmental Assessment, Jean Lafitte National Historical Park and Preserve*. The environmental topics addressed include soils and geology, vegetation, fish and wildlife, special status species, hydrology and water quality, wetlands, and visitor use and experience including health and safety. Impacts for each of these topics are analyzed in the "Environmental Consequences" chapter of this EA.

SOILS AND GEOLOGY

The geology of the Preserve is largely influenced by the historic location of the area and the relationship between this area and the historic course of the Mississippi River. The Preserve is positioned within the upper Barataria estuarine basin between two distributary arms of the Mississippi River (the current main stem of the river and Bayou Lafourche) and straddles an older distributary arm, the Bayou des Familles/Bayou Barataria. This deltaic lobe was formed by the Mississippi River roughly 3,500 to 1,500 years ago before the river changed its course. The Bayou des Familles/Bayou Barataria distributary arm of the Mississippi River is flanked by natural levees, which average a height of 5 feet above mean sea level. These levees formed from annual spring (over-bank) flooding and depositional processes. Breaks in the natural levee formed crevasses, such as Bayou Coquille, which in turn built subdistributary lobes. Abandoned distributary beds slowly filled with sediments as the Mississippi River changed course, leaving only narrow tidal drainage streams, or bayous, in the abandoned distributary beds.

The soils within the Preserve are characteristic of those developed in a subtropical, humid climate under frequently flooded conditions within coastal and deltaic plains. The flat topography of the Preserve and abundance of slowly decaying organic matter present conditions that allow for the constant build up of both mineral and organic sediments.

Within the Preserve two broad categories of soils are found: mineral soils and organic soils. The mineral soils are characterized as being very deep, level to gently undulating, somewhat poorly drained mineral soils formed in loamy and clayey alluvium that is moderately to slowly permeable. The organic soils are very deep, very poorly drained soils formed from decomposed freshwater or brackish herbaceous material over alluvial sediments. In general, the mineral soils tend to occur along the eastern border of the Preserve and are associated with Holocene epoch alluvium and natural levees (NRCS 2009; USGS 1998). The organic soils occur within the remainder of the Preserve and are associated with Holocene epoch fresh and brackish water deltaic plains (NRCS 2009; USGS 1998). All of the soils in the Preserve belong to two soil hydrologic classes, "C" and "D"; however, the majority occurs within class "D" (NRCS 2009). For the purposes of this EA, the analysis will focus on soil class "D" because this soil type is most likely to be found along the canals proposed for reclamation.

Table 4 describes the physical properties of the class "D" soils found within the Preserve. The majority of the soils in the Preserve that formed in coastal and deltaic plains consist of highly decomposed organic material over mineral material. The upper portion of the mineral layers ranges between zero and 60 inches below the surface, depending on the thickness of the organic material.

Table 4. Physical properties of hydrologic soil class "D" soils within Barataria Preserve (NRCS 2009)

Hydrologic Soil Class	"D" Soils
Composition	Muck material over fine textured, thick clayey soils. Clay pan or clay layer begins between 0 and 60 inches below the surface.
Location	Generally located in coastal and deltaic plains
Permeability	Very low to moderately low
Erodibility	Moderate to low
Compaction	Low
Shrink / Swell Potential	Low
Ponding Frequency	Frequent
Flooding Frequency	Frequent
Run-off Potential	Low
Infiltration rate	Low to Moderate
Recharge Potential	Low

Soils with deep organic layers have a low erodibility index, but increases to moderately erodible when the depth of the clay layer is less than 20 inches below the surface (NRCS 2009). The erodibility index also depends on the rainfall energy, slope, slope length, vegetative cover, and site conservation or management practices. Although most slopes within the Preserve are relatively flat (less than two percent), soil erosion control is necessary whenever vegetative cover is removed or lost during natural environmental events.

Typically, soils with high clay content are subject to compaction; however, there is a greater possibility of compaction in the Preserve where organic matter is thin (less than 20 inches). Shrink-swell potential in the Preserve is low because the clay material associated with the class "D" soils is generally not composed of expansive material. The few clayey soils that are composed of expansive clays would tend to contract if drained. Due to the water budget of the area, flat topography, and frequency and duration of flooding, the depth of shrinkage cracks in clayey soils would probably not exceed 1 foot (NRCS 2009).

The majority of the Preserve is composed of one soil type, Kenner muck (NRCS 2009). Kenner muck soils consist of very deep, very poorly drained, very slowly permeable, organic soils (NRCS 2009). Kenner soils formed from herbaceous plant remains stratified with clayey alluvium in fresh water marshes. Other soil types that are less represented include Allemands muck, Barbary muck, Lafitte-Clovelly, and Schriever clay, Cancienne silt loam, and Cancienne silty clay loam (NRCS 2009). Allemands soils are characterized by thick organic layers underlain with thin clay layers, and are found in fresh marshes (NRCS 2009). Barbary soils are associated with swamps as the semi-fluid mineral soils that were deposited on the backslope of natural levees (NRCS 2009). Lafitte-Clovelly soils are semi-fluid organic soils typically found in intermediate to brackish marshes (NRCS 2009). The Schriever series consists of very deep, poorly drained, slowly permeable soils; they are typically found on the lower portions of natural levees in back-swamp positions on the lower Mississippi River alluvial plain (NRCS 2009). The Cancienne series consists of very deep, level to gently undulating, somewhat poorly drained mineral soils that are moderately permeable. These soils are on high and intermediate positions on natural levees and deltaic fans of the Mississippi River and its distributaries (NRCS 2009).

VEGETATION AND NON-NATIVE SPECIES

Natural communities occurring within the Preserve include bottomland hardwood forest, baldcypress-tupelo swamp, scrub-shrub swamp, fresh marsh, intermediate marsh, and submerged/floating vascular vegetation (Urbatsch, Ferguson, and Gunn-Zumo 2007). Ninety-five percent of the Preserve is classified as emergent and forested wetlands with principal habitat types consisting of bottomland hardwood forests, baldcypress-tupelo swamp, and freshwater floating marsh (NPS 1997). The Preserve's forest is among the finest examples remaining in the delta of this original forest ecosystem.

The first complete vegetation survey of the Preserve documented 328 species in 88 families (White, Darwin, and Thien 1983). The most recent study documented 524 taxa comprising 115 families (Urbatsch, Ferguson, and Gunn-Zumo 2007). Ground above sea level lies along the alluvial soils of natural levees and along spoilbanks. Elevation changes of only a few centimeters cause large changes in plant communities due to changes in saturation, salinity, and hydroperiod (Cooper, Cederbaum, and Gannon 2005). Marsh elevation changes with water levels in many locations within the Preserve.

This region supports native natural levee crest species dominated by water oak (*Quercus nigra*), with live oak (*Quercus virginiana),* sweetgum (*Liquidambar styraciflua*), and hackberry (*Celtis laevigata*) as sub-dominants (White, Darwin, and Thien 1983). Dwarf palmetto (*Sabal minor*) is the dominant understory plant species, interspersed with hawthorn (*Crataegus viridis*) and deciduous holly (*Ilex decidua*). Forest gaps are colonized by Chinese tallow, American beautyberry (*Callicarpa americana*), and vines including Eastern poison ivy (*Toxicodendron radicans*), dewberry, muscadine, trumpet creeper (*Campsis radicans*), and numerous grasses. Chinese tallow, a nonnative species, has become the most successful colonizing species, and now dominates many of the spoilbanks within the Preserve.

The backslopes of natural levees are cloaked with more water-tolerant species, including swamp red maple (*Acer rubrum* var. *drummondii*) and green ash (*Fraxinus pennsylvanica*). On the backslope, the understory comprises primarily taller specimens of dwarf palmetto. The backslope elevations descend into swampy areas where soils are inundated most of the year; baldcypress and water tupelo are the dominant canopy species and are interspersed with black willow (*Salix nigra*) and pumpkin ash (*Fraxinus profunda*) (White, Darwin, and Thien 1983). Wax myrtle (*Morella cerifera*) shrubs are often found in the understory of this area.

In addition to the diversity of native plants, the Preserve is plagued by a multitude of nonnative plants. Many of these exotic plants are invasive and rapidly outcompete native species, thus preventing natural regeneration of native species. Common nonnative aquatic plants include water hyacinth (*Eichhornia crassipes*), common salvinia (*Salvinia minima*), and alligatorweed (*Alternanthera philoxeroides*). Common terrestrial exotic plants and vines include Chinese tallow, Chinese privet (*Ligustrum sinense*) Japanese climbing fern (*Lygodium japonicum*), camphor tree (*Cinnamomum camphora*), and Japanese honeysuckle (*Lonicera japonica*). Many spoilbanks are dominated by Chinese tallow.

Freshwater Marsh

Within the Preserve, extensive amounts of freshwater marsh border the shoreline of Lake Salvador eastward to the western banks of Kenta Canal. This community generally occurs adjacent to brackish intermediate marshes. Small pools and deep water openings are often found scattered throughout the marsh system.

The Preserve's marshes occur beyond the swamps described above where alluvial soils have subsided well below sea level. Above this sunken surface, generations of marsh plants lay down a layer of peat, often many feet thick. The peat supports a unique floating marsh, known as floatant. In places within the Preserve, the floatant is so thick that it supports a unique floating community of shrubs and small trees; elements of this community have their closest affinities 50 miles to the north, in the pine savannahs north of Lake Pontchartrain. The Preserve floatant comprises part of the largest floating marsh complex in the world, which extends westward to the Atchafalaya Basin and is the only floatant marsh complex in the national park system.

This unique fresh marsh system is composed of masses of intertwined living plant roots forming a relatively thick mat that is suspended above the water table. Bulltongue arrowhead (*Sagittaria lancifolia* subsp. *media*) is the dominant component of the freshwater marsh system within the Preserve. Other common fresh marsh species include floating marsh pennywort (*Hydrocotyle ranunculoides*), spike rush (*Eleocharis* spp.), saltmarsh morning glory (*Ipomoea sagittata*), broadleaf arrowhead (*Sagittaria latifolia*), cattail (*Typha* spp.), alligatorweed, smooth beggartick (*Bidens laevis*), southern annual saltmarsh aster (*Symphyotrichum divaricatum*), and southern amaranth (*Amaranthus australis*) (Urbatsch, Ferguson, and Gunn-Zumo 2007).

Intermediate Marsh

The marshes of the Preserve transition from fresh to intermediate as they extend westward toward the shoreline of Lake Salvador. Intermediate marsh makes up only a very small portion of the Preserve along the southern boundaries bordering Lake Salvador near the confluence of the Bayou Segnette Waterway. This natural community includes plant species found in both fresh marsh and brackish marsh. The marsh is nearly devoid of woody species, except for wax myrtle and a recent invasion of Chinese tallow. Dominant marsh plant species include eastern baccharis (*Baccharis halimifolia*), wax myrtle, wiregrass (*Spartina patens*), common threesquare (*Schoenoplectus pungens*), pink redstem (*Ammannia latifolia*), spike rush, bristlegrass (*Setaria* spp.), cattail, and alligatorweed.

Submerged/Floating Vascular Vegetation

Submerged and floating beds of aquatic vascular vegetation can be found in bayous, canals, open water ponds, shallow depressions, and in shallow waters along the Lake Salvador and Lake Cataouatche shorelines. This community type is especially common within the slow-flowing water of canals and larger openings among the floatant marsh within the Preserve. Dominant submerged aquatic species include coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria americana*), southern naiad (*Najas guadalupensis*), and pondweed (*Potamogeton* spp.). Dominant floating species include water hyacinth, duckweed (*Lemna minor*), floating pennywort, alligatorweed, and common salvinia.

Scrub/Shrub Swamp

Scrub/shrub swamps are low, flat wetland dominated by woody vegetation less than 20 feet tall found in scattered patches throughout the interior marshes often occurring as floatants. This unique floatant scrub-shrub swamp is dominated by thickets of wax myrtle suspended upon mats of sphagnum (moss). Dominant species within the scrub-shrub swamp include Chinese tallow, black willow, eastern baccharis, Drummond's maple, buttonbush (*Cephalanthus occidentalis*), yellow spikerush (*Eleocharis flavescens*), fern species, slender yellow-eyed grass (*Xyris torta*), chalky bluestem (*Andropogon virginicus* var. *glaucus*), pine barren goldenrod (*Solidago fistulosa*), beaksedge (*Rhynchospora* spp.), arrowhead

(*Sagittaria* spp.), manyflower marshwort (*Hydrocotyle umbellata*), sawtooth blackberry (*Rubus argutus*), green flatsedge (*Cyperus virens*), pickerelweed (*Pontederia cordata*), herb of grace (*Bacopa monnieri*), smartweed (*Polygonum* spp.), turkey tangle fogfruit (*Phyla nodiflora*), giant cutgrass (*Zizaniopsis miliacea*), and rush (*Juncus* spp.) (Urbatsch, Ferguson, and Gunn-Zumo 2007).

Baldcypress-Tupelo Swamp

Baldcypress-tupelo swamp includes forested, alluvial swamps growing on sporadically exposed soils that are generally saturated or inundated throughout most of the growing season except for periods of extreme drought. Such habitat generally has relatively low floristic diversity. Within the Preserve, baldcypress-tupelo swamp is found primarily just east of the Kenta Canal extending north to south. It also occurs along the poorly drained edges of Bayou des Familles. Baldcypress-tupelo swamp transitions westward from a forested swamp to a freshwater marsh. Baldcypress and water tupelo are generally the two co-dominate species of this community. Other baldcypress-tupelo swamp woody species include swamp tupelo (*Nyssa biflora*), swamp red maple, pumpkin ash, green ash, black willow, and wax myrtle. Submerged/floating vascular vegetation is also common among the standing water. The only state-listed plant species found within the Preserve occurs in a baldcypress-tupelo swamp: floating antlerfern (*Ceratopteris pteridoides*).

Bottomland Hardwood Forest

Bottomland hardwood forests include broad areas of alluvial forested wetland occupying the floodplain of a major river system. The bottomland hardwood forest within the Preserve was divided into three divisions based on topographic position and canopy species composition (Urbatsch, Ferguson, and Gunn-Zumo 2007). The divisions of bottomland hardwood forest associations include: Hackberry-American Elm-Green Ash Forest, Sweetgum-Water Oak Forest, and Live Oak Natural Levee Forest. A description of each natural community follows.

Hackberry-American Elm-Green Ash Forest. This bottomland hardwood forest community consists of hackberry, American elm (*Ulmus americana*), and green ash, and generally is found paralleling waterways within the Preserve, especially the Bayou des Familles canal. Such forests are generally poorly drained and often have standing water present during portions of the growing season, especially during frequent or high rain events, and may often be flooded from overflow of water from associated canals.

Sweetgum-Water Oak Forest. Areas of bottomland hardwood forests are dominated by sweetgum and water oak with a dense understory of enormous dwarf palmetto. Such areas exhibit better drained soils than areas of Hackberry-American Elm-Green Ash Forest and Live Oak Natural Levee Forest, but contain many species common to these forests.

Live Oak Natural Levee Forest. Live oak forest primarily occurs along the natural levees of Bayou des Famillies and Bayou Barataria, along the southern boundaries of the Preserve along Highways 45 and 301. It also occurs on scattered higher ridges of some of the canal spoilbanks, especially along the southern banks of the Bayou Segnette Waterway and lower Kenta Canal. These areas of evergreen oak forest are described as developing on natural levees and on islands among marshes and swamps with live oak as the predominant woody species. The long limbs of live oaks are typically covered and draped with resurrection fern and Spanish moss. Such areas are often poorly drained with areas of standing water often present. A dense understory primarily composed of dwarf palmetto is typical.

FISH AND WILDLIFE

The Preserve harbors the rich and varied estuarine environment of coastal Louisiana. This complex of terrestrial and aquatic habitats supports a diversity of resident and migrant wildlife. The NPS has conducted many species surveys in the Preserve in collaboration with local universities. The following section summarizes these inventories, literature reviews, and wildlife observations to describe fauna believed to currently inhabit the Preserve.

Mammals

The Preserve's climate is warm with plentiful rainfall and fertile soils—a combination that creates ideal habitat for an abundance of terrestrial wildlife. From 2003 – 2005, 30 different mammal species were observed on the Preserve (Hood 2005). In 2006, 26 different species of mammal were reported in a survey.

The more common mammals found in the Preserve include swamp rabbit (*Sylvagus aquaticus*), eastern gray squirrel (*Sciurus carolinensis*), opossum (*Didelphis virginiana*), gray fox (*Urocyon cinereoargenteus*), and nine-banded armadillo (*Dasypus novemcinctus*). Seven bat species have been documented in the Preserve: eastern red bat (*Lasiurus borealis*), Rafinesque's big-eared bat (*Corynorhinus rafinesquii*), southeastern myotis (*Myotis austroroparius*), eastern pipistrelle (*Pipestrellus subflavus*), yellow bat (*Lasiurus intermedius*), evening bat (*Nycticeius humeralis*), and the Brazilian free-tailed bat (*Tadarida brasiliensis*).

Other species that utilize the Preserve habitat include white-tailed deer (*Odocoileus viginianus*), coyotes (*Canis latrans*), raccoon (*Procyon lotor*), mink (*Mustela vison*), and river otter (*Lutra canadensis*). More recently, nonnative species nutria (*Myocastor coypus*), black rat (*Rattus rattus*), and the house mouse (*Mus musculus*) have been found in surveys. Wild pigs (*Sus scrofa*) are a nonnative species that was thought to have been successfully eradicated from the Preserve, but has recently reappeared.

Birds

Coastal Louisiana harbors an array of habitat types including bottomland hardwood forest, baldcypress swamp, fresh and intermediate marshes, and open water. This highly varied environment hosts a diversity of resident and migratory birds. More than 400 bird species are known to occur in Louisiana, and upwards of 300 of these use the Preserve (Mac et al. 1998). Of those, northern cardinals (*Cardinalis cardinalis*), red-winged blackbirds (*Agelaius phoeniceus*), boat-tailed grackles (*Quiscalus major*), barred owls (*Strix varia*), and Carolina chickadees (*Poecile carolinensis*) were species found to be abundant during all seasons on the 2005 Barataria Preserve bird list.

Hardwood forests, emergent forested wetlands, and other terrestrial landscapes harbor nesting and feeding grounds for a variety of land birds. Land birds that are breeding in the Preserve include the northern parula (*Parula americana*), Carolina chickadee, Carolina wren (*Thryothorus ludovicianus*), tufted titmouse (*Baeolophus bicolor*), blue-gray gnatcatcher (*Polioptila caerulea*), American crow (*Corvus ossifragus*), orchard oriole (*Icterus spurius*), Cooper's hawk (*Accipiter cooperii*), and blue jay (*Cyanocitta cristata*).

The Preserve's floating swamps, in combination with shallow mudflats, deep water lakes, bayous, and other wetlands, provide water birds, particularly wading birds, with prime habitat. Great blue heron (*Ardea herodias*), great egrets (*Ardea alba*), ibis (*Plegadis* sp.), laughing gull (*Larus artricilla*), double

crested cormorant (*Phalacrocorax auritus*), common moorhen (*Gallinula chloropus*), green herons (*Butorides virescens*), and black-necked stilts (*Himantopus mexicanus*) use the Barataria marsh and wetlands for breeding grounds.

Abundant shallow water ponds provide habitat for wintering waterfowl. Waterfowl are an important commercial resource for recreational hunting, especially in Louisiana. They generally nest in the northern United States and Canada in the spring and summer and overwinter in warmer coastal climates from Florida to Mexico. Coastal Louisiana is an important over-wintering habitat for many waterfowl species. Blue-winged teals (*Anas discors*), wood ducks (*Aix sponsa*), mallards (*Anas platyrhynchos*), lesser scaups (*Aythya affinis*) and green-winged teals (*Anas crecca*) are commonly seen using ponds in the Preserve to pair bond, feed, and rest. Brown pelicans (*Pelecanus occidentalis*) also use open water habitat in the colder months.

Raptors that commonly inhabit the park include American kestrel (*Falco sparverius*), turkey vulture (*Cathartes aura*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Butteo jamaicensis*), red-shouldered hawk (*Buteo lineatus*), osprey (*Pandion haliaetus*), and black vultures (*Coragyps atratus*).

At the time of the 2005 bird list of Barataria Preserve and adjacent lakes, 11 bird species were considered rare in the Preserve: white-winged scoters (*Melanitta fusca*), pomarine jaeger (*Stercorarius pomarinus*), bridled tern (*Onychoprion anaethetus*), buff-bellied hummingbird (*Amazilia yucatanensis*), western kingbird (*Tyrannus verticalis*), scissor-tailed flycatcher (*Tyrannus forficatus*), Nashville warbler (*Vermivora ruficapilla*), Cape May warbler (*Dendroica tigrina*), mourning warbler (*Oporornis philadelphia*), western tanager (*Piranga ludoviciana*), and yellow-headed blackbird (*Xanthocephalus xanthocephalus*).

Reptiles and Amphibians

A 2001 – 2002 inventory of reptiles and amphibians in the Preserve (Anderson and Seigel 2002) found 19 amphibian and 36 reptile species inhabiting the hardwood forests, swampland, and marshland. Common amphibians found included eastern newts (*Notophthalmus viridescens*), green tree frogs (*Hyla cinerea*), and bronze frogs (*Rana clamitans*). The American alligator (*Alligator mississippiensis*) is a common reptile inhabiting the Preserve, along with the Gulf Coast ribbon snake (*Thamnophis proximus*), ground skinks (*Scinella lateralis*) and green anoles (*Anolis carolinensis*). Venomous snakes inhabiting the Preserve include cottonmouth (*Agkistrodon piscivorus leucostoma*) and copperhead (*Agkistrodon contortrix contortrix*).

Fish

The Preserve offers diverse and richly inhabited aquatic systems from open water and deep water canals to slow-moving bayous and intermediate marsh. Within the Preserve, dissolved oxygen levels can be very low and salinity fluctuates. Most water is approximately 1 meter deep, so the water temperature closely follows the air temperature and can experience increases as the air warms. The western portion of the Preserve borders lakes with salinities around 5 parts per thousand. Fish species inhabiting this ecosystem must therefore be somewhat saltwater tolerant. NPS observations and a 2003 – 2005 fish inventory (Schultz 2005) documented 63 species of freshwater and saltwater fish. Other inventories have found as many as 66 (Seale 1999, Swarzenski et al. 2004, Schultz 2005). The most common species found in the Preserve are typical of coastal Louisiana and include gar (*Lepisosteus* spp.), sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and catfish (*Ictalurus* spp.). Atlantic stingrays (*Dasyatis sabina*) were included in the

2003 – 2005 fish list (Schultz 2005). Several species of crappie and killfish are also common in the Preserve.

Invertebrates

Aquatic invertebrates in the Preserve are abundant and diverse. The majority of species documented in the Preserve were freshwater species, but some brackish water and marine species were also found (Swarzenski et al. 2000). Invertebrates from 84 genera belonging to 51 families were documented in a 2000 survey. True flies (*Diptera*) were the most diverse order with 38 taxa. Crustaceans, especially those from the order Amphipoda, were most abundant. The most richly inhabited areas were the floating rafts of aquatic plants that make up the floating marshes in the Preserve. Crawfish, crabs, shrimp and other benthic invertebrates form the base of a food web in the coastal ecosystem, which supports many of the larger aquatic and terrestrial species inhabiting the Preserve.

SPECIAL STATUS SPECIES

The Endangered Species Act of 1973 requires the NPS to address impacts to federally listed threatened, endangered, and candidate species as well as species proposed for listing. Also, NPS policy requires that state listed species, and others identified as species of management concern by the park, are to be managed in parks in a manner similar to those that are federally listed. In addition, the NPS *Management Policies 2006* and DO #77: *Natural Resources Protection* requires the NPS to examine the impacts on federal candidate species, as well as state listed threatened, endangered, candidate, rare, declining, and sensitive wildlife and vegetation species. Table 5 presents listed species within the Preserve.

Observations by park staff and recent biological inventories indicate that no federally listed threatened or endangered species reside in the project area.

Although it does not include any critical habitat, potential habitat for six federally listed aquatic species is found in the Preserve. The green sea turtle (*Chelonia mydas*) (federally listed endangered, except breeding populations in Florida and Mexico that are listed as threatened; and state listed threatened) is found in shallow waters and lagoons. The hawksbill sea turtle (*Eretmochelys imbricate*) (federally listed endangered and state listed endangered), the most frequently encountered sea turtle, is found in warm bays and estuaries. Kemp's Ridley sea turtle (*Lepidochelys kempii*) (federally listed endangered, state listed endangered) is found in gulf waters but only comes ashore to lay eggs. The leatherback sea turtle (*Dermochelys coriacea*) (federally listed endangered, state listed endangered) has been found in Gulf Coast waters. The loggerhead sea turtle (*Caretta caretta*) (federally listed threatened, state listed threatened) has also been found in the Gulf Coast waters. The West Indian manatee (*Trichechus manatus*) (federally listed endangered, state listed endangered) can inhabit both freshwater and marine waters and typically forages in warm waters near shorelines (USFWS 2009). The pallid sturgeon (*Scaphirhynchus albus*) (federally listed threatened, state listed threatened) is a fish species that has been known to occur in Louisiana. Critical habitat for the gulf sturgeon (*Acipenser oxyrhinchus desotoi*) (federally listed threatened, state listed threatened) is located in the extreme northern end of Jefferson Parish, near, but not within, the Preserve.

Three state animal species of special concern are found within the Preserve. These include the saltmarsh topminnow (*Fundulus jewkinsi*); Cooper's hawk (*Accipiter cooperii*), a breeder in Louisiana, which has been observed in the Preserve during the breeding season; and the alligator snapping turtle (*Macroclemys temminckii*), a species that has been observed in the Preserve (LDWF 2009; NOAA 2009).

Table 5. Listed species or their habitat within Barataria Preserve

Common Name	Scientific Name	Federal Status	State Status
BIRDS			
Cooper's Hawk	*Accipiter cooperii*	SofC	SofC
Bald Eagle	*Haliaeetus leucocephalus*	P[1]	P
Least Tern	*Sterna a. antillarum*	E	E
FISH			
Saltmarsh Topminnow	*Fundulus jewkinsi*	NL	SofC
Pallid Sturgeon	*Scaphirhynchus albus*	T	T
MAMMALS			
West Indian Manatee	*Trichechus manatus*	E	E
REPTILES			
Green Sea Turtle	*Chelonia mydas*	ET[2]	T
Loggerhead Sea Turtle	*Caretta caretta*	T	T
Leatherback Sea Turtle	*Dermochelys coriacea*	E	E
Hawksbill Sea Turtle	*Eretmochelys imbricata*	E	E
Kemp's Ridley Sea Turtle	*Lepidochelys kempii*	E	E
Alligator Snapping Turtle	*Macroclemys temminckii*	UR	SofC

T – Threatened
E – Endangered
ET – Endangered and Threatened
NL – Not listed
SofC – Species of Concern
UR – Under Review
P – Protected
[1]The Bald Eagle is protected by the Bald and Golden Eagle Protection Act (16 USC 668 a-d).
[2] The Green Sea Turtle is Endangered in Florida and Mexico's Pacific coast breeding colonies and Threatened in all other areas.

The bald eagle (*Halaieetus leucocephalus*) is protected by the Bald and Golden Eagle Protection Act (16 USC 668 a-d). Bald eagles forage near the Preserve and in the waters of Lakes Salvador and Cataouatche. In the past, a bald eagle has nested within 1 mile of the Preserve boundary; however, the current status of the nest is unknown. The federally listed endangered interior least tern (*Sterna a. antillarum*) and the recently delisted brown pelican (*Pelicanus occidentatlis*) are known to forage in the Preserve (NPS 2009).

The Louisiana Natural Heritage Program has identified additional species of conservation concern in Louisiana, including the glossy ibis (*Plegadis falcinellus*) (resident), American woodcock (*Scolopax minor*) (winter), cerulean warbler (*Dendroica cerulea*) (migrant), American kestrel (*Falco sparverius*) (winter), and loggerhead shrike (*Lanius ludovicianus*) (resident).

Critical habitat for the piping plover (*Charadrius melodus*) (federally listed as endangered and threatened, state listed as endangered and threatened) is located in the extreme northern and southern ends of Jefferson Parish, near, but not within, the Preserve.

Migratory Birds

While the Endangered Species Act of 1973 protects only species listed as endangered or threatened, the Migratory Bird Treaty Act of 1918 (MBTA) protects all migratory birds and their nests from direct harm. Section 703(a) provides that "it shall be unlawful at any time, by any means, or in any manner, to…take…any migratory bird, any part, nest, or egg of any such bird." In construing the MBTA, the courts have held that the Act's "taking" prohibition does not apply to habitat modification. *Citizens Interested in Bull Run, Inc. v. Edrington*, 781 F. Supp. 1502 (D.Ore. 1991); *Mahler v. United States Forest Service*, 927 F. Supp. 1559 (S.D. Ind. 1996); *Seattle Audubon Society v. Evans*, 952 F.2d 297 (9th Cir. 1991). While habitat destruction that indirectly causes the death of migratory birds or the destruction of their nests does not constitute a taking within the meaning of the MBTA, the MBTA does prohibit the direct, though unintended, taking of protected migratory birds and/or nests.

The Preserve is a component of the Barataria-Terrebonne Important Bird Area (IBA) which has been nominated by the Louisiana IBA program as a Global IBA. The Preserve is a site partner of the Gulf Coast Bird Observatory, and has documented more than 230 species. At least 60 of these are known to breed within the park.

Because of its location on the northern Gulf Coast of Louisiana, the Preserve is important to trans-gulf neotropical spring and fall migrants as stopover habitat. In addition, it is located at the ecotone of the forested Mississippi Alluvial Valley and the marshes of the West Gulf Coastal plain (respectively the largest bottomland forest and marsh ecosystems in North America). Both of these systems are vital to bird populations and have experienced extreme rates of habitat loss and conversion.

The area is important for migrants that use the Preserve seasonally, including both stopover migrants in the spring and fall, and temperate migrants that winter in the marshes and forests of the Gulf Coast. The Preserve also harbors important breeding habitat, especially its marshes and swamps, and serves as foraging habitat for species which breed elsewhere in the Barataria estuary.

Several priority Partners in Flight and Audubon Watchlist species occur in the Preserve. Prominent among these species are birds that breed in or near the Preserve and that have populations that are all or in part neotropical trans-gulf migrants. Examples of these birds include (but are not limited to) Mississippi kite (*Ictinia mississippiensis*) and least bittern (*Ixobrychus exilis*). Examples of those that are stopover migrants include (but are not limited to) the western, white-rumped and stilt sandpipers (*Erolia* spp.) and Baltimore oriole (*Icterus galbula*). Those that winter in the Preserve include (but are not limited to) the pied-billed grebe (*Podilymbus podiceps*) and rusty blackbird (*Euphagus carolensis*). Those year-round residents or visitors include (but are not limited to) the mottled duck (*Anas fulvigula*) and loggerhead shrike (*Lanius ludovicianus*).

HYDROLOGY AND WATER QUALITY

Since the 1700s, the Preserve has experienced drastic anthropomorphic changes to the functioning deltaic system (Taylor, Day, and Neusaenger1988). Prior to human intervention, over-bank flooding from the Mississippi River allowed sheeting across the wetlands and introduced deposits of new, nutrient-rich riverine sediments into the system. The Preserve's proximity to New Orleans has resulted in expanding suburban development immediately adjacent to the Preserve boundary. Agriculture, urban development, oil and gas exploration, canal construction, and levee building have eliminated over-bank flooding. Canals now funnel drainage water from uplands out of the Preserve, converting the Preserve into a

primarily weather- and tides-based system. Spoilbanks retain water outside of the canal, submerging the surrounding wetland vegetation and leading to lower productivity and seedling regeneration.

Flow Regime

The Preserve is near sea level and, therefore, all open water within the Preserve is a near estimation of the water table level. Prior to human interference, water movement responded to the tides, which for the Gulf of Mexico, averages about a foot of range per day. Inland flows were slowed by friction and wind in the wetlands to rates as slow as 1 centimeter (cm) per second, which increased during frequent rain and flooding events (NPS 1997). The hydrology of the two lower units of the Barataria Preserve is influenced by the canal spoil banks. The further into the interior one gets in these two units, the more disconnected the water level fluctuations there are when compared with surface water fluctuations in the waterways surrounding the two units. The interior of the Preserve is functioning as a quasi-impoundment, with water levels saying an inch or more above the marsh surface for most of the year (USGS Swarzenski pers. comm. 2009). To protect residential areas rainwater must also be collected in canals and discharged with pumps across levees into adjacent canals or bayous. As a result, there is little remaining sheet flow from uplands through lowlands to waterbodies.

Water Quality

Increased development, channels, and alterations to the natural water flow in the area have affected water quality within the Preserve. Channeling nutrient-rich overflow has created problems with eutrophication in receiving waterbodies within the Preserve, which are often unable to process the nutrient loads (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to eutrophication of Preserve waters (Conner and Day 1987).

Dissolved oxygen levels are highly variable depending on location, time of year, and the amount of floating plant material. During the long growing season, rapid and extensive floating plant growth is linked to decreased water quality. Excessive accumulation of floating aquatic plants form thick mats. Vegetation mats prevent light from penetrating the water column and alter water chemistry. These changes in water chemistry frequently result in low levels of dissolved oxygen, increased water temperature, and lower specific conductivity. Severely reduced dissolved oxygen levels may result in mortality of fish and macroinvertebrates. After two fish kills, a 1982 water quality testing revealed extremely detrimental conditions for fish with high ammonia nitrogen, ammonia, ammonium, iron, carbon dioxide, and low dioxide levels (Berjarano 1982, 1985). A high number of sewage fly pupa, a biological indicator of organic pollution, were also found. In addition to urban runoff, known points of entry for pollutants include the Bayou Segnette Pumping Station and multiple sewage treatment plants.

Regional Aquifers

The groundwater surrounding New Orleans exists in five aquifers: “shallow aquifer,” the “200-foot” sand, the “400-foot” sand, the “700-foot” sand, and the “1,200-foot” sand (Rollo 1966). Most groundwater withdrawals were historically from the 700-foot aquifer, which is not declining (Dial 1983). The major aquifer for northwestern Jefferson Parish contains saltwater and shows a northern movement of the saltwater line with higher withdrawal rates (Dial and Tomaszewski 1988).

Most of the freshwater input available to the Preserve is through precipitation. The average annual precipitation in the Barataria Basin is 156 cm/year. Approximately 61 cm/year is available for runoff and groundwater recharge because of loss to evaporation (Taylor, Day, and Neusaenger 1988).

Salinity

The health of freshwater wetlands is highly dependent on salinity. Wetland loss and canal construction south of the Preserve in the lower Barataria Basin have provided avenues for saline waters from the Gulf of Mexico to enter freshwater wetlands in the upper portion of the basin. Since many wetland plants have limited tolerance for prolonged exposure to salt, gulf waters must be kept at bay to maintain the integrity of this system. Multiple studies have noted increased salinity in surface water within the Preserve and an increase of salt-tolerant vegetation in certain areas of the Preserve (Kucera 1984; Taylor, Day, and Neusaenger 1988). Salinities in the Preserve are also known to vary with the seasons - increasing in the spring and peaking in the fall (Taylor Day, and Neusaenger 1988).

In order to combat the influence of saltwater from the Gulf of Mexico and Barataria Bay, the Davis Pond Freshwater Diversion was constructed to divert freshwater from the Mississippi River into the northern part of the Barataria Basin. When fully operational, the diversion is capable of pumping more than 10,000 cubic feet per second of Mississippi River water into its outflow pond and adjacent Lake Cataouatche. Operation of the diversion mimics that of the natural flooding regime of the river and this input of freshwater helps to keep the salinity levels below levels that are capable of destroying freshwater marshes in the upper and middle portions of the basin.

WETLANDS

For regulatory purposes under the Clean Water Act, the term wetlands refers to “those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands include areas inundated or saturated by surface or groundwater for a sufficient length of time during the growing season to develop and support characteristic soils and vegetation. The NPS classifies wetlands based on the USFWS Classification of Wetlands and Deepwater Habitats of the United States, or the Cowardin classification system. Based on this classification system, a wetland must have one or more of the following attributes (NPS 2005):

- the habitat at least periodically supports predominantly hydrophytic vegetation (wetland vegetation);
- the substrate is predominantly undrained hydric soil; or
- the substrate is non-soil and saturated with water, or covered by shallow water at some time during the growing season.

Wetlands are significant in that they provide important habitat for the wildlife of the Preserve.

Some functions of wetlands are interdependent with the surrounding landscape. For example, wetlands dampen the effects of storms by reducing flood crests and flow rates, thereby reducing flooding in surrounding areas. The effectiveness of wetlands for flood abatement may vary, depending on the size of the area, type and condition of vegetation, slope, the location of the wetland in the flood path, and the saturation of wetland soils before flooding. A 1-acre wetland can typically store about 3 acre-feet of

water, or one million gallons. An acre-foot is one acre of land, about three-quarters the size of a football field, covered 1 foot deep in water. Three acre-feet describes the same area of land covered by 3 feet of water. Trees and other wetland vegetation help slow the speed of flood waters. This action, combined with water storage, can actually lower flood heights and reduce the water's destructive potential (EPA 2006).

A variety of amphibians, reptiles, birds, and mammals require wetlands during substantial parts of their lives and depend on wetlands spaced throughout the landscape. Other creatures have adapted to wetlands that maintain standing water for only a few weeks to a month during the year and remain dry the rest of the year. Wetlands also provide essential habitat for 60% of threatened and 40% of endangered species. Overall, each type of wetland may provide similar functions but for different organisms (NPS 2005).

The Preserve is part of the largest, most productive, and most imperiled wetland in the United States (Urbatsch, Ferguson, and Gunn-Zumo 2007). Marshes in the Preserve comprise part of the largest floating marsh complex in the world, which extends westward to the Atchafalaya Basin. This globally unique resource was formed as alluvial soils subsided below sea level. The Preserve is composed of predominantly marsh and bottomland vegetation communities. These communities are described in the "Vegetation" section of this chapter and include Freshwater Marsh, Intermediate Marsh, Submerged/Floating Vascular Vegetation, Scrub-Shrub Swamp, Baldcypress-Tupelo Swamp, Bottomland Hardwood Forest, Hackberry-American Elm-Green Ash Forest, Sweetgum-Water Oak Forest, and Live Oak Natural Levee Forest.

More than 95% of the Preserve is classified as emergent and forested wetlands according to the 1992 USFWS National Wetlands Inventory (NWI) (Cowardin et al. 1979). According to the NWI, the most common wetland systems found in the Preserve are palustrine and estuarine, with fewer amounts of lacustrine and riverine. Common subsystems include palustrine emergent, palustrine forested, palustrine scrub-shrub, and estuarine intertidal emergent.

Bayou aux Carpes is a 2,905-acre area comprised of primarily wetlands on the eastern side of the Preserve. The functions and values of Bayou aux Carpes are of such high quality that the area was one of the first where the EPA exercised its authority under Section 404(c) of the Clean Water Act to prohibit, restrict, or deny the discharge of dredged or fill material into waters of the United States. There are only 11 more of these areas, known as 404(c) areas, in the country. A large portion of the Bayou aux Carpes 404(c) area was acquired by the United States to settle a lawsuit in 1996. The federal land in the area was transferred to NPS management in March 2009.

Factors affecting the Preserve's wetlands include sea level rise, subsidence, shoreline erosion, and climate extremes. The health of the floating marsh is highly dependent on the ability of plants to produce below-ground roots that hold the marsh mat together. Because these plants have limited tolerance for prolonged exposure to salt, Gulf waters must be kept at bay in order to maintain the integrity of this system. As described above under "Salinity," the Davis Pond Freshwater Diversion helps to prevent saltwater intrusion into the freshwater marsh.

VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY

The resources and surrounding natural landscapes of the Preserve provide many opportunities for public recreational use. Some of the most popular recreational uses include hiking, wildlife viewing, photography, canoeing, fishing, and hunting.

Within the Preserve, ranger-guided walks, canoe trips, summer camps, and environmental education programs are available year-round. About 10 miles of walking trails provide Preserve visitors with an avenue to explore the forests, swamps, and marshes of the Preserve. Ten miles of non-motorized (canoe) trails (Figure 5) plus 20 miles of natural bayous, canals, and waterways are available for recreational boating and fishing. The most popular canoe trails are Bayou des Familles, Bayou Coquille, the Kenta Canal complex, and Twin Canals. These trails allow visitors the opportunity to immerse themselves in natural and cultural resources found in the park. The park also maintains three canoe launches located at Twin Canals, Kenta Canal, and Bayou des Familles. Adjacent to the Preserve's boundary on Bayou des Familles is a livery that rents canoes to the public year round. Ranger-led canoe tours are also conducted by the NPS. Due to reduced water flow, floating aquatic vegetation, increased sedimentation, and accumulation of detritus that has decreased overall water levels, all of the canoe trails within the Preserve are seasonally impassable.

In addition to these amenities, the visitor center near Crown Point provides interpretation of the Preserve's diverse resources and complex history.

A number of privately owned fishing camps also are located within the Preserve. They are mostly concentrated along the very western end of Tarpaper Canal and the northern end of the Bayou Segnette Waterway between Lake Cataouatche and Lake Salvador.

In addition to NPS visitors there is a commercial swamp tour boat company that operates in some of the canals in Bayou aux Carpes. The company is located immediately adjacent to the Preserve, and its boats are stored and operated in canals owned by the United States that are proposed for reclamation. The tour boat company is not a park concessionaire, but because of the recent acquisition of Bayou aux Carpes by the NPS, the NPS will be coordinating with the tour boat company to allow it to continue its operations in the Bayou aux Carpes area under the terms of a commercial use authorization.

The majority of recreational activities enjoyed by the public at the Preserve are compatible with each other. However, to prevent confrontation among user groups, the park restricts public use and access in certain areas. For example, where bank fishing and canoeing are popular along Twin Canals, motorized boats are prohibited. Individuals wanting to hunt and trap are required to apply for a (free) permit and are restricted to designated hunting zones (Figure 5). Hunting is prohibited within 500 feet of a roadway, trail, waterway, or structure to ensure visitor safety and to prevent user conflicts.

Health and Safety

The Preserve attempts to prevent unreasonable risks to visitors; however, as with activity anywhere there is some risk of injury. To reduce risk to visitors, safety information is included in most publications provided to visitors. Information on specific risks - for example, dangers of Preserve wildlife - is also published on the park website to educate visitors on how to avoid risky behavior. Safety notifications and policies are also included in most programs presented by park staff, and are posted at various visitor use sites throughout the Preserve.

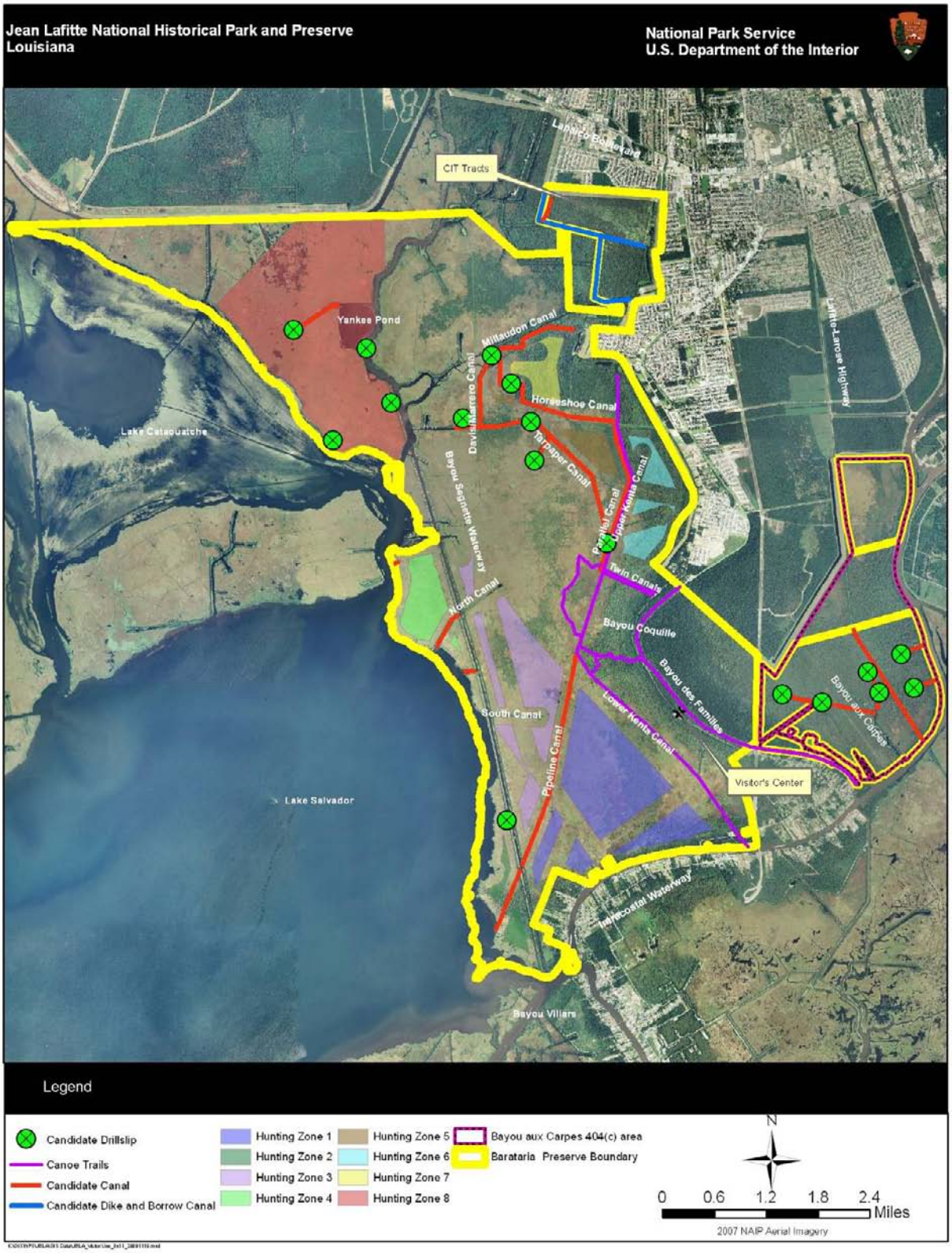

Figure 5. Visitor Use and Non-Historic Canals to be Reclaimed at Barataria Preserve

ENVIRONMENTAL CONSEQUENCES

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

The environmental consequences discussion addresses the potential impacts to each resource area (i.e., impact topics) for each alternative. To determine resource impacts, the action alternative is compared to the no action alternative, or baseline, before reclamation activities are implemented. In the absence of quantitative data, best professional judgment was used. In general, impacts were determined through consultation and collaboration with a multidisciplinary team of NPS and professional staff. Regulatory agency consultation with the USFWS, Louisiana State Historic Preservation Officer, and existing data sources such as soil surveys, various studies on Preserve ecology, and park planning documents were also used to assess the potential impact of each alternative.

Impacts are classified as either direct or indirect. A direct impact is an impact that occurs as a result of the proposal or alternative in the same place and at the same time as the action. An indirect impact is an impact that occurs later in time or farther in distance than the action. These are future impacts, or the impacts of reasonably expected connected actions (NPS 2001).

Potential impacts of all alternatives are described in terms of type (beneficial or adverse), context, duration (short- or long-term), and intensity (negligible, minor, moderate, or major). Definitions of these descriptors include:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that declines, degrades, and/or moves the resource away from a desired condition or detracts from its appearance or condition.

Context: The affected environment within which an impact would occur, such as local, park-wide, regional, global, affected interests, society as a whole, or any combination of these. Context is variable and depends on the circumstances involved with each impact topic. As such, the impact analysis determines the context.

Duration: The duration of the effect is described as short term or long term.

Short-term: Impacts that occur only during project construction activities or last less than one year.

Long-term: Impacts lasting longer than one year.

Intensity: Because definitions of impact intensity (negligible, minor, moderate, and major) vary by impact topic, intensity definitions are provided separately for each impact topic analyzed.

CUMULATIVE IMPACTS

The Council on Environmental Quality regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-

federal) or person undertakes such other actions" (40 CFR Part 1508.7). Cumulative impacts are considered for the no action and action alternative and were determined by combining the impacts of the alternative being considered with impacts of other past, present, or reasonably foreseeable future projects or plans in the study area. Table 6 summarizes the cumulative impact projects and describes the various resource areas that could be affected by these projects. Analysis of cumulative impacts follows four steps:

- Step 1—Resources Affected. Identify resources affected by any of the alternatives.
- Step 2—Boundaries. Identify an appropriate spatial boundary for each resource.
- Step 3—Cumulative Action Scenario. Determine which actions to include with each resource.
- Step 4—Cumulative Impact Analysis. Summarize the cumulative impact, which includes the effects of the proposed action plus other actions affecting the resource; defined context, intensity, duration and timing; defined thresholds, methodology, etc.

For all resources, the impact analysis area for cumulative impacts is the northeastern portion of the Barataria Basin in the vicinity of the Preserve.

Table 6. Cumulative impacts projects

Type of action	Cumulative Action	Description	Status
Flood and Storm Surge Control	Gulf Intracoastal Waterway West Closure Complex	The Gulf Intracoastal Waterway West Closure Complex (GIWWCC) is a storm surge protection system currently under construction and is targeted for completion in 2011. The project consists of a surge barrier on the Gulf Intracoastal Waterway below the confluence of the Algiers Canal and Harvey Canal, and the largest drainage pumping station of its type in the nation with a capacity of 20,000 cubic feet per second. During a storm surge of sufficient size, the gates of the barrier will close and the Harvey Canal and Algiers Canal will act as detention basins. Safe water levels would be maintained by the pumping stations of the complex.	Past, Present, and Future
	Levee Construction	In 1999 and 2001, six borrow pits totaling 110 acres were excavated along the eastern portion of the park boundary. Soil was used to construct nearby hurricane protection levees. Today, the pits remain and have filled with water. The construction of levees along rivers and canals has reduced natural flooding regimes and denied sediment input to adjacent wetlands and contributed significantly to land subsidence. Recent plans were proposed to construct additional hurricane protection levees near Barataria Preserve under USACE direction. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to address the need for levee improvement and coastal wetland restoration. New levee alignments and strengthening of existing levees are proposed. Plans include installing flood gates, constructing new earthen levees, and increasing the width and height of existing levees. To obtain material suitable for constructing or increasing the height of existing earthen levees, there is a need for borrow material. Lands adjacent to the park are suitable for use in levee construction. After excavation is complete, borrow pits would fill with water and create deep water ponds. Due to their anticipated depth, ponds would not be suitable for the establishment of emergent wetland or submerged aquatic vegetation.	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
NPS Land Acquisition	Bayou aux Carpes Acquisition	The Bayou aux Carpes is a 2,905-acre area comprised of primarily wetlands located on the eastern side of the park. The functions and values of the Bayou aux Carpes are of such high quality that the area was one of the first where the EPA exercised its authority under Section 404(c) of the Clean Water Act to prohibit, restrict, or deny the discharge of dredged or fill material into waters of the United States. There are only 11 more of these areas, known as 404(c) areas, in the country. A large part of the Bayou aux Carpes 404(c) area was acquired by the United States to settle a lawsuit in 1996. The federal land in the area was transferred to NPS management in March 2009.	Past and Present
	CIT Tracts Acquisition	The CIT Tracts are an area comprising forested wetlands located on the northern side of the Preserve. The area was acquired by the United States in 1994 to settle a lawsuit. Management of the property was transferred to the NPS in March 2009.	
Ecological Restoration Activities in or Near the park	Oil and Gas Access Canal Reclamation	In 2002 reclamation activities occurred at two dead-end canals connected to the Segnette Waterway. Spoilbank material was returned to the canals, and the southern canal had additional material pumped into it from Lake Salvador. Check meanders were installed to prevent erosion of the reclaimed areas.	Past
	Lake Salvador Shoreline Protection	The Lake Salvador shoreline in the Preserve experienced high rates of land loss from 1953 – 1983, averaging 13 feet a year. This caused breaches in the lake shoreline, which exposed surrounding marsh sediments to erosion. In 1992, the retreating shoreline reached the spoilbank of the Bayou Segnette Waterway, a USACE navigational canal that bisects the Preserve. Hurricane Andrew breached the spoilbank and the waters of the lake and waterway became contiguous. Implementation of shoreline protection was approved in 1993. Four types of shoreline protection structures were tested. Rock shoreline protection proved to be the most effective. Nine thousand feet of rock shoreline protection were implemented in phase II of the project, and a further 7,300 feet of shoreline were protected in phase III. Shoreline protection of Lake Salvador would have a beneficial impact on the soils and geology of the area. In 1992, the state constructed a breakwater where the breach occurred along the western bank of the waterway. In 1996, the USACE, with NPS funding, built a second breakwater parallel to the state breakwater to create a containment area for marsh restoration by the placement of fill material. The fill material would mostly be derived from the beneficial use of dredged material from ongoing USACE navigational maintenance projects. To date, approximately 200,000 cubic yards of material have been placed within the restoration area. In 2010 the USACE will place up to an additional 700,000 cubic yards of material, which would complete the filling of the containment area.	Past, Present, and Future
	Davis Pond Freshwater Diversion Structure	The Davis Pond Freshwater Diversion Structure was opened in 2001 and became fully functional in 2008 (USACE 2004a). The structure is designed to imitate historic spring floods by diverting an average of 5,000 cubic feet per second of water from the Mississippi River through Davis Pond into Lake Cataouatche and Lake Salvador.	Past, Present, and Future
	Other Ongoing Wetland Restoration Projects	The benefits of coastal wetlands have moved to the forefront of public attention since the devastation caused by Hurricanes Katrina and Rita in 2005. Projects vary in size and magnitude and are being conducted throughout the state on private and public lands. The park has identified wetland restoration projects and is working with officials from state and federal agencies to implement these projects. Wetland	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
		restoration is ongoing and highly dependent on available funding. The park annually submits wetland restoration projects for funding consideration through the NPS Disturbed Lands program and the Coastal Wetlands Restoration, Planning, and Protection Act. Types of restoration projects include terracing, rock revetment, vegetative plantings, and constructed crevasses.	
	Invasive Vegetation Control	The park has been working with the New Orleans District of the USACE Operations Division since 2001 to utilize the herbicide 2, 4-D (2, 4-Dichlorophenoxyacetic Acid) to control water hyacinth and alligatorweed, and the herbicide Reward (Diquat) to control common salvinia. During the growing season, the plants form dense floating mats that cover over 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Giant salvinia (*S. molesta*) was observed and documented in the Preserve for the first time during research that occurred between June 2006 and April 2008. The waterways authorized for herbicide treatment within the park are Kenta Canal, Pipeline Canal, Tarpaper Canal, Bayou des Familles, Millaudon Canal, Parallel Canal, Ross Canal, and the northern part of Twin Canals. Typically, USACE sprays between 150 and 325 acres of park waterways. There is no set schedule, and the areas and acreage treated varies each year, as does the species treated. Spraying is performed from flat-bottom boats with outboard propulsion for some areas, and airboats for shallow waterways or those that contain large floating mats of the exotics. The Louisiana Department of Wildlife and Fisheries began introducing water hyacinth weevils (*Neochetina eichhorniae* and *N. bruchi*) statewide using aerial drops from helicopters into heavily infested areas, including some in Jefferson Parish in 1974. Water hyacinth weevils were released in Jean Lafitte National Historical Park and Preserve in the 1980s. Observations by park staff indicate that the Preserve currently contains a well-established population of water hyacinth weevils that are widespread within park areas. However, water hyacinth remains a problem. Between June 2002 and June 2005, salvinia weevils (*Cyrtobagous salviniae*) were released in the Preserve in an attempt to establish biological control of common salvinia. The U.S. Department of Agriculture (USDA) Agricultural Research Service Invasive Plant Research Laboratory, which coordinated the releases, was unable to determine if the weevils became established in the park because of several environmental perturbations that occurred during their research, notably Hurricane Katrina. The results, which were reported in late 2007, were not encouraging. In June 2009, the same species of salvinia weevils, which were locally raised on giant salvinia, were released in the Preserve.	Past, Present, and Future
Nearby Urban Development	Rapid expansion in the Westbank area of Jefferson Parish	Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Massive clearing of vegetation has increased the amount of soil disturbance, compaction, and erosion. Once devoid of vegetation, soils are washed into ditches and canals, increasing turbidity and runoff, resulting in adverse impacts to soils and geology.	Past, Present, and Future

Type of action	Cumulative Action	Description	Status
Deltaic Subsidence	Deltaic Subsidence	Soil compaction and land subsidence is a natural process occurring in recent deltaic land formations. However, this process is accelerated by anthropogenic forces attributed to altered land use, increased development, changes in hydrology, and oil and gas extraction. Average land subsidence rates in the New Orleans region average 5mm/year (Burkett, Zilkowski, and Hart no date). These rates are expected to continue and possibly increase, which would impact areas throughout southeastern Louisiana.	Past, Present, and Future
Oil and Gas Activities	Various	Oil and gas activities include exploration, extraction, and maintenance. In 2004, two wells were directionally drilled in the park. Both were determined to be dry holes, and plans to drill two additional wells were abandoned. In June 2006, a new well was drilled in Lake Salvador within a mile of Barataria Preserve. Recent seismic activity was conducted along the park's western boundary in Lake Cataouatche in 2006. In April 2007, the park was approached about directionally drilling a gas well in the park, but the project was dropped.	Past, Present, and Future
Visitor Activities Within or Adjacent to Jean Lafitte National Historical Park and Preserve	Hunting and Fishing	Included in the park's enabling legislation are provisions for fishing, hunting, and trapping. Fishing occurs in park waterways and adjacent to the park boundary in Lakes Salvador and Cataouatche. Hunting and trapping are managed through permitting, and trapping is focused on controlling the nutria population (a nonnative, invasive species). As outlined in the Superintendent's Compendium, visitors are permitted to legally take small quantities of certain plants, nuts, and fruits for personal consumption.	Past, Present, and Future
Facility Development and Maintenance	Palmetto Trail Reopening	The park repaired and has reopened the Palmetto Trail, which was heavily damaged as a result of Hurricane Katrina. The 0.9-mile trail runs parallel to Highway 45 from the Visitor Center to the Bayou Coquille parking lot.	Past
	Debris Removal and Dredging of Canals within Barataria Preserve	The park proposes to remove debris and dredge detritus from canoe trails at Barataria Preserve (NPS 2008). The debris resulted from the high winds and storm surge associated with Hurricanes Katrina and Rita in 2005. Debris would be removed from the waterways; woody debris would be cut into small pieces and left to rot; non-biodegradable debris would be disposed of properly offsite; and dredge material would be pumped into surrounding wetlands as a thin layer of slurry.	Future

IMPAIRMENT ANALYSIS

In addition to determining the environmental consequences of the alternatives under consideration, the NPS *2006 Management Policies 2006* and DO #12 require analysis of potential effects to determine if actions would impair park resources and values. The fundamental purpose of the national park system as established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. These laws give the NPS the management discretion to allow impacts to park resources and values (when necessary and appropriate) to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. NPS

managers must always seek ways to avoid or minimize, to the greatest degree practicable, adversely impacting park resources and values.

The impairment prohibited by the Organic Act and the General Authorities Act is an impact, in the professional judgment of the responsible NPS manager, that harms the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts. An impact to any park resource or value may constitute impairment, but an impact would more likely constitute impairment if it has a major or severe adverse effect upon a resource or value whose conservation is:

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- identified as a goal in the park's General Management Plan or other relevant NPS planning documents.

An impairment determination is included in the conclusion statement of the impact analysis of each alternative. Impairment determinations are not made for visitor use and experience, health and safety, socioeconomics, or park operations and management because impairment findings relate to park resources and values; these impact areas are not generally considered to be park resources or values. Impairment determinations are not made for visitor use and experience because, according to the Organic Act, enjoyment cannot be impaired in the same way an action can impair park resources and values.

UNACCEPTABLE IMPACTS ON PARK RESOURCES OR VALUES

The impact threshold at which impairment occurs is not always readily apparent. Therefore, the NPS applies a standard that offers greater assurance that impairment would not occur. The NPS would do this by avoiding impacts that it determines to be unacceptable. These are impacts that fall short of impairment, but are still not acceptable within a particular park's environment. Park managers must not allow uses that would cause unacceptable impacts; they must evaluate existing or proposed uses and determine whether the associated impacts on park resources and values are acceptable.

Unacceptable impacts are impacts that, individually or cumulatively, would be inconsistent with a park's purposes or values, or would:

- impede the attainment of a park's desired future conditions for natural and cultural resources as identified through the park's planning process,
- create an unsafe or unhealthful environment for visitors or employees,
- diminish opportunities for current or future generations to enjoy, learn about, or be inspired by park resources or values, or
- unreasonably interfere with park programs or activities, an appropriate use, the atmosphere of peace and tranquility, the natural soundscape maintained in wilderness, and natural, historic, or commemorative locations within the park.

SOILS AND GEOLOGY

Methodology and Assumptions

To analyze the impacts to soils and geology, background information was compiled from park documents, USDA soil survey maps, scientific publications, and professional expertise.

Study Area

The area of analysis for direct and indirect impacts to soils and geology is limited to the immediate vicinity of the candidate canal sites and access areas. The NPS developed the following definitions for intensity thresholds for impacts to soils and geology:

Negligible: Impacts to surficial and shallow geology including soils would be at or below the lowest levels of detection. Any effects would result in very little or no physical disturbance, compaction, or erosion, and changes to soil productivity or fertility would be slight.

Minor: Impacts to surficial and shallow geology including soils would be detectable in relatively few areas. Effects would result in small amounts of disturbance, compaction, or erosion, and changes to soil productivity or fertility would be small. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts to surficial and shallow geology including soils would be detectable over a relatively wide area or in numerous areas. Effects would result in disturbance, compaction, or erosion, and changes to soil productivity or fertility would be detectable. Mitigation measures, if needed to offset adverse impacts, could be extensive but would likely be successful.

Major: Impacts to surficial and shallow geology including soils would be readily apparent over a relatively large proportion of the Preserve. Effects would result in disturbance, compaction, or erosion, and changes to soil productivity or fertility would be readily apparent. Extensive mitigation measures would be required to offset any adverse impacts, and their success would not be guaranteed.

No action Alternative (Alternative A)

Under the no action alternative, the NPS would not degrade developer-built spoilbanks and dikes to the surrounding marsh level for more than 20 miles of non-historic canals within the Preserve. The non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals.

The soils within the proposed project area formed in coastal and deltaic plains and have properties of frequently flooded soils. The presence of the spoilbanks creates an impoundment of hydrology such that water levels remain approximately 1 inch above the soil surface for the majority of the year, the exception being in high evaporation seasons. Soil formation is affected by the impoundment of hydrology because the soil substrate is organic. Having these marshes more or less continuously inundated slows down decomposition and enhances the buildup of organic matter. On the other hand, the presence of spoilbanks may reduce the frequency and duration of tidal flooding of these impounded areas. Both processes are

important to the long-term ecological health of the marshes. In addition, channels facilitate erosion from wave action (wind, boats) as well as more rapid tidal discharges. Should the NPS select alternative A, it would continue maintaining and protecting the natural resources, functions, and values within the Preserve and respond to future needs and conditions associated with the canals and coastal wetlands without extensive actions or changes in the present course. Any effects to surficial and shallow geology, including soils, would be slight and undetectable. Thus, the impacts to soils and geology would be long-term negligible and adverse.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the vicinity of the project area have affected or could affect soils. Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Massive clearing of vegetation has increased the amount of soil disturbance, compaction, and erosion. Once devoid of vegetation, soils are washed into ditches and canals, increasing turbidity and runoff. Urban development near the Preserve results in long-term moderate adverse impacts due to extensive erosion after vegetation clearing has taken place.

Recent plans to implement storm surge protection projects and to construct hurricane protection levees would cause extensive soil disturbance near the Preserve. These plans include installing flood gates, constructing new earthen levees, and increasing the width and height of existing levees, all of which would affect soils and geology of the area. The construction of levees along rivers and canals has reduced natural flooding regimes, greatly diminished sediment input to adjacent wetlands and contributed significantly to large areas of land subsidence. Flood and storm surge control projects near the Preserve would result in long-term minor to moderate adverse impacts.

Soil compaction and land subsidence is a natural process occurring in recent deltaic land formations. However, this process is accelerated by human influences attributed to altered land use, increased development, changes in hydrology, and oil and gas extraction. Land subsidence rates in the New Orleans region average 5 millimeters/year (Burkett, Zilkowski, and Hart no date). These rates are expected to continue and possibly increase, impacting large areas throughout southeastern Louisiana. Human influences would result in long-term minor to moderate adverse impacts.

Disturbance to geological features and soils occurs from oil and gas activities, including exploration and pipeline maintenance. Unless reclaimed, disturbance from these activities creates long-term adverse effects, though they are generally minor because of the small footprint of oil and gas operations. However, the indirect effects of unreclaimed oil and gas access canals lead to land loss in coastal wetlands. These cumulative effects have the potential to cause long-term minor to moderate adverse impacts.

The park proposes to dredge detritus from canoe trails in the Preserve (NPS 2008). Approximately 488,787 cubic yards of material would be dredged from approximately 125 acres of waterbottoms in Bayou des Famillies, Bayou Coquille, Lower and Upper Kenta Canal, Twin Canals, Fuller's Trenasse, Bayou Boeuf, and Wood's Place Canal. The dredge spoil from the project would be spread as a slurry layer no more than 6 inches deep on approximately 605 acres of wetlands adjacent to these waterways. Dredging activities would have a short-term moderate adverse impact on soils of the canals (NPS 2008).

Some plans and projects within the Preserve would also have beneficial effects on soils, including dredging activities described above. Pumping dredge material/detritus slurry into the surrounding wetlands would mimic over-bank flooding and provide nutrients and sediments to large areas of wetland.

This aspect of dredging activities could have a long-term beneficial impact on the soils of the surrounding wetland areas by helping to counteract subsidence.

The high quality wetland areas of Bayou aux Carpes and the CIT Tracts were transferred to NPS ownership in 2009. Acquisition and preservation of these areas by the NPS would have a long-term beneficial impact because these areas would no longer be subject to clearing or other human activities that are detrimental to soils and geology.

Lake Salvador experienced high rates of land loss from 1953 – 1983, averaging 13 feet a year. This caused breaches in the lake shoreline, which exposed surrounding marsh sediments to erosion. Implementation of shoreline protection was approved in 1993. Four types of shoreline protection structures were tested. Rock shoreline protection proved to be the most effective. Nine thousand feet of rock shoreline protection was implemented in phase II of the project, and a further 7,300 feet of shoreline were protected in phase III. Shoreline protection of Lake Salvador would have a long-term beneficial impact on the soils and geology of the area.

Although some cumulative impacts would be long-term and beneficial to soils and geology, overall, the cumulative impacts when added to the long-term negligible adverse impacts under alternative A would have short-term moderate and long-term negligible to moderate adverse impacts on soils and geology.

Conclusion: Alternative A would result in long-term negligible adverse impacts to soils and geology. Cumulative impacts would be long-term beneficial and short-term moderate and long-term negligible to moderate adverse with the no action alternative contributing only negligibly to adverse cumulative impacts. Because there would be no major adverse impacts on soils and geology, there would be no impairment of park resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B, spoilbanks would be degraded and vegetation would be cleared using marsh buggies, barge-mounted excavators, or other earth-moving equipment. Minor disturbance may occur to soils from the use of large equipment and from an increase in the number of people in the project area. Heavy earth-moving equipment would access the reclamation sites via the canals or the spoilbanks and remain in existing waterways on a barge or on the spoilbanks. This would limit the impacts to the spoilbanks and canals themselves and would result in no long-term adverse impacts to surrounding wetlands and soils. Soil disturbance would result from the removal of spoil material from the spoilbanks within the project. The spoilbanks present an artificial area of high elevation and mineral soils. Reclamation of the spoilbank areas to organic soils would result in a beneficial impact.

Check meanders would be designed and installed upstream from the confluence of any canal with the Bayou Segnette Waterway. Installation of check meanders would be expected to prevent wave activity, whether produced by boat or wind, from entering the reclaimed canal from the waterway. This would help reduce erosion in the reclaimed canal, resulting in a beneficial impact.

In areas where trees are either chipped in place or felled and placed parallel to the canal banks, soil disturbance and compaction would result causing short-term negligible adverse impacts.

The NPS may use a technique called gapping in areas where there is too much material to degrade the entire spoilbank cost effectively. Gapping would include intermittently breaching spoilbanks to reestablish hydraulic connections with the surrounding wetlands and partially filling the canals with this material. Through reestablishing the hydraulic connection of the canals with the surrounding wetlands, gapping would allow sediments to build up naturally over the wetlands; thus, this activity would result in beneficial impacts. However, the beneficial impacts would be less than in those areas where the spoilbanks are completely degraded. While impacts resulting from this alternative would be short-term negligible adverse to soils and geology during project activities, overall the project would result in long-term beneficial effects once complete.

Cumulative Impacts: The same actions identified as contributing cumulative effects under alternative A would also occur under alternative B. Overall, when combined with the impacts of alternative B, the cumulative impacts would be short-term negligible to moderate adverse, long-term negligible to moderate adverse and long-term beneficial to soils and geology in the Preserve.

Conclusion: Under alternative B, construction activities would result in short-term negligible adverse impacts to soils and geology; however, long-term impacts would be beneficial. Cumulative impacts when combined with the project impacts would be short-term negligible to moderate adverse, long-term negligible to moderate adverse and long-term beneficial with alternative B contributing a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on soils and geology, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on soils and geology under alternative B.

VEGETATION AND NON-NATIVE SPECIES

Methodology and Assumptions

The methodology used for assessing impacts to vegetation communities included identification of the communities in the Preserve and the potential effects from canal reclamation activities on the structure, composition, or distribution of plant communities. Impacts to vegetation may result from the direct removal of vegetation and the degradation of existing vegetation. The assessment of impacts is based on professional expertise and observation and was developed through discussions with NPS staff and a review of previous and current research.

Study Area

The area of analysis for direct and indirect impacts to vegetation is limited to the immediate vicinity of the candidate canal sites and access areas. The NPS developed the following definitions for intensity thresholds for impacts to vegetation:

Negligible: Impacts would not cause discernable alteration to the composition, abundance, or diversity of the native vegetation.

Minor: Impacts would cause limited alteration to the composition, abundance, or diversity of the native vegetation, but the change would be small and of little perceptible consequence. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would cause alteration to the composition, abundance, or diversity of the native vegetation. The change would be measurable, and of some perceptible consequence. Mitigation measures, if needed to offset adverse effects, may be more involved, but would likely be successful.

Major: Impacts would cause substantial alteration to the composition, abundance, or diversity of the native vegetation. The change would have measurable and perceptible consequences. Extensive mitigation measures would be required to offset any adverse effects and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under this alternative, there would be no reclamation activities, and non-historic canals would remain open allowing for the continued intrusion of saltwater into freshwater marsh often changing the vegetation community composition. Earthen spoilbanks at higher elevations than the surrounding marsh interrupt hydrology and nutrient and sediment movement through the Preserve. Many of these spoilbanks support species of nonnative vegetation that are invasive and rapidly outcompete native species, thus preventing the establishment of native marsh vegetation. During a study performed in 2007, almost half (55 species) of all plant species documented during the study were exotic species (Urbatsch, Ferguson, Gunn-Zumo 2007). These effects could cause further changes in the abundance and quality of native vegetation surrounding these canals and would result in long-term moderate adverse impacts to vegetation.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the vicinity of the project area would contribute both adverse and beneficial cumulative impacts on vegetation. Rapid urban development in Jefferson Parish, especially near the Preserve, has led to a decrease of native vegetation and forested areas. Increased development and habitat fragmentation also provides a conduit for invasive exotic species to adversely impact native vegetation communities. Park managers have seen an increase in the presence of invasive exotic species along the Preserve's boundary. Urban development would have short- and long-term minor adverse effects on vegetation by potentially altering the native vegetation composition, abundance, and diversity.

The park repaired the Palmetto Trail, which was heavily damaged as a result of Hurricane Katrina. Removal and replacement of damaged sections involved the use of power tools, equipment, increased human presence, and a staging area for materials. Some vegetation was cut and removed, which may allow a potential increase in invasive plant species until mitigation measures are employed. This would result in short-term negligible adverse impacts to vegetation.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial impacts on vegetation. Increasing the size of protected area buffers the Preserve's existing vegetation by reducing impacts from storm surge, wave energy, and wind effects. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area had been

successfully reclaimed to wetland conditions (Turner et al. 2006). Wetland reclamation projects result in short-term minor adverse impacts to vegetation from construction and fill activities. However, wetland reclamation projects also result in long-term beneficial impacts by converting deeper open water areas and upland spoilbanks to wetland conditions which enables primarily native wetland vegetation to recolonize the area.

Other ecological restoration projects also provide beneficial impacts to vegetation. The Lake Salvador Shoreline Protection project helps prevent shoreline erosion that can adversely impact vegetation, while the Davis Pond freshwater diversion project helps combat saltwater intrusion into freshwater marsh, which would otherwise kill salt-intolerant native wetland species. The Davis Pond diversion project also mimics spring flood conditions that help to move sediment through the system providing beneficial nutrients and sediment deposition to vegetation, resulting in long-term beneficial impacts.

The park has been working with the New Orleans District of the USACE Operations Division since 2001 to chemically treat and control water hyacinth, common salvinia, and alligatorweed. During the growing season, these plants form dense floating mats that cover more than 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Typically, the USACE sprays between 150 and 325 acres of Preserve waterways. Additionally, between June 2002 and June 2005 the park released salvinia weevils (*Cyrtobagous salviniae*) in the Preserve in an attempt to establish biological control of common salvinia. Exotic species management projects result in short- and long-term beneficial impacts. While chemical treatment damages target vegetation, it has not provided control of the exotic species in the Preserve and can also harm native floating and submerged aquatic vegetation causing short-term negligible adverse impacts.

Man-made canals have allowed saltwater intrusion into freshwater marsh and channeling of nutrient-rich overflow. Rather than allowing typical slow inland flows where nutrients can be absorbed by the marsh, water in the canals is directed swiftly through the marsh to receiving waterbodies, which are often unable to process the nutrient loads, resulting in problems with eutrophication that can affect the composition, abundance, and diversity of native species (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). Therefore, man-made canals constructed during oil and gas activities would affect the composition, abundance, and diversity of native species that have a low tolerance to salinity and eutrophication causing long-term moderate adverse impacts on vegetation.

Overall, when beneficial and adverse impacts of the cumulative actions are combined with the long-term moderate adverse impacts under alternative A, there would be short-term negligible to minor and long-term negligible to moderate adverse cumulative impacts as well as long-term beneficial cumulative impacts on vegetation.

Conclusion: Alternative A would have long-term moderate adverse effects on vegetation associated with open water non-historic canals. Non-historic canals would remain open allowing for the intrusion of saltwater into freshwater marsh causing further changes to the composition, abundance, and diversity of native vegetation. Spoilbanks would continue to support nonnative vegetation that outcompetes native species. Cumulative impacts under alternative A would be short-term negligible to minor adverse, long-term negligible to moderate adverse and long-term beneficial on vegetation with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of Preserve resources and values. Because the impacts

previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B, clearing of spoilbank vegetation using marsh buggies, barge-mounted excavating equipment, or other earth-moving equipment would be conducted from either the canals and/or the spoilbanks themselves. Spoilbank vegetation would be disturbed during project activities from the use of large equipment and from an increase in the number of people in the project area. Because equipment would be operating in waterways, there would also be disturbance to floating and rooted aquatic vegetation. Additionally, some branches may need to be cut for the equipment to get to the project site. Project activities would primarily remove spoilbank vegetation with minimal impacts to native wetland vegetation. These disturbed areas would be recolonized primarily by native emergent wetland and shallow water vegetation species. As a result of this alternative, short-term minor adverse impacts to vegetation would occur.

During reclamation operations, weed control measures would be implemented to minimize the potential spread of nonnative species. Baldcypress and water tupelo would be used to revegetate and enhance areas where appropriate and would have a long-term beneficial effect. Restrictions on the areas where equipment would be used would reduce or eliminate the adverse impacts to wetland vegetation.

The spoilbanks present an artificial area of high elevation and soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow but the removal of native vegetation would also occur. Chinese tallow-dominated spoilbanks are a type of fringe wetland that provides habitat but little food and nutrients (Barrow 2001). Although reclamation would result in the loss of spoilbank forested habitat, contiguous high quality forested habitat is found within the Preserve. Further analysis on habitat impacts is provided in the "Fish and Wildlife" and "Special Status Species" sections of this chapter.

Cumulative Impacts: Cumulative impacts to vegetation under this alternative would include those described under alternative A. The introduction of nonnative species is not a concern because they are already present in the project area, and this alternative would not be expected to increase their distribution.

Alternative B would contribute short-term minor adverse effects during reclamation activities through the removal of vegetation on the spoilbanks and submerged aquatic vegetation, but these species would ultimately be replaced by primarily native wetland vegetation, resulting in long-term beneficial effects. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial cumulative impacts to Preserve vegetation.

Conclusion: Alternative B would result in both adverse and beneficial impacts. Equipment and project activities would result in short-term minor adverse impacts to floating and terrestrial vegetation in the canals and on the spoilbanks. However, there would be long-term beneficial impacts to vegetation from

planting native vegetation on disturbed areas. Overall, when combined with the past, present, and reasonably foreseeable future actions, there would be short-term negligible to minor adverse, long-term moderate adverse and long-term beneficial effects to Preserve vegetation from alternative B. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts. Because there would be no major adverse impacts on vegetation, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on vegetation under alternative B.

FISH AND WILDLIFE

Methodology and Assumptions

Impacts to fish and wildlife were analyzed from NPS professional expertise and observation, previous and current research, and an ongoing inventory. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting fish and wildlife throughout all of Barataria Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to fish and wildlife:

Negligible: Impacts would result in a change to native wildlife populations and their supporting habitats, but the change would not be of any measurable or perceptible consequence. Alterations would be within the range of natural fluctuations and would not affect wildlife population viability or dynamics between different species.

Minor: Impacts would result in changes to native wildlife populations, and/or cause localized changes to their supporting habitats, but the changes would be barely perceptible to the species or habitat function. Occasional responses to disturbance by some individuals could be expected, but alterations would be within the range of natural fluctuations and would not affect overall wildlife population viability, or dynamics between different species. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable. Impacts would result in measurable effects to native wildlife populations, and/or to a relatively large area of their supporting habitats. The viability of wildlife populations and dynamics between different species would be affected, but these changes would be short term. Remaining habitat would be sufficient to support the previous diversity of species at comparable populations. Mitigation measures, if needed to offset adverse effects, may be extensive, but would likely be successful.

Major: Impacts on native species, their habitats, or the natural processes sustaining them would be detectable and might have permanent consequences for a species population, dynamics between multiple species, or unique habitats. Responses to disturbance by many individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Remaining habitat would not be sufficient to support the previous diversity of species at comparable populations. Extensive mitigation measures would be required to offset any adverse effects, and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion into freshwater marsh. As a result, changes in native aquatic species could be measurable and over a large habitat area resulting in long-term moderate adverse effects. The Preserve provides important breeding habitat for terrestrial and aquatic native species, especially in its marshes and swamps, and serves as foraging habitat for species that breed elsewhere in the Barataria estuary. As a result of taking no action, common wetland wildlife species would continue to utilize the canals and spoilbanks at present levels; however, important fish and wildlife habitat within interior marsh/wetlands would continue to decline over time resulting in long-term moderate adverse impacts to fish and wildlife.

Cumulative Impacts: The coastal Louisiana region has undergone several past and ongoing large-scale projects that impact the Preserve's ecosystem. Continual pressure from urban development in Jefferson Parish has required the clearing of forest and vegetated areas, resulting in decreased available native habitat and habitat fragmentation for resident fish and wildlife, particularly for large mammals. These changes have also provided a conduit for invasive exotic species to enter the Preserve. The importance of the remaining habitats present in the Preserve is becoming more apparent as the surrounding development encroaches. Neighboring habitat destruction and increased human presence reaffirms the ecological importance of the park for fish and wildlife. Park managers have seen an increase in the presence of invasive exotic vegetation along the park's boundary, which provides little value for native fauna. Urban development would have long-term moderate adverse effects on fish and wildlife by harming species viability over a large area of habitat.

Population increases in the surrounding areas expand the demand for recreational activities in the Preserve, including visitor use of hiking and canoeing trails. Park visitors are required to remain on trails, which reduces the likelihood of encountering or disturbing wildlife. However, an increase in visitor use could have localized short-term negligible to minor adverse effects on fish and wildlife.

Although necessary to protect growing coastal urban centers from catastrophic flooding events, levee construction generally has negative impacts on adjacent wetlands and their inhabitant fish and wildlife. Levees along rivers and canals disturb natural flooding regimes, inhibit sediment input to adjacent wetlands, and contribute to land subsidence. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to improve existing levees. Recent plans include the construction of additional hurricane protection levees near the Preserve under USACE

direction. The construction of these levees would remove wildlife habitat and potentially alter habitat near them. This would result in long-term minor to moderate adverse impacts on fish and wildlife.

The GIWWCC storm surge protection system would maintain safe water levels by way of pumping station complexes, but the project would generally have long-term moderate adverse impacts on fish and wildlife due to disturbance from construction and fill activities, as well as from further disconnecting Preserve waterways from the natural flooding regime.

Oil and gas activities including exploration, extraction, and maintenance have been ongoing in the Preserve for decades. Oil and gas activities have minor to moderate adverse impacts on fish and wildlife. Access canals created for oil and gas activities cause direct loss of wetlands and result in deep open water, increase erosion, and allow saltwater intrusion into freshwater marsh, thereby destroying freshwater and brackish-water vegetation (Bass and Turner 1997; Gosselink 1998) and wildlife habitat.

Canals constructed have allowed channeling of nutrient-rich overflow. Rather than typically slow inland flow rates where nutrients are absorbed by the marsh, water in the canals is directed swiftly through the marsh to receiving waterbodies, which are often unable to process nutrient loads, creating problems with eutrophication (Taylor, Day, and Neusaenger 1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). Oil and gas activities would have long-term moderate adverse effects on fish and wildlife by affecting the composition, abundance, and diversity of native species based on their tolerance to salinity and eutrophication.

Some canals in the Preserve are used as canoe trails to enhance visitor experience. As a result of debris downed by several recent tropical cyclone events, the park is proposing to dredge the canoe trails to remove debris and make the canals once again passable for visitors. This action is expected to have short-term minor adverse impacts on fish and wildlife from noise and increased human activity; however, the project would ultimately result in long-term beneficial impacts due to an overall improvement in the quality of fish and wildlife habitat in the canals being dredged.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial impacts on fish and wildlife by protecting large tracts of habitat. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area has been successfully reclaimed to wetland conditions (Turner et al. 2006). By reconnecting these two canals with the surrounding marsh, the projects have diminished the fragmented nature of the marsh in these areas, providing larger tracts of marsh for wetland species.

Additionally, the Lake Salvador Shoreline Protection project and the Davis Pond freshwater diversion project have helped combat erosion and saltwater intrusion into freshwater marsh. The acquisition and reclamation of additional areas for management and preservation by the NPS has long-term beneficial impacts for fish and wildlife by increasing the size of protected habitat and buffering the Preserve's habitats from urban development.

Provisions for fishing, hunting, and trapping, which, if managed correctly, have a long-term beneficial impact on fish and wildlife, are included in the park's enabling legislation. Fishing occurs in Preserve waterways and adjacent to the Preserve boundary in lakes Salvador and Cataouatche. While there are no records of annual fish harvest, fishing pressure is low enough to reasonably assume that harvest rates are not adversely impacting fish populations. Additional information provided from recent fisheries studies

indicates fish populations are stable or increasing. Hunted species include waterfowl, gray squirrel, rabbit, wild or feral hogs, nutria, and white-tailed deer. Hunter participation and harvest has declined in the last four years. The recommended annual harvest rate for white-tailed deer that was proposed in a recently completed deer management plan is 90 to 100 individuals (Chamberlain and Nyman 2006). Actual harvest rates over the last 15 years have been far lower than the recommended annual rate, averaging 29 individuals and have been as low as 20 in the 1992 – 1993 season (NPS 1997; Chamberlain and Nyman 2006).

Cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the long-term moderate adverse effects of the no action alternative, would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on Preserve fish and wildlife.

Conclusion: Under alternative A, there would be long-term moderate adverse impacts on fish and wildlife because there would be no reclamation of canals and habitat would remain degraded. Cumulative impacts under alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial to fish and wildlife with alternative A adding a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on fish and wildlife, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative A.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

The elevated spoilbanks adjacent to the canals support tree and shrub communities that would not typically be sustained within the surrounding marsh habitat. While there are some native species, most spoilbanks are dominated by the Chinese tallow tree, an invasive exotic species. The limitations of Chinese tallow-dominated spoilbanks are discussed in more detail in the "Vegetation" and "Special Status Species" sections of the "Environmental Consequences" chapter of this EA. The spoilbanks are also fairly narrow and only provide a fringe type habitat, which provides little protective cover or forage habitat. Removal of the spoilbank habitat would result in most wildlife species currently inhabiting them to be displaced to other nearby forested riparian habitats that are more expansive and provide a higher quality of habitat, so the net impact would be short-term and negligible. Benthic invertebrates in the canals would likely be buried by placement of spoil material in the canals, but this would be a short-term negligible to minor impact as benthic species would be expected to recolonize the area after the work is completed. Fish in the canals would vacate the area during project activities, but would be expected to return once the work is completed resulting in short-term negligible adverse impacts. Along the Bayou Segnette Waterway where earthen plugs would be created in the reclaimed canals to prevent spoil material from drifting into the navigable waterway, check meanders incorporated into the design of the plugs would allow aquatic organisms to move freely between the open water of the waterway and the reclaimed canal.

Long-term beneficial impacts would result from converting the poor quality spoilbank habitat to native marsh habitat. Similar to the canal off of the Bayou Segnette Waterway that was reclaimed in 2001 by the

same method proposed under this alternative, the degraded spoilbanks and the partially filled canals are expected to revert to the submerged and emergent vegetation naturally occurring in the Preserve, increasing the available habitat for native wildlife species (Baustian and Turner 2006; Baustian et al. 2009). Reclaiming the canals would also restore the historical hydrology of the project area and restore wetland functions by facilitating a slower and more natural tidal exchange. The integrity of the interior wetlands would be preserved by a reduction in the tidal exchange, as well as wave energy that contributes to erosion and saltwater intrusion into the freshwater marsh. All of which would provide long-term beneficial impacts to fish and wildlife by increasing the amount of and preserving the existing native wetland habitat.

Cumulative Impacts: Cumulative impacts to fish and wildlife under this alternative include those described under alternative A. Additional impacts to fish and wildlife may include beneficial impacts to fish and wildlife populations because of increased habitat with reclaimed canals. The introduction of nonnative fish and wildlife species is not a concern since they are already present in the project area, and it is not expected that this alternative would increase their distribution. Overall, cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the short-term negligible to minor adverse and long-term beneficial effects of alternative B, would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on Preserve fish and wildlife.

Conclusion: Alternative B would result in short-term negligible to minor adverse impacts and long-term beneficial impacts. Cumulative impacts for alternative B would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial with alternative B adding a negligible adverse increment and a beneficial increment to overall cumulative impacts . This would ultimately enhance the natural conditions in the Preserve, which would assist the NPS in fulfilling park purposes and other resource management goals. Because there would be no major, adverse impacts on fish and wildlife, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on fish and wildlife under alternative B.

SPECIAL STATUS SPECIES

Methodology and Assumptions

Impacts to special status species were analyzed from NPS professional expertise and observation, previous and current research, and an ongoing inventory. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting special status species throughout all of Barataria Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to special status species:

Negligible: Impacts would result in a change to individuals or populations and their supporting habitats, but the change would be of no measurable or perceptible consequence. Alterations would be within the range of natural fluctuations and would not affect population viability or dynamics between different species.

Minor: Impacts would result in changes to special status species populations, and/or cause localized changes to their supporting habitats, but the changes would be barely perceptible to the species or habitat function. Occasional responses to disturbance by some individuals could be expected, but alterations would be within the range of natural fluctuations and would not affect overall population viability or dynamics between different species. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable. Impacts would result in measurable effects to populations and/or to a relatively large area of their supporting habitats. The viability of populations and dynamics between different species would be affected, but these changes would be short term. Mitigation measures, if needed to offset adverse effects, may be extensive, but would likely be successful.

Major: Impacts on special status species, their habitats, or the natural processes sustaining them would be detectable and might have permanent consequences for a species population, dynamics between multiple species, or unique habitats. Responses to disturbance by many individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Remaining habitat would not be sufficient to support the species at comparable populations. Extensive mitigation measures would be required to offset any adverse effects, and their success would not be guaranteed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater, allowing continued deltaic subsidence, and providing a conduit for saltwater intrusion into freshwater marsh.

According to park staff and recent biological inventories, no federally listed threatened or endangered species reside in the proposed project area. Three state animal species of special concern are found within the Preserve. Potential habitat for six aquatic species of concern can be found in the Preserve. One federally listed migratory bird species has been recorded in the Preserve in the past. Several migratory bird species listed in the state of Louisiana occur in the Preserve.

The habitat in the Preserve is especially important for migratory birds and aquatic special status species listed in the “Special Status Species” section of the “Affected Environment” chapter of this EA. Marshes and swamps are breeding areas for aquatic species. Passage migrants and temperate migrants utilize the Preserve seasonally. Under alternative A, special status species would continue to utilize the canals and spoilbanks at present levels; however, important habitat for these species within interior wetlands would

continue to decline over time resulting in long-term moderate adverse effects to aquatic and migratory bird special status species.

Cumulative Impacts: The coastal Louisiana region has undergone several past and ongoing large-scale projects that impact the ecosystem of the Preserve. In addition, there are many projects planned to restore and reclaim parts of the region's wetlands. As a component of the Barataria-Terrebonne IBA, many migratory bird species depend on the Preserve for breeding and foraging habitat.

Continual pressure from urban development in Jefferson Parish has required the clearing of forest and vegetated areas resulting in decreased available native habitat and habitat fragmentation for migratory birds. These changes have also provided a conduit for invasive, exotic species to enter the Preserve. Competition from invasive species can put additional pressure on special status species. Urban development would have long-term moderate adverse effects on migratory bird special status species.

Population increases in the surrounding areas expand the demand for recreational activities in the Preserve, including visitor use of the hiking and canoeing trails. Park visitors are required to remain on trails, which reduces the likelihood of encountering or disturbing wildlife, however, an increase in visitor use could have localized short-term negligible to minor adverse effects on both aquatic and migratory bird special status species.

Levee construction is necessary to protect growing coastal urban centers from catastrophic flooding events, but generally has negative impacts on adjacent wetlands and their inhabitant species. Levees along rivers and canals disturb natural flooding regimes, deny sediment input to adjacent wetlands and contribute to land subsidence. As a result of Hurricane Katrina, the state and federal governments are devising a coastal protection and restoration plan to address the need for levee improvement. Recent plans have been created to construct additional hurricane protection levees near the Preserve under the direction of the USACE. This would result in a long-term minor to moderate adverse impact on aquatic and migratory bird special status species.

Oil and gas activities including exploration, extraction, and maintenance have been ongoing in the Preserve for decades. Oil and gas activities have long-term minor to moderate adverse impacts on special status species. Access canals cause direct loss of wetlands and result in deep open water, increased erosion, and allow saltwater intrusion into freshwater marsh, thereby destroying freshwater and brackish-water vegetation (Bass and Turner 1997; Gosselink 1998). Two special status species of fish occur in marsh waters. These species have salinity requirements that may be negatively impacted by saltwater intrusion caused by canals (Peterson, Fuller, and Woodley 2003).

Some canals in the Preserve are used as canoe trails to enhance visitor experience. As a result of debris downed by several recent tropical cyclones, the park is proposing to dredge the canoe trails to remove the debris and make the canals passable for visitors. This action is expected to have short-term minor adverse impacts on special status species from noise and increased human activity; however, the project would ultimately result in long-term moderate beneficial impacts due to an overall improvement in the quality of habitat in the canals being dredged. Long-term beneficial impacts to wetland habitat would occur from pumping a thin layer of the dredge material/detritus slurry into the surrounding wetlands. This process would mimic over-bank flooding and would provide nutrients and sediments to the wetlands, improving this habitat for special status species.

The recent park acquisitions of Bayou aux Carpes and the CIT Tracts in 2009 have placed thousands of acres of additional wetland vegetation under NPS management and preservation resulting in beneficial

impacts on fish and wildlife by protecting large tracts of habitat. The reclamation of two oil and gas canals in the Preserve was completed in 2002, and, as of 2006, 37% of the project area has been successfully reclaimed to wetland conditions (Turner et al. 2006). By reconnecting these two canals with the surrounding marsh, the projects have diminished the fragmented nature of the marsh in these areas, providing larger tracts of marsh for wetland species.

Additionally, the Lake Salvador Shoreline Protection project and the Davis Pond freshwater diversion project have helped combat erosion and saltwater intrusion into freshwater marsh. The acquisition and reclamation of additional areas for management and preservation by the NPS has long-term beneficial impacts for fish and wildlife by increasing the size of protected habitat and buffering the Preserve's habitats from urban development.

Cumulative impacts from past, present, and reasonably foreseeable future actions when combined with the long-term moderate adverse impacts under alternative A would be short-term negligible to minor and long-term minor to moderate adverse and long-term beneficial impacts to Preserve special status species.

Conclusions: Under alternative A, there would be long-term moderate adverse impacts to special status species. Cumulative impacts for alternative A would be short-term negligible to minor adverse, long-term minor to moderate adverse, and long-term beneficial to park special status species. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on special status species, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

As a result of this alternative, short-term minor impacts to special status species and habitat would occur from the use of heavy equipment and increased human activity. Short-term disturbance would result from abnormal noise levels caused by construction equipment. To mitigate these impacts, project activities would only be allowed during the day to reduce the amount of time wildlife is disturbed (although many bird species are diurnal, the majority of activity takes place during dawn and dusk). Special status species are expected to move from the project area once activities begin and return after the project is completed. Because activities would be limited to spoilbanks and within the canal waterways, habitat disturbance would occur only in localized areas and not throughout the entire project area at any given time.

Tree and shrub communities on spoilbanks would be removed, and spoilbanks would revert to primarily native marsh habitat. Coastal woodlands next to spoilbank vegetation provide stopover sites for migratory landbirds (Barrow et al. 2005). The spoilbanks in the project area are fairly narrow and provide only fringe type habitat, which does not provide much cover or forage. Canal spoilbanks throughout much of the Preserve are also dominated by Chinese tallow trees. These invasive plants provide some cover for migrating birds on their stopover, but little food and nutrients (Barrow 2001). As a member of the *Euphorbiaceae* family Chinese tallow foliage is known to be toxic to livestock and more importantly, to have low numbers of leaf-chewing insects, particularly *Lepidopteran* larvae (Redlus 1997; Barrow 2001).

Lepidopteran larvae, or caterpillars, are an important nutrient source for migrant birds. Chinese tallow seeds, which the birds eat, have a waxy coating and are high in saturated fatty acids, making them difficult for birds to metabolize (Baldwin et al. 2008). Therefore, the birds acquire limited to negative nourishment from the seeds. While studies found that migrant bird species richness did not differ between tallow stands and native riparian forests (Barrow 2001), Chinese tallow provides little in the way of nourishment for the energy-intensive demands of migration. Therefore, these fringe wetlands are potentially functioning as an ecological sink for migratory birds. The surrounding riparian forests are considered higher quality habitat for cover and forage. In the absence of Chinese-tallow dominated spoilbanks, migratory species would likely select these surrounding riparian forests as stopover points during their migration and would benefit from the higher habitat quality.

There would be long-term beneficial impacts to the areas experiencing reclamation. Native wetland species are expected to recolonize the area after spoil material removal, providing additional native habitat. Partially filling open water areas with material from the spoilbanks is expected to create additional areas of shallow water and emergent marsh naturally occurring in that area, further increasing available habitat (Baustian and Turner 2006; Baustian et al. 2009).

Cumulative Impacts: Cumulative impacts to special status species under this alternative include those described under alternative A. Cumulative impacts from past, present, and reasonably foreseeable future actions in and around Barataria Preserve, when combined with the short-term minor adverse and long-term beneficial impacts of alternative B, would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as beneficial on Preserve special status species.

Conclusions: Alternative B would result in short-term minor adverse impacts and long-term beneficial impacts. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse as well as long-term beneficial to special status species populations because of increased habitat with reclaimed canals. Alternative B would add a negligible adverse increment and a beneficial increment to overall cumulative impacts. This would ultimately enhance the natural conditions in the Preserve, which would assist the NPS in fulfilling park purposes and other resource management goals. Because there would be no major adverse impacts on special status species, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on special status species under alternative B.

HYDROLOGY AND WATER QUALITY

Methodology and Assumptions

Impacts to hydrology and water quality were analyzed from NPS professional expertise and observation, previous and current research, and ongoing monitoring. In addition, scientific documents and reports relating to this and similar activities were reviewed.

Study Area

Certain aspects of the project have the potential for affecting hydrology and water quality throughout all of the Preserve. The impact analysis area for evaluating direct and indirect effects is the Preserve boundary. The NPS developed the following definitions for intensity thresholds for impacts to hydrology and water quality:

Negligible: Impacts to hydrology and water quality would not be detectable or would fall outside of the normal range of fluctuation and remain well below water quality standards or criteria. Water quality ranges and stream flow would remain comparable to historic and baseline conditions.

Minor: Impacts would result in detectable changes to hydrology and water quality; however, the impacts would be small and localized and remain below water quality standards or criteria. Water quality ranges and stream flow would remain comparable to historic and baseline conditions. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would result in changes to hydrology and water quality that would be readily detectable but remain at or below water quality standards or criteria. Water quality ranges and stream flow would occasionally and temporarily deviate from historic and baseline conditions. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

Major: Impacts would result in changes to hydrology and water quality that would be substantial and exceed water quality standards and criteria. Water quality ranges and stream flow would frequently fall outside of historic and baseline conditions. Extensive mitigation measures would be required to offset any adverse impacts, and would not be guaranteed to succeed.

No Action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water because the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion. As a result, the continued change to hydrology could be measurable and over large areas and would have long-term moderate adverse effects to hydrology and water quality.

Cumulative Impacts: As wetland ecology is centrally dependent on hydrology (Turner 1987) the integrity of the Preserve as a valued cypress/tupelo swamp, intermediate marsh, and freshwater marsh ecosystem is highly affected by the cumulative impacts to its hydrologic regime.

Hydrologic changes have occurred extensively throughout the Preserve and the surrounding area. Most notably, canals and levees have been constructed for oil and gas exploration. Canals and spoilbanks alter both above- and below-ground hydrology. They introduce unnaturally fast-flowing water to the interior of the marsh which causes erosion and other problems (Turner 1987). In fact, studies have shown that canal density and wetland loss by erosion have a clear positive correlation (Scaife, Turner, and Costanza 1983), and many large areas of open water have formed near canals and spoilbanks in the past five decades,

while none have formed away from them (Turner 1987). Levees disrupt natural hydrology by compressing and compacting the material below them, creating an above and below-ground drainage block and isolating one area of marsh from another (Turner 1987). When a levee crosses a natural drainage channel, the natural channel typically closes off, silts in, or erodes into a pond area.

Canals streamline the flow of saltwater inland; allowing for saltwater intrusion which destroys freshwater vegetation that is intolerant of salt, resulting in the loss of wetland habitat (Turner 1987). Periodic floods are important in recharging marshes with nutrient-rich sediment. Natural wetland drainage is slow, which allows nutrients to absorb in the marsh. Canals instead channel nutrient-rich sediment swiftly to receiving waterbodies denying surrounding marsh area of nutrients and sediment (Turner 1987). Receiving waterbodies in the Preserve are often unable to process the nutrient loads, which creates problems with eutrophication (Taylor, Day, and Neusaenger1988). High nutrient levels from agricultural runoff and urban discharge and sediment inputs have also contributed to the eutrophication of Preserve waters (Conner and Day 1987). In other areas, spoilbanks and levees prolong flooding, keeping marsh vegetation submerged for longer than is natural, or eventually creating more open water area. Oil and gas activities have long-term moderate adverse effects on hydrology and water quality by altering baseline and historic hydrologic conditions.

The Davis Pond Freshwater Diversion (approximately 3 miles north of the Preserve) was constructed to maintain salinity at natural levels within the Barataria estuary disrupted in part by saltwater intrusion from canals. The project diverts freshwater from the Mississippi River into the Preserve. The structure impacts 777,000 acres of marshes associated with the watershed of the Davis Pond structure (USACE 2004a). However, water quality of the Mississippi River is poor, largely from urban and agricultural run-off (including fertilizers and herbicides). Bayou Segnette, which bisects the western portion of the Preserve, has been identified as a waterbody with low levels of dissolved oxygen, and high nutrients and pathogen loads. The influx of this water may negatively impact marsh ecosystems in the Preserve. The Davis Pond Freshwater Diversion has long-term moderate adverse effects on hydrology because it affects a large area and alters baseline and historic hydrologic conditions.

Rapid urban development in Jefferson Parish, especially near the Preserve, has led to a decrease in water quality and disrupted flow regime. Man-made levees disconnect the Preserve from the natural flooding regime, altering the amount, rate, and type of water that enters the park. Levees hydrologically isolate different areas of marsh in the Preserve and add to wetland loss with ponding (Turner 1987). Additional levee construction has been proposed and may influence lands adjacent to the Preserve and further decrease sheet flow. Urban development would have long-term moderate adverse effects on hydrology by altering baseline and historic hydrologic conditions.

The GIWWCC is a storm surge protection system currently under construction that would maintain safe water levels by way of pumping station complexes, but would generally have negative impacts on hydrology and water resources by further disconnecting Preserve waterways from the natural flooding regime. The effects of this would be long-term moderate and adverse.

Several tracts of wetland have been acquired by the park in recent years. The Bayou aux Carpes and the CIT Tracts were acquired in March 2009. These tracts of high quality wetland will insulate the Preserve from poor water quality urban runoff. The acquisition of additional wetland areas has long-term beneficial impacts on the hydrology and water quality of the park.

Overall, when the beneficial and adverse effects of these cumulative actions are combined with the long-term moderate adverse effects of alternative A, there would be long-term moderate adverse impacts and long-term beneficial impacts on hydrology and water quality.

Conclusion: Alternative A would have long-term moderate adverse effects to hydrology and water resources associated with open water non-historic canals. Cumulative impacts for alternative A would have long-term moderate adverse impacts and long-term beneficial impact on hydrology and water quality. Alternative A would add a slight adverse increment to overall cumulative impacts. Because there would be no major adverse impacts on hydrology and water quality, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water quality under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

The preferred alternative would reclaim more than 20 miles of non-historic canals within the Preserve by degrading spoilbanks and dikes to the level of the surrounding wetlands and partially filling the canals with this soil and vegetative material. Check meanders constructed in reclaimed canals along the Bayou Segnette Waterway would diminish the artificially high flow rates of water in the canals. The recolonization of canals by native marsh vegetation would recreate freshwater wetlands and aid in restoring the natural hydrology.

Wetland characteristics are centrally dependent on hydrology (Turner 1987). Therefore, restoring hydrologic functions by reclaiming canals would have beneficial impacts to the Preserve. Backfilling and building check meanders partially restores pre-canal drainage patterns by slowing and spreading out flow, which is more similar to natural sheet flow. Important nutrient loads from natural flooding would be returned with the disruption of channelized drainage caused by canals. This also helps in reducing erosion and saltwater intrusion, two important causes of wetland loss (Turner et al. 2006; Turner 1987). Shallower depths, slower moving water, and reduced saltwater intrusion created by reclamation activities provide suitable conditions for native marsh species to recolonize canal areas (Turner et al. 2006). Past reclamation activities have shown that successful recolonization decreases open water area, further decreasing flow rates and improving conditions for more recolonization, creating a positive feedback loop (Turner et al. 2006). Reduced areas of open water also decrease habitat for invasive floating vegetation that is harmful to water quality.

Reclamation of two oil and gas canals in the Preserve was completed in 2002. These canals have been monitored for rate of recolonization by native marsh species and were found to be 37% to 42% restored in 3 years, by 2006 (Turner et al. 2006). Studies indicate a maximum recovery rate for backfilled canals of 94% after 20 years (Baustian and Turner 2006). Failure to reclaim canals would allow the continued disruption of natural hydrology, continued wetland loss and degraded water quality.

During reclamation operations turbidity levels and quantities of suspended particulates within the water column would temporarily increase from the placement of degraded spoil material in the canals. In canals where check meanders are installed, the check meanders would trap additional sediments to minimize

impacts on local water quality in the adjacent canals. In all locations, turbidity levels and suspended particulates would rapidly return to ambient conditions following completion of construction activities resulting in short-term minor adverse impacts.

With the use of any motorized equipment there is always the possibility of accidental fuel spills or leaks. Spill containment materials would be staged near the action area in case of accidental spills. However, spills and leaks are unlikely, and to further minimize the likelihood of occurrence, all equipment would be checked regularly to identify and repair any leaks; only four stroke boat motors would be used for boats operating in the canals during reclamation activities; spill containment materials would be staged near the construction activities; and, if a spill or leak is discovered, it would be immediately contained and cleaned up and park staff would be notified.

With the use of mitigation measures, alternative B would result in short-term minor adverse and long-term beneficial impacts to hydrology and water quality.

Cumulative Impacts: Cumulative impacts to hydrology and water quality under this alternative include those described under alternative A. Alternative B would contribute localized short-term minor adverse effects during reclamation activities, but long-term beneficial effects once reclamation is complete. Overall, when the beneficial and adverse effects of the cumulative actions are combined with the short-term minor adverse and the long-term beneficial impacts of alternative B, there would be short-term minor adverse and long-term moderate adverse impacts in addition to the long-term beneficial impacts on hydrology and water quality.

Conclusion: Alternative B would result in short-term minor adverse impacts as well as long-term beneficial impacts to hydrology and water quality. Overall cumulative impacts would be short-term minor adverse and long-term moderate adverse in addition to long-term beneficial. Alternative B would add a slight adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on hydrology and water quality, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on hydrology and water quality under alternative B.

WETLANDS

Methodology and Assumptions

Impacts to wetlands were analyzed from NPS professional expertise, previous and current research, consultation with other experts, and park documents. In addition, related scientific documents relating to this and similar activities were reviewed.

Study Area

The area of analysis for direct and indirect impacts to wetlands is limited to the immediate vicinity of the candidate canal sites and access roads. The NPS developed the following definitions for intensity thresholds for impacts to wetlands:

Negligible: Impacts would affect wetlands, but would not alter wetland functions and values.

Minor: Impacts would affect a limited number of individuals of plant or wildlife species within the wetland. The change to wetlands in terms of area, composition, and structure would be detectable but inconsequential. Wetland processes, functions, and integrity would remain unaffected. Mitigation measures, if needed to offset adverse effects, would be simple and successful.

Moderate: Impacts would have a measurable effect on plant or wildlife species within the wetland, but all species would remain indefinitely viable. Changes to wetlands would be readily apparent, but would only temporarily affect the wetland's composition and structure. Wetland processes, function, and integrity could also be temporarily affected. Mitigation measures, if needed to offset adverse effects, would be extensive, but would likely be successful.

Major: Wetland species would be at risk of extirpation from the Preserve. Wetland processes, function, and integrity would be altered to the point where wetland structure and composition would permanently change. Extensive mitigation measures would be required to offset any adverse effects, and would not be guaranteed to succeed.

No action Alternative (Alternative A)

Under the no action alternative, the non-historic canals would remain open water, as the NPS would not place any spoilbank or dike material in the canals. The presence of the canals would continue to alter the historic hydrologic functions of the Preserve by allowing rapid tidal exchanges, disrupting the flow of freshwater and nutrients, and providing a conduit for saltwater intrusion into freshwater marsh. The integrity of the existing interior marshes and associated wetland communities would continue to be threatened, resulting in possible break up and eventual conversion to open water. The no action alternative would result in long-term moderate adverse impacts to wetlands.

Cumulative Impacts: In southeastern Louisiana, wetland loss and degradation is occurring due to natural and man-made processes. Urban development, oil and gas exploration, and changes in land use and hydrology have reduced the extent and quality of wetlands surrounding the Preserve. The construction of levees along rivers and canals has reduced natural flooding regimes, denied sediment input to adjacent wetlands, and contributed significantly to land subsidence. Oil and gas exploration is attributed to direct loss as new canals are cut through wetlands, resulting in large areas of deep open water. In addition to the direct creation of open water area, canal dredging causes secondary loss of wetlands. Canals expose sediments to wave action, increasing erosion. Canals also allow saltwater to intrude further into wetland systems, destroying freshwater and brackish-water vegetation. Interlocking spoilbanks from canal intersections can effectively impound areas and lead to wetland loss (Gosselink 1998). Studies have shown that for every 1.0 hectare (ha) of canal dredging, 2.85 ha of open water are created and 1.0 ha of wetland is lost from spoilbank placement (Bass and Turner 1997). These activities would have long-term moderate adverse effects on wetlands.

It is reasonably foreseeable that forested wetlands in the Preserve would be impacted by nearby levee construction under the direction of the USACE. As a result of Hurricane Katrina, the state and federal

governments are devising a coastal protection and reclamation plan to address the need for levee improvement and coastal wetland reclamation. New levee alignments and strengthening of existing levees are being proposed. In order to obtain material suitable for constructing or increasing the height of existing earthen levees, there is a need for borrow material. Current planning documents indicate that the borrow material would come from inside the Preserve. Preliminary meetings with park officials and the public have been held to discuss construction plans and alternatives. After excavation is complete, borrow pits would become deep water ponds unsuitable for the establishment of emergent wetland or submerged aquatic vegetation. Floating aquatic vegetation may become established. These activities would permanently change the vegetation of wetland areas and have long-term moderate adverse effects on wetlands.

Reclamation projects have been initiated to combat loss of wetland area in southeastern Louisiana. The benefits of coastal wetlands have moved to the forefront of public attention since the devastation caused by Hurricanes Katrina and Rita in 2005. Projects vary in size and magnitude and are being conducted throughout the state on private and public lands. Large-scale reclamation projects in nearby wetlands may have indirect beneficial impacts on the Preserve as they buffer the Preserve's habitats by reducing the storm surge, wave energy, and wind effects. Large-scale reclamation projects near Jean Lafitte National Historical Park and Preserve include the GIWWC Project and the shoreline reclamation of Lake Salvador. The acquisition of Bayou aux Carpes and the CIT Tracts by the park have placed thousands of acres of additional wetland under NPS management and preservation.

The park has identified wetland reclamation projects and is working with officials from state and federal agencies to implement these projects. The park has implemented successful reclamation projects including backfilling two dead-end canals along the Bayou Segnette Waterway, debris removal and dredging of existing park canals, and using dredge material to fill open water ponds which were previously floating marsh. Wetland reclamation is ongoing and is highly dependent on available funding. The park annually submits wetland reclamation projects for funding consideration through the NPS Disturbed Lands program and the Coastal Wetlands Restoration, Planning, and Protection Act. Reclamation projects result in long-term beneficial impacts.

The park has been working with the New Orleans District of the USACE Operations Division since 2001 to chemically treat and control water hyacinth, common salvinia, and alligatorweed. During the growing season, these plants form dense floating mats that cover more than 9,000 acres of aquatic habitats in the Preserve, including interior ponds, canals, and natural waterways. Typically, the USACE sprays between 150 and 325 acres of Preserve waterways. Additionally, between June 2002 and June 2005, the park released salvinia weevils (*Cyrtobagous salviniae*) in the Preserve in an attempt to establish biological control of common salvinia. Exotic species management projects result in short-term minor adverse and beneficial impacts.

The past, present, and reasonably foreseeable future actions would have short-term minor and long-term moderate adverse impacts to wetlands and short- and long-term beneficial impacts to wetlands when combined with the long-term moderate adverse effects of alternative A.

Conclusion: Alternative A would result in long-term moderate adverse impacts to wetlands from risks associated with non-historic canals. Cumulative impacts for alternative A would be short-term minor adverse and long-term moderate adverse and short- and long-term beneficial to wetlands. Alternative A would add a slight adverse increment to overall cumulative effects. Because there would be no major

adverse impacts on wetlands, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Under alternative B it would be impossible to avoid impacting wetland habitats because virtually all of the Preserve is classified as wetlands. Minor adverse impacts would result from sedimentation from partially filling canal areas with spoil material and destruction of wetland vegetation growing on the spoilbanks. The use of equipment in the project area would result in the compaction of spoilbank soils and temporarily destroy or alter spoilbank vegetation. Impacts would be negligible temporary and localized since equipment would not be present in all areas of the project at any given time, and due to the low ground pressure of the equipment. Due to the extensive seed source and small amount of disturbance in a localized area, wetland vegetation would only be impacted in a small area and is expected to rapidly recolonize disturbed sites once work is completed (Baustian et al. 2009).

To avoid impacting wetland vegetation outside of the spoilbanks, vehicle access to the project site locations would be via the canals or the spoilbanks themselves. Other mitigation measures during project activities would include instructions to ground crews on how to avoid damaging any part or whole of wetland vegetation outside of the spoilbanks themselves. The NPS would also regularly monitor project activities to ensure wetland vegetation is not damaged during reclamation activities.

The spoilbanks present an artificial area of high elevation and mineral soils that encourage the establishment of invasive vegetation species. Trees felled on the spoilbanks would primarily consist of invasive Chinese tallow, and primarily native wetland species are expected to recolonize the area after spoil material removal (Baustian et al. 2009). Partial filling of open water areas with material from the spoilbanks is expected to create additional areas of submerged and emergent vegetation. This methodology has been used in many areas of coastal Louisiana and at other locations in the Preserve. Research has documented the long-term beneficial effects of this process (Baustian and Turner 2006; Baustian et al. 2009). Reclaiming the canals would create acres of new wetlands and would also protect the existing interior marsh by facilitating a slower and more natural tidal exchange between the remaining open water canals and the interior marsh, reducing wave energy that contributes to erosion, and reducing saltwater intrusion into the freshwater marsh, which can destroy salt intolerant species. Construction of check meanders in those canals to be reclaimed along the Bayou Segnette Waterway would provide additional protection from wave action along that maintained navigable water way as well. Spoilbank removal and partial filling of the canals would have a beneficial impact on wetlands.

Cumulative Impacts: Cumulative impacts to wetlands under this alternative include those described under alternative A. Implementation of this alternative would contribute to the various wetland reclamation plans throughout the state, including the Coast 2050 plan and the Louisiana Coastal Areas – Ecosystem Restoration Study (USACE 2004b). The past, present, and reasonably foreseeable future actions, in combination with the short-term negligible to minor adverse and long-term beneficial impacts

from alternative B, would have short-term negligible to minor adverse, long-term moderate adverse cumulative impacts, and long-term beneficial cumulative impacts on wetlands.

Conclusion: Alternative B would result in short-term negligible to minor adverse and long-term beneficial impacts to wetlands. Cumulative impacts to wetlands under this alternative would be short-term negligible to minor adverse, long-term moderate adverse, and long-term beneficial to wetlands. Alternative B would contribute a negligible adverse increment and a beneficial increment to overall cumulative effects. Because there would be no major adverse impacts on wetlands, there would be no impairment of Preserve resources and values. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on wetlands under alternative B.

VISITOR USE AND EXPERIENCE, INCLUDING HEALTH AND SAFETY

Methodology and Assumptions

The methodology for assessing impacts on visitor use and experience is based on professional judgment and was developed through consultation with NPS staff and other experts.

Area of Analysis

Any area used for visitor use, or where visitors may be within the Preserve is included in the impact analysis for visitor use and experience, including health and safety. The Preserve boundary is the impact analysis area for evaluating direct and indirect effects. The NPS developed the following definitions for intensity thresholds for impacts to visitor use and experience including health and safety:

Negligible: Changes in visitor use and/or experience would be below or at the level of detection. Visitors are not likely to be aware of the effects associated with the alternative. There is no expectation for endangering visitor health and safety.

Minor: Changes in visitor use and/or experience would be detectable, although the changes would be slight. Few visitors would be aware of or affected by the implementation of the alternative. There is little expectation for endangering visitor health and safety with the application of mitigation measures.

Moderate: Changes in visitor use and/or experience would be readily apparent. Many visitors would be aware of or affected by the implementation of the alternative, and would likely express an opinion about the effects. Extensive mitigation measures would be necessary to reduce risk of endangering visitor health and safety.

Major: Changes in visitor use and/or experience would be readily apparent and have important consequences. Most visitors would be aware of or affected by the implementation of the alternative, and would likely express a strong opinion about the effects. Extensive mitigation measures may not reduce the risk of endangering visitor health and safety.

No action Alternative (Alternative A)

Under the no action alternative, no reclamation activities would take place so there would be no temporary impacts from additional noise sources or canal closures for construction activities. Maintenance activities to protect the natural resources, functions, and values within the Preserve would continue and responses to future needs and conditions associated with the canals and coastal wetlands would occur without extensive actions or changes in the present course. Maintenance activities could result in temporary closures of small areas used by visitors to the Preserve. Closing the areas where maintenance activities occur would prevent any risk to visitor health and safety. The impacts to visitor use and experience, including health and safety, would be localized short-term negligible and adverse.

Cumulative Impacts: Other past, present, and reasonably foreseeable actions within the central Barataria Basin in the vicinity of the Preserve have affected or could affect visitor use and experience. Rapid expansion in the Westbank area of Jefferson Parish has resulted in extensive construction of roads and commercial and residential buildings. Urban development near the Preserve could result in more visitors to the Preserve with the Preserve being noticeably more crowded. More visitors also mean more pollution and noise originating from both inside and outside the Preserve as a whole. The impacts would be long-term moderate and adverse.

Recent plans to implement storm surge protection projects and to construct hurricane protection levees would cause adverse impacts to visitor use and experience during construction in the Preserve. The construction of levees along rivers and canals would affect visitor use by causing noise disturbances and possible area closures. Risks to health and safety would not increase because all construction areas would be closed to visitor use. Flood and storm surge control projects near the Preserve result in short- and long-term minor adverse impacts.

Visitor use and experience are also adversely affected by oil exploration, production, transport and maintenance activities. These activities or associated abandoned infrastructure are readily noticeable, and could cause closures and increased noise levels. Oil well or pipeline leaks are another possibility and could be harmful to visitors, increasing risks to health and safety. However, oil and gas related infrastructure also provides access to the Preserve for certain visitor groups, which would be beneficial. These activities have the potential to cause long-term minor to moderate adverse and long-term beneficial impacts.

As a result of several recent tropical cyclones, the park is proposing to remove downed debris and dredge canoe trails in the Preserve. Canals impacted by the project include Bayou des Famillies, Bayou Coquille, Lower and Upper Kenta Canal, Twin Canals, Fuller's Trenasse, Bayou Boeuf, and Wood's Place Canal. The dredge spoil from the project would be spread as a slurry layer no more than 6 inches deep on approximately 605 acres of wetlands adjacent to these waterways. During the project activities, short-term minor adverse impacts would occur from noise and temporarily closing areas to visitor use for safety reasons. However, the project would result in long-term beneficial impacts to visitor use by reopening areas to visitors that are currently impassible during much of the year.

The CIT Tracts are an area comprising forested wetlands located on the northern side of the Preserve. The area was acquired by the United States in 1994 to settle a lawsuit. Management of the property was transferred to the NPS in March 2009. Acquisition of the Bayou aux Carpes area in the southern portion of the Preserve also occurred in 2009, and would provide visitors with more recreational area to use. These acquisitions would have long-term beneficial impacts on the visitor use and experience of the

Preserve. Shoreline protection of Lake Salvador would preserve areas of the Preserve that are used for recreation that would otherwise have been destroyed. As a result, the impacts would be long-term and beneficial on visitor use and experience.

Planned and routine facility development and maintenance would have short-term minor adverse impacts to visitor use during the construction and maintenance. The park has recently made repairs to the Palmetto Trail, which was heavily damaged by Hurricane Katrina. Impacts from this improvement are long-term and beneficial.

These past, present, and reasonably foreseeable future actions would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on visitor use and experience, including health and safety. In combination with the localized short-term negligible adverse impacts of alternative A, the overall cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial.

Conclusion: Alternative A would result in localized short-term negligible adverse impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative A would add a negligible adverse increment to overall cumulative impacts. Because the impacts previously described (1) are not inconsistent with the park's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience including health and safety under the no action alternative.

Canal Reclamation to Natural Landscape by Degrading Developer-Built Spoilbanks and Dikes (Alternative B, Preferred Alternative)

Impacts to visitor use and experience under alternative B would vary. In the area of construction activities, canals would be closed to visitor use for safety reasons. These closures would be temporary, and the areas would be reopened to visitors after project activities were complete. Because all 20 miles of non-historic canals would not be reclaimed at once, the temporary closures would only impact small areas of the Preserve at any one time and would, therefore, result in short-term negligible to minor adverse impacts.

Increased noise levels from equipment during reclamation activities would also impact visitor experience. However, the frequency, duration and magnitude of noise from the project would not exceed those already produced by park staff and visitors during normal park operations and recreational activities. Therefore, these impacts would result in short-term negligible adverse effects on visitor use and experience.

In canals where pushing woody vegetation into the open water may interfere with navigation, such as in Tarpaper Canal, Horseshoe Canal, Pipeline Canal and Davis/Marrero Canal, as well as canals in the Bayou aux Carpes area used by a commercial swamp tour, cut woody vegetation would either be chipped in place or placed parallel to the banks of the canals. This would allow visitors to still use the canals without impacting navigation. These techniques may also be employed in areas where canals and/or drillslips meet a navigable waterway so that woody debris does not drift into the waterway and impact navigation. Though woody debris would be managed along these waterways, the placement of spoilbank

material into canals would reduce water depths and potentially limit access by some vessels. Along the Bayou Segnette Waterway, which is a maintained waterway, check meanders would be installed in reclaimed canals. Check meanders would prevent woody debris and sediment from moving into the waterway and impeding navigation. However, check meanders themselves represent a potential impediment to navigation. With these mitigation measures, impacts to boat navigation in these canals would be reduced, and are expected to be long-term minor adverse.

Opportunities for fishing access by boats would be reduced as described above in reclaimed canals, but fish habitat, in general, would be enhanced. Marsh areas open for hunting would not be affected, although temporary closures in the vicinity of project activities may result in short-term minor adverse impacts.

While there would be short-term negligible to minor and long-term minor adverse impacts from implementing the proposed action, reclaiming the canals and allowing them to revert to more natural open marsh habitat would provide long-term beneficial effects to the visitor use and experience by allowing visitors to enjoy a more natural system, representative of the wetlands and ecosystems present prior to the canals.

Cumulative Impacts: The same actions identified as contributing cumulative effects under alternative A would apply to alternative B. These past, present, and reasonably foreseeable future actions would have short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial cumulative impacts on visitor use and experience, including health and safety. In combination with the impacts of alternative B, the overall cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial.

Conclusion: Alternative B would result in localized short-term negligible to minor and long-term minor adverse impacts and long-term beneficial impacts to visitor use and experience, including health and safety. Cumulative impacts would be short-term negligible to minor adverse, long-term minor to moderate adverse and long-term beneficial. Alternative B would contribute a slight adverse increment and a beneficial increment to the overall cumulative impacts to visitor use and experience, including health and safety. Because the impacts previously described (1) are not inconsistent with the Preserve's purpose and values, (2) do not prevent the attainment of desired future conditions for natural and cultural resources, (3) do not create an unsafe environment, (4) do not diminish opportunities for future enjoyment of the park, and (5) do not unreasonably interfere with park programs or activities, an appropriate use, or contractor operations, there would be no unacceptable impacts on visitor use and experience, including health and safety under alternative B.

COORDINATION AND CONSULTATION

The intent of NEPA is to encourage the participation of federal- and state-involved agencies and affected citizens in the assessment procedure, as appropriate. This chapter describes the consultation that occurred during development of this EA. This chapter also includes a description of the public involvement process and a list of the recipients of the document.

THE SCOPING PROCESS

The NPS divides the scoping process into two parts: internal scoping and external or public scoping. Internal scoping involved discussions among NPS personnel regarding the purpose of and need for

management actions, issues, management alternatives, mitigation measures, the analysis boundary, appropriate level of documentation, available references and guidance, and other related topics.

Public scoping is the early involvement of the interested and affected public in the environmental analysis process. The public scoping process helps ensure that people have an opportunity to comment and contribute early in the decision-making process. For this planning document, project information was distributed to individuals, agencies, and organizations early in the scoping process, and people were given opportunities to express concerns or views and to identify important issues or even other alternatives.

Taken together, internal and public scoping are essential elements of the NEPA planning process. The following sections describe the various ways scoping was conducted for this EA.

INTERNAL SCOPING

An internal scoping meeting was held at the Jean Lafitte National Historical Park and Preserve on October 8 and 9, 2009. Internal scoping uses NPS staff to determine what topics need to be analyzed in the EA. The meetings were attended by personnel from the park, the NPS Denver Service Center, the Louis Berger Group, and PENSCO. Based on these meetings, the interdisciplinary team defined the purpose, need, and objectives of the plan, identified potential issues, discussed preliminary alternatives, and defined data needs. The results of the meetings were captured in a report now on file as part of the administration record for this EA.

PUBLIC SCOPING

Public scoping efforts for this planning process focused on the means or processes to be used to include the public, the major interest groups, and local public entities. To notify interested parties of the project, an informational brochure was mailed out to 86 representatives of educational institutions, nongovernmental organizations, parish governments, and federal agencies, as well as other people who expressed an interest in the project. In addition, the park e-mailed 58 electronic copies of the brochure to a similar cross section of individuals. The brochure was also posted on the NPS' Planning, Environment, and Public Comment website (www.parkplanning.nps.gov/jela) as well as the park's website (www.nps.gov/jela/parkmgmt/publicinvolvement.htm). In addition, a press release was sent to *The Times Picayune*. With the scoping brochure, the public was given 30 days to comment on the project from October 2, 2009, through October 31, 2009.

PUBLIC SCOPING COMMENTS

During the 30-day scoping period, 32 pieces of correspondence were received from the public. These comments included both support for and against the project, requests to remove certain canals from the project, suggestions to avoid impacting middens and other archeological sites, suggestions to remove invasive species such as Chinese tallow and water hyacinth, and concerns about the adverse ecological impacts that removing the spoilbanks might have including killing off native cypress trees. Other comments suggested evaluating impacts to wildlife existing on the spoilbanks to be removed, neotropical and other migratory birds as well as other species of conservation concern, recreational fishing in the canals to be reclaimed, and hydrology; spreading the spoilbank material across the marsh instead of placing it in the canals; and conducting any work outside of the nesting season for bird species of conservation concern. Several concerns were noted about continued access to private properties, and one

commenter expressed concern about the continued ability of companies with mineral rights in the Preserve to exercise those rights and access sites if the canals and drillslips are reclaimed. Several commenters also indicated that the project should be paid for by the oil and gas companies that created the canals and expressed their displeasure that the project was being paid for with taxpayer money.

AGENCY CONSULTATION

In accordance with Section 5.5 of DO #12, coordination and public involvement in the planning and preliminary design of the proposed action was initiated early in the process. As required by NPS policies and planning documents, it is the park's objective to work with state, federal, and local governments and private organization to ensure that the park and its programs are coordinated with theirs, are supportive of their objectives, and that their programs are similarly supportive of park programs. The following agencies were consulted when preparing this EA:

Federal Departments and Agencies

- U.S. Department of the Army, Corps of Engineers
- U.S. Department of the Interior, Fish and Wildlife Service

Louisiana State Agencies

- Louisiana Department of Environmental Quality
- Louisiana Department of Natural Resources
- Louisiana Department of Wildlife and Fisheries
- State Historic Preservation Office, Louisiana

Affiliated Native American Groups

- Alabama-Coushatta Tribe of Texas
- Caddo Nation
- Chitimacha Tribe of Louisiana
- Choctaw Nation of Oklahoma
- Coushatta Tribe of Louisiana
- Jena Band of Choctaw Indians
- Mississippi Band of Choctaw Indians
- Quapaw Tribe of Oklahoma
- Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Tunica-Biloxi Tribe of Louisiana

RECIPIENTS OF THE ENVIRONMENTAL ASSESSMENT

To inform the public of the availability of the EA, the NPS will distribute a notification letter to the various agencies, tribes, and members of the public on the project mailing and e-mail lists. The EA will also be available electronically on the NPS' Planning, Environment, and Public Comment website at http://www.parkplanning.nps.gov/jela. Copies of the document will also be provided upon request.

PERMITS REQUIRED

USACE Clean Water Act Permit-Section 404/Section 10

Louisiana Department of Natural Resources Coastal Use Permit

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APPENDIX A

PUBLIC SCOPING AND AGENCY CONSULTATION LETTERS

Public Scoping Brochure

USFWS Section 7 Consultation Letter

USFWS Section 7 Consultation Response

Louisiana State Historic Preservation Office Consultation Letter

Louisiana State Historic Preservation Office Response

NPS Determination of No Adverse Effect with attached Assessment of Effect

Tribal Consultation Letters

Tribal Consultation Responses

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National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical
Park and Preserve,
Louisiana

Canal Reclamation at Barataria Preserve

National Park Service
U.S. Department of the Interior

Jean Lafitte National Historical
Park and Preserve,
Louisiana

Planning Process

The NPS expects to release an Environmental Assessment (EA) for public review in January 2010. The EA will be available for public review and comment for 30 days. Written comments received on the EA will be reviewed to determine whether any new important issues or reasonable alternatives or mitigation measures have been suggested. If substantive issues are raised which point to the potential for significant impacts, an Environmental Impact Statement would be prepared, otherwise a Finding of No Significant Impact (FONSI) is expected.

For More Information

If you have questions about the project or would like more information, please visit **http://parkplanning.nps.gov/jela/** or contact:

Haigler "Dusty" Pate
Natural Resource Program Manager
504 589-3882 ext 119

Or send email to **jela_superintendent@nps.gov**

Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130

Project Background

As a result of funding made available through the 2009 enactment of the American Recovery and Reinvestment Act (ARRA), the National Park Service (NPS) is soliciting public comments on a proposed project that would reclaim more than 20 miles of canals in the Barataria Preserve, a unit of the Jean Lafitte National Historical Park and Preserve. The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, and partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

Oil and gas exploration, development, and transportation, along with unsuccessful residential development projects, have scarred the landscape of the Barataria Preserve with man-made canals and drillslips (canals). More than 590 acres of the Preserve are directly affected by these non-historic canals and associated spoilbanks and dikes, and more than 20 linear miles of canals have been identified for reclamation throughout the preserve.

Canals and their associated spoilbanks alter hydrology and have both a direct and an indirect role in Louisiana's land loss problem. Directly, canals have turned marsh to open water and spoilbanks have replaced marsh with an upland environment. Indirectly, spoilbanks restrict water flow above and below the marsh surface and can cause both increased flooding and drying of the marsh behind them.

This hydrologic alteration can limit sediment deposition, stress marsh vegetation, increase subsidence, and lead to marsh deterioration. Other impacts include amplification of tidal volumes and increased saltwater intrusion. In addition, the vegetated communities in wetlands adjacent to canal dredging sites have changed, and the canals and spoilbanks are now colonized by exotic species. Wetlands benefit coastal communities by providing protection from flooding, helping to maintain water quality, and providing habitat for fish and wildlife, including estuarine organisms, wintering waterfowl, and neotropical migrant birds. The loss of these wetland functions due to the construction of canals continues to adversely affect the Preserve.

NPS policies call for the restoration and active management of resources damaged or compromised in the past, including wetlands and floodplains. In addition, the legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and undermine the ability of the park to preserve and protect those values.

CANAL WITH SPOILBANKS

CANAL BACKFILLING IN PROGRESS

Purpose and Need for Project

The **purpose** of this project is to restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks; and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events.

This project is **needed** at this time because:

- The indirect effects of canals and spoilbanks on the park are continual stressors on park resources and values, with continued adverse effects on natural hydrology, ecology, water quality, and wetland functions and values.
- Combined with other sources of cumulative adverse impacts, canals have resulted in increased rates of land loss in the park, the Barataria estuary, and throughout coastal Louisiana.
- The NPS currently has an opportunity to fund the restoration of resources affected by canals and spoilbanks in the park in part because of the American Recovery and Reinvestment Act. The work would create jobs in the local economy, which is a goal of this legislation.

Project Objectives

The **objectives** of the project are to:

- Restore wetland functions and values (hydrology – water, sediment, and nutrient movement/vegetation/ access for estuarine organisms/wildlife habitat)
- Improve visitor experience
- Avoid or minimize adverse impacts to park resources and values
- Improve the resiliency of park ecosystems in the face of subsidence and climate change impacts - sea level rise and intensified tropical storms

Public Comment

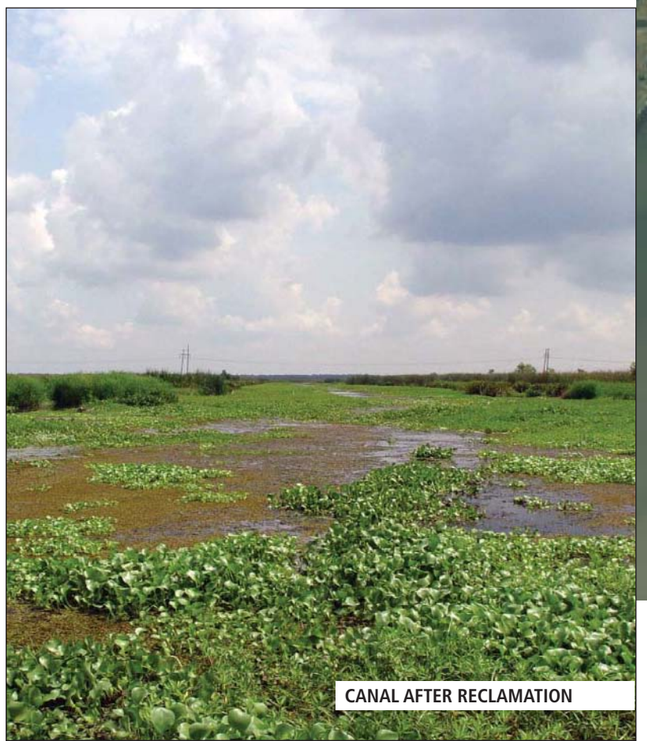
The NPS is inviting the public to provide input regarding this project, also known as "Public Scoping." Issues and concerns from the public, government agencies, and organizations will assist the NPS in preparation of an Environmental Assessment (EA). Public comments will be accepted until October 31, 2009. Submit comments to:

Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur St.
New Orleans, LA 70130
Attn: Canal Reclamation at Barataria Preserve

Online at: **www.parkplanning.nps.gov/jela** (click on project)
By email to: **jela_superintendent@nps.gov**

Please be sure to include your full name and address with the comments so we may add you to our mailing list for information on the planning process.

Before including your address, phone number, e-mail address, or other personal identifying information in your comment, be advised that your entire comment—including your personal identifying information—may be made publicly available at any time. While you can ask us in your comment to withhold from public review your personal identifying information, we cannot guarantee that we will be able to do so.



CANAL AFTER RECLAMATION

Canal Reclamation at Barataria Preserve

Produced 09/25/2009
FILE: BARA_CanalRestoScopeBmap.mxd

Note: Basemap is 2008 true color DOQQ aerial imagery from the USGS National Wetlands Research Center and the CWPPRA Task Force

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United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130-1035

IN REPLY REFER TO

September 2, 2009

Jim Boggs
Field Supervisor
Lafayette Ecological Services Field Office
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

Re: Section 7 Consultation for Proposed Canal Backfilling Project at Jean Lafitte National Historical Park and Preserve

Dear Mr. Boggs:

The National Park Service is currently considering a project to degrade spoilbanks and levees within the Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve. Fill material from the spoilbanks and levees would be used to partially backfill the open water of canals. Most of the canals in the proposed project area were originally constructed for oil and gas exploration and development, and backfilling them would restore natural hydrology and reestablish wetland vegetation. Our title for this project is 'Restore Freshwater Floating Marsh by Reclaiming Abandoned Oil and Gas Canals,' and the internal project number in our Planning, Environment and Public Comment (PEPC) system is 25944.

In compliance with section 7(a)(2) of the Endangered Species Act of 1973 (as amended), we are requesting your concurrence that the species distribution list we obtained from your website is accurate. We visited http://www.fws.gov/lafayette/section7/ on September 1, 2009. The last update for the list downloaded from the site was August 8, 2008. For Jefferson Parish, the location of the proposed project, the list includes the West Indian manatee, brown pelican, Gulf sturgeon, and the green, hawksbill, Kemp's ridley, leatherback, and loggerhead sea turtles. We noted that Jefferson Parish contains critical habitat for the piping plover and Gulf sturgeon. We are also requesting confirmation that the Barataria Preserve unit, which is delineated on the attached map, does not contain critical habitat for these species.

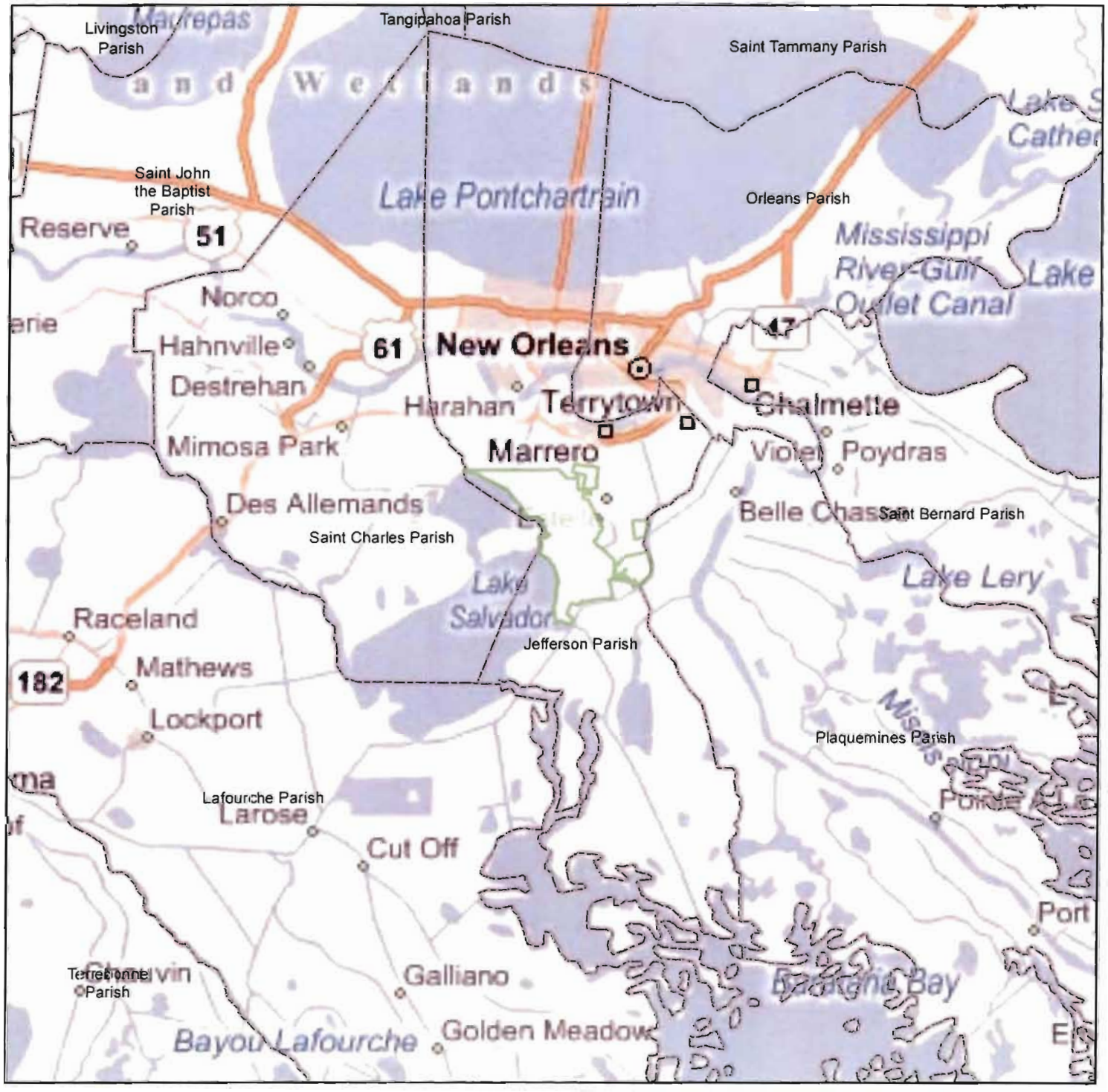
If you have any questions or concerns, please contact me at (504) 589-3882 extension 119, or via email at haigler_pate@nps.gov. I appreciate your consideration of our requests.

Sincerely,

Haigler "Dusty" Pate
Natural Resource Program Manager

Enclosure

Jean Lafitte NHP & Pres Barataria Preserve & Region



Legend

- Barataria Preserve
- LA County Boundaries

N

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Basemap is a live web service from the Microsoft Virtual Earth (now Bing Maps) online mapping system. © 2009 Microsoft Corp. http://maps.live.com.

Map created 09/02/2009.

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130-1035

IN REPLY REFER TO:

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September 2, 2009

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Jim Boggs
Field Supervisor
Lafayette Ecological Services Field Office
U.S. Fish and Wildlife Service
646 Cajundome Boulevard, Suite 400
Lafayette, LA 70506

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Sincerely,

Haigler "Dusty" Pate
Natural Resource Program Manager

Enclosure

This project has been reviewed for effects to Federal trust resources under our jurisdiction and currently protected by the Endangered Species Act of 1973 (Act). The project, as proposed,
( ) Will have no effect on those resources
(X) Is not likely to adversely affect those resources.
This finding fulfills the requirements under Section 7(a)(2) of the Act.

Sep 11, 2009
Acting Supervisor — Date
Louisiana Field Office
U.S. Fish and Wildlife Service

SITE MAY CONTAIN WETLANDS. Contact the U.S. Army Corps of Engineers for a jurisdictional determination.
District: New Orleans
Telephone No. 504-862-2274

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

October 2, 2009

Mr. Scott Hutcheson
Louisiana State Historic Preservation Officer
Office of Cultural Development
P.O. Box 44247
Baton Rouge, LA 70804

Attention: Section 106 Reviewer

Dear Mr. Hutcheson:

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, we are informing you of a proposed undertaking. The project under consideration would reclaim more than 20 miles of modern canals in the Barataria Preserve, a unit of Jean Lafitte National Historical Park and Preserve located just south of the greater New Orleans metropolitan area. We sent you a scoping brochure regarding the project on September 30, 2009, and a map of the area of potential effect is enclosed. An Assessment of Actions Having an Effect on Cultural Resources will be sent at a later date for your review.

The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

The park's legislative mandate, general management plan, and resource management plan direct that the Preserve is to be managed to preserve natural resources and values. The legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and undermine the ability of the park to preserve and protect those values.

The Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve contains the Barataria Unit Historic District and a number of prehistoric and historic sites and historic structures. The canals proposed for backfilling are in areas without adjacent sites, with one exception: 16-JE-56, a shell midden associated with the Baytown and Mississippian Cultural Periods. We propose, therefore, to leave the spoilbank intact near 16-JE-56 and to refrain from backfilling the canal in that vicinity. No other known sites within the project area have the potential to be impacted by the project.

As stated above, the purpose of this letter is to inform you of the proposal, and to request information you may have on resources potentially affected by the undertaking. If you have any questions regarding this request, please contact me at 504-589-3882, extension 111.

Sincerely,

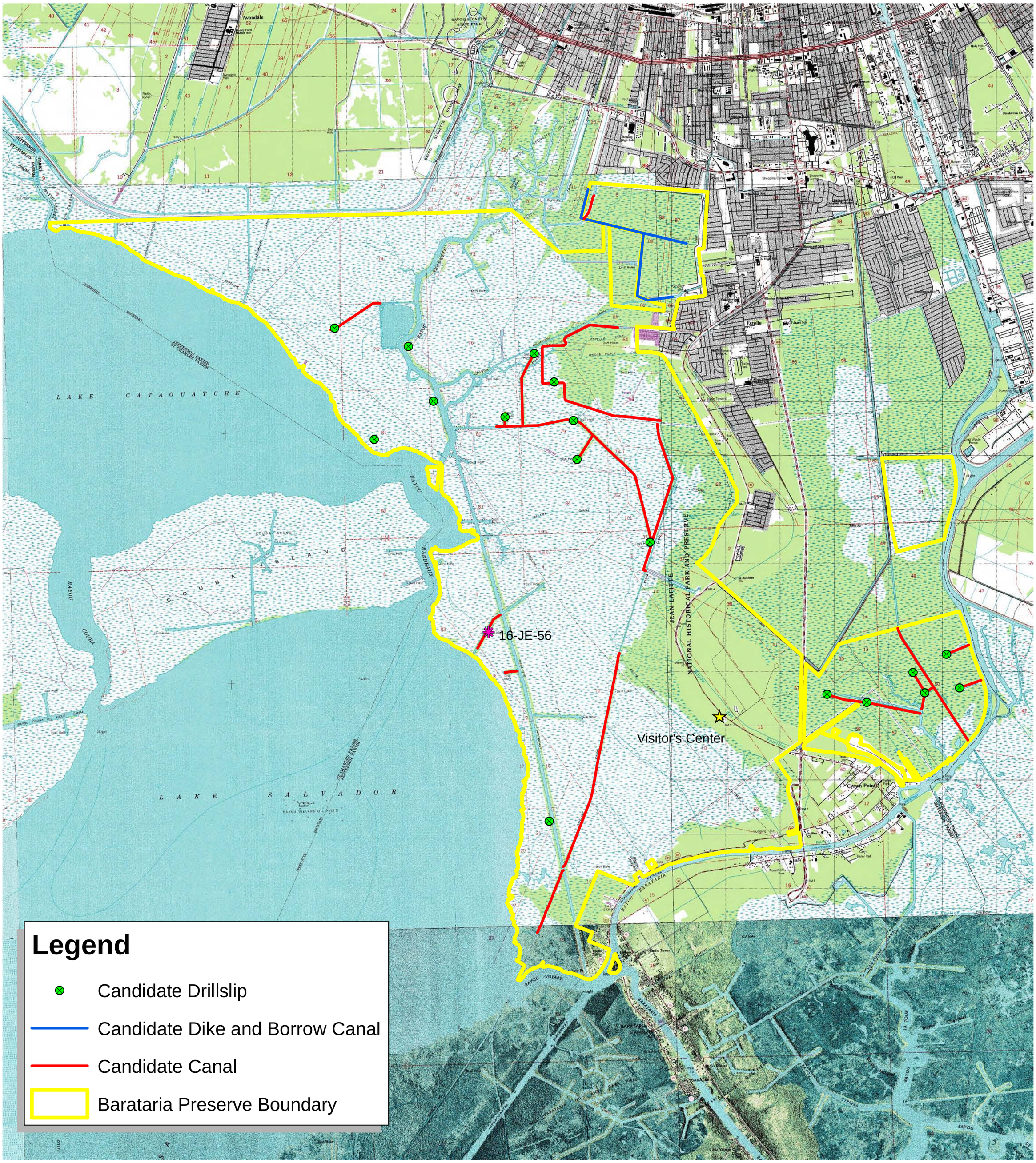
Carol A. Clark
Acting Superintendent

Enclosure

Jean Lafitte National Historical Park and Preserve
Louisiana

National Park Service
U.S. Department of the Interior

Canal Reclamation at Barataria Preserve



0 0.5 1 2 3 4 Miles

Note: Basemap is mosaiced USGS 7.5 minute topographic and orthophotomap (topographic) quadrangles. The following quads, or portions of quads, are included: Barataria, Bertrandville, Catahoula Bay, Lafitte, Lake Cataouatche East and West, and New Orleans East and West.

N

Produced 10/01/2009

FILE: BARA_CanalRestoInitConsultwSHPOMap.mxd

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

December 17, 2009

Mr. Scott Hutcheson
State Historical Preservation Officer
Department of Culture, Recreation and Tourism
Office of Cultural Development
Division of Archeology
Baton Rouge, LA 70804-4247

Re: Determination of *No Adverse Effect*, Barataria Preserve Canal Reclamation Project, PEPC # 25944, Barataria Preserve, Jefferson Parish Louisiana

Dear Mr. Hutcheson:

Enclosed is an Assessment of Effect form for the Barataria Preserve Canal Reclamation Project. The Assessment of Effect form describes the proposed undertaking, and its area of potential effects. We have previously consulted with you on this project, and in your letter dated November 13, 2009, you agreed with our treatment plan for the known archeological site (16JE56) that has the potential to be impacted by this project. The area of potential effects has not changed.

As you are aware, this project proposes to reclaim canals, by degrading their spoilbanks to the level of the surrounding marsh, and partially filling the open water with this material. The project would restore wetland vegetation directly in and around the canals and drill slips, and would provide indirect benefits to surrounding areas. The canal reclamation project will likely be done in segments as funding becomes available.

The area of potential effect for this undertaking would be confined to the spoilbanks and previously disturbed areas where archeological sites and historic properties would generally not be expected to occur, and there would be a low probability of locating significant archeological resources.

In accordance with 36 CFR 800.5(d)(1), Jean Lafitte National Historical Park and Preserve has determined that there would be *no adverse effects* on archeological resources or historic properties under the condition that the mitigations outlined in the Assessment of Effect form and presented below are followed prior to the implementation of each project phase, and that should unexpected discoveries be made during construction or buried human remains be discovered, all construction will stop and the proper authorities be contacted to consult on the project. The mitigations include the following: NPS shall conduct a Phase I archeological survey focusing especially in areas where canal segments have intersected or cut into natural waterways or historic canals and on canal

segments recently acquired where previous surveys have not been completed. The archeologist conducting the survey shall: 1) visit the state site files office to determine if there are previously identified archeological sites in the newly acquired lands, and obtain copies of all associated site forms; 2) visit all levees to be impacted, especially those in the newly acquired lands; 3) conduct a pedestrian survey of all intersections of canals and levees targeted for destruction with natural waterways and/or historic canals (if above water), and if deemed necessary, conduct limited subsurface testing; and 4) flag for avoidance site 16JE56 and any additional sites or historic properties discovered during the survey and project managers shall drop them from the project area. A buffer around identified sites or properties shall be established and the spoilbank near the site or property left intact. No backfilling or construction use would be permitted within the buffer zone. If you concur with the assessment of effect and conditions as outlined, please sign in the space provided below and return this letter to:

Carol A. Clark
Acting Superintendent
Jean Lafitte National Historical Park and Preserve
419 Decatur Street
New Orleans, LA 70804

If you should have any questions, please contact me at 504-589-3882, extension 111.

Sincerely,

for

Carol A. Clark
Superintendent

Enclosure

I CONCUR

_____ _____

Scott Hutcheson
State Historic Preservation Officer, Louisiana

Date

ASSESSMENT OF ACTIONS HAVING AN EFFECT ON CULTURAL RESOURCES

A. DESCRIPTION OF UNDERTAKING

1. Park: **Jean Lafitte NHP & Pres** Park district (optional):

2. Project Description:
a. Project Name **Canal Reclamation at Barataria Preserve** Date: **December 17, 2009** PEPC project ID no. **25944**
b. Describe project and area of potential effects (as defined in 36 CFR 800.2[c])

Oil and gas exploration, development, and transportation, along with unsuccessful residential development projects, have scared the landscape of the Barataria Preserve unit of JELA with man-made canals and drill slips (canals). More than twenty linear miles of these features have been identified for reclamation throughout the preserve. The canals and their associated spoil banks or levees range in width from approximately 150 feet to over 400 feet, with about 40 to 250 feet of that width being open water. More than 590 acres are directly affected by the canals, and essentially the entire 22,500 acre preserve, which is predominately freshwater marsh and forested wetlands, is indirectly affected. The preserve contains the only example of floating marsh in the National Park System, and portions of one of only twelve areas where the EPA has exercised its authority to prohibit the placement of fill material into wetlands under Section 404(c) of the Clean Water Act. In addition, the preserve is part of the Barataria Terrebonne National Estuary.

Canals and their associated spoil banks are responsible for a large portion of the rapid land losses on the LA coast that have occurred over the past century, which are primarily due to the conversion of coastal marshes to open water. Direct conversion of wetlands to open water and spoil banks from canal dredging has been estimated at approximately 22% of the total wetland area loss in the state. Though it is difficult to quantify exactly what proportion of the land loss is from indirect effects, it is nevertheless clear that an even greater percentage of the land losses from canal dredging are due to indirect effects. Indirect effects of canal dredging are due to the alteration of natural hydrological functions and circulation patterns, that is, disruption of sheet flow of fresh water and nutrients/sediments, partial or complete impoundment of adjacent wetlands, amplification of tidal volumes, disruption of flooding patterns, and increased saltwater intrusion. Spoilbanks and levees are colonized by exotic Chinese tallow trees. Vegetation communities in wetlands adjacent to canal dredging sites are changed.

This project proposes to reclaim canals, by degrading their spoilbanks to the level of the surrounding wetlands, and partially filling the open water with this material. This wetland

restoration method, known as backfilling, is technically simple and cost-effective. The project would restore wetland vegetation directly in and around the canals and drill slips, and would provide indirect benefits to surrounding areas. Marsh vegetation is expected to begin growing on about 65% of the original spoil bank area and 25% of the open water area of the canals within 3 years, and the open water portion of the project area could continue to shrink over the long-term.

There are few environmental values at risk from the proposed project. Adverse impacts should be generally confined to the previously disturbed work areas. There is a shell midden associated with Native American and other cultures that was bisected by a canal which is part of the proposed project area. The NPS informed the Louisiana State Historic Preservation Officer (SHPO) and all associated Indian Tribes by letters dated October 2, 2009 of the planned mitigation strategy for the protection of the midden, which is identification and avoidance. The SHPO responded in a letter dated November 13, 2009 that, "We feel you have identified the one archeological site that has potential to be impacted by the project (16JE56, JELA-56) and we agree with the treatment plan for this site." There were two responses from tribes, but neither addressed the proposed mitigation for the midden. The tribal responses from the Alabama-Coushatta Tribe of Texas on October 20, 2009 and the Choctaw Nation of Oklahoma on November 9, 2009, indicated that, so far as they could determine, there would not be effects to tribal resources from the project. However, both tribes informed the NPS that in the event of the discovery of previously unidentified cultural resources during the project, work should cease, and that they would like to be notified. The NPS would comply with these requests in the unlikely event an unexpected discovery occurs.

Potential hazards associated with the nature of these former industrial sites will be identified and mitigated for. Backfilling the preserve's canals would close a portion of the open water previously available for recreation, research and education, commercial use, and park management activities. However, since the spoil material originally dredged from the marsh to create the canals has been dewatered, weathered, oxidized, and has lost most of its organic component, less material would be available to fill the open water of the canals. Therefore, the backfilling process would not close the waterways completely, at least in the short-term.

JELA-56 - Midden

3. Has the area of potential effects been surveyed to identify cultural resources?

__No
_X_ Yes, Source or reference: **Parts of area have been surveyed; new lands have not.**

___ Check here if no known cultural resources will be affected. (If this is because area has been disturbed, please explain or attach additional information to show the disturbance was so extensive as to preclude intact cultural deposits.)

4. Potentially Affected Resource(s):

Archeological resources affected?

Name and number(s): **Barataria Preserve** Location: **Jefferson Parish**
NR status: **1 - Listed in Register and documented**
Notes: **There is a midden site within the area of potential effect; however, mitigation will be built into the project to avoid adverse effects.**

5. The proposed action will: (check as many as apply)
_**No**_ Destroy, remove, or alter features/elements from a historic structure
_**No**_ Replace historic features/elements in kind
_**No**_ Add non-historic features/elements to a historic structure
_**No**_ Alter or remove features/elements of a historic setting or environment (inc. terrain)
**Yes** Add non-historic features/elements (inc. visual, audible, or atmospheric) to a historic setting or cultural landscape
_**No**_ Disturb, destroy, or make archeological resources inaccessible
_**No**_ Disturb, destroy, or make ethnographic resources inaccessible
**Yes** Potentially affect presently unidentified cultural resources
_**No**_ Begin or contribute to deterioration of historic features, terrain, setting, landscape elements, or archeological or ethnographic resources
_**No**_ Involve a real property transaction (exchange, sale, or lease of land or structures)
__ Other (please specify)

6. Measures to prevent or minimize loss or impairment of historic/prehistoric properties:
(Remember that setting, location, and use may be relevant.)

- **Ensure that there is a buffer around the known midden site, so that project activities avoid this area.**

7. Supporting Study Data:
(Attach if feasible; if action is in a plan, EA or EIS, give name and project or page number.)

Beavers, Richard C. Archeological Site Inventory of the Barataria Marsh Unit Core Area Jean Lafitte National Historical Park, Jefferson Parish, Louisiana. National Park Service. 1982.
Franks, Herschel A., Jill-Karen Yakubik and Marco J. Giardino. Archeological Survey in 65 Acres of Land Adjacent to Bayou des Familles. Southwest Cultural Resources Center Professional Papers, No. 26, Santa Fe, New Mexico. 1990.
Fuller, R. S. Identification and Analysis of Artifacts from Thirteen Sites in and Adjacent to the Barataria Unit of the Jean Lafitte National Historical Park, Jefferson Parish, Louisiana. Manuscript in Jean Lafitte National Historical Park and Preserve Library, 1990.

Gagliano, S., R.A. Weinstein, E. Burden, K. Brooks, and W. Gladner. Cultural Resources Survey of the Barataria, Segnette and Regional Waterways, Jefferson Parish, LA. New Orleans, New Orleans District Army Corps of Engineers, 1978.
Giardino, Marco. "Overview of the Archaeology of the Coquilles Site, Barataria Unit, Jean Lafitte National Park, Louisiana." 1986.
Goodwin and Associates, Inc. Preserving the Past for the Future: A Comprehensive Archeological and Historic Site Inventory of Jefferson Parish, Louisiana (Volumes 1-3) New Orleans, R.C. Goodwin and Associates, 1985.
Goodwin, R. Christopher. Archeological Assessment of the Barataria Unit, Jean Lafitte National Historical Park. By John Stuart Speaker, Joanna Chase, Carol Poplin, Herschel Franks and R. Christopher Goodwin. Southwest Region, National Park Service. 1986.
Holmes, Barbara. Historic Resources Study. The Barataria Unit of Jean Lafitte National Historical Park. Southwest Cultural Resources Center, Professional Papers No. 5, Santa Fe, New Mexico, 1986.
Impact Assessment, Inc. Traditional Use Study: Barataria Preserve, Jean Lafitte National Historical Park and Preserve. Impact Assessment, Inc., La Jolla, California, 1998.
Swanson, Betsy. Historic Jefferson Parish: From Shore to Shore. Gretna, LA. Pelican Publishing Co., 1975.
Swanson, Besty. Historic Land Use Study of a Portion of the Barataria Unit of the Jean Lafitte National Historical Park and Preserve. New Orleans, NPS, 1987.
Swanson, Betsy. Terre Haute de Barataria: A Historic Upland on an Old River Distributary Overtaken by Forest in the Barataria Unit of the Jean Lafitte National Historical Park and Preserve. Harahan, LA. Jefferson Parish Historical Commission. 1991.
Yakubik, Jill-Karen, Herschel A. Franks and Marco J. Giardino. Archeological Investigations of Six Spanish Colonial Period Sites Barataria Unit, Jean Lafitte National Historical Park and Preserve. Southwest Cultural Resources Center Professional Papers, No. 22, Santa Fe, NM, National Park Service. 1989.
(In Draft) Swanson, Betsy. Documenting the Link Between Environment and Culture in the Barataria National Historic District. A Cultural Resource Study: A Cultural Resource Study . 2009

8. Attachments:
[ ] Maps [ ] Archeological survey, if applicable [ ] Drawings [ ] Specifications [ ] Photographs
[ ] Scope of Work [ ] Site plan [ ] List of Materials [ ] Samples [ ] Other:

Prepared by **Allison Pena** Date: **December 15, 2009** Title: **Cultural Anthropologist Acting Regional Ethnographer & NAGPRA Coordinator** Telephone: **504-589-3882**

B. REVIEWS BY CULTURAL RESOURCE SPECIALISTS

The park 106 coordinator requested review by the park's cultural resource specialist/advisors as indicated by check-off boxes or as follows:

[**X**] Archeologist
Name: **Meredith Hardy**
Date: **10/16/2009**
Comments: **This project will result in the moving of earth/ground disturbance by destroying levees to fill in non-historic canals throughout Barataria unit of JELA. Many of these canals and levees were created in the 1930s-1950s and later, and are technically historic; however, some of these canals appear to have cut and/or utilized natural waterways or older canals. These intersections may have unrecorded cultural resources. Additionally, several of these canals and levees are located on lands that have been recently acquired by JELA, and have never had a cultural resources or archeological survey. A site visit and Phase I survey is necessary for this project. On another note, these canals are themselves components of the historical ecology and landscape of the area, and the story of the oil boom, 20th century changes to the landscape, and lessons learned from these actions should be recorded, told, and interpreted.**

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected __ No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:
Archeologist who conducts this survey should: 1) visit the state site files office to determine if there are previously identified archeological sites in the newly acquired lands, and obtain copies of all associated site forms. 2) All levees to be impacted should be visited, especially those in the newly acquired lands. 3) All intersections of canals and levees targeted for destruction with natural waterways and/or historic canals should be visited with a pedestrian survey (if above water), and if deemed necessary, subjected to limited subsurface testing.

[**X**] 106 Advisor
Name: **Tommy Jones**
Date: **12/14/2009**
Comments:

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected **X** No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:
No adverse effect provided issues raised by Ms. Hardy are properly addressed.

Doc Method:
Standard 4-Step Process

[**X**] Anthropologist
Name: **Allison Pena**
Date: **12/11/2009**
Comments: **We have contacted the American Indian tribes that may be affiliated with this project. We have received two responses - one from the Alabama-Coushatta Tribe of Texas and one from the Choctaw Nation of Oklahoma and both letters confirm that the project would have no adverse effect on historic properties. There are no ethnographic concerns for this project.**

Check if project does not involve ground disturbance [ ]
Assessment of Effect: __ No Historic Properties Affected _X_ No Adverse Effect __ Adverse Effect
__ Streamlined Review
Recommendations for conditions or stipulations:

Doc Method:
Standard 4-Step Process

No Reviews From: **Curator, Historical Architect, Historian, Other Advisor, Historical Landscape Architect**

C. PARK SECTION 106 COORDINATOR'S REVIEW AND RECOMMENDATIONS

1. Assessment of Effect:

_____ No Historic Properties Affected ___X__ No Adverse Effect _____ Adverse Effect

2. Compliance requirements:

[**X**] A. STANDARD 36 CFR PART 800 CONSULTATION
Further consultation under 36 CFR Part 800 is needed.

[ ] B. STREAMLINED REVIEW UNDER THE 2008 SERVICEWIDE PROGRAMMATIC AGREEMENT (PA)

The above action meets all conditions for a streamlined review under section III of the 2008 Servicewide PA for Section 106 compliance.

APPLICABLE STREAMLINED REVIEW Criteria
(Specify 1-16 of the list of streamlined review criteria.)

[ ] C. PLAN-RELATED UNDERTAKING

Consultation and review of the proposed undertaking were completed in the context of a plan review process, in accordance with the 2008 Servicewide PA and 36 CFR Part 800.
Specify plan/EA/EIS: _____

[ ] D. UNDERTAKING RELATED TO ANOTHER AGREEMENT
The proposed undertaking is covered for Section 106 purposes under another document such as a statewide agreement established in accord with 36 CFR 800.7 or counterpart regulations.
Specify: _____

[ ] E. COMPLIANCE REQUIREMENTS SATISFIED BY USE OF NEPA
Documentation is required for the preparation of an EA/FONSI or an EIS/ROD has been developed and used so as also to meet the requirements of 36 CFR 800.3 through 800.6

[ ] F. No Potential to Cause Effects [800.3(a)(1)]

[ ] G. STIPULATIONS/CONDITIONS
Following are listed any stipulations or conditions necessary to ensure that the assessment of effect above is consistent with 36 CFR Part 800 criteria of effect or to avoid or reduce potential adverse effects.

Recommended by Park Section 106 coordinator:
Name: **Margo Davis, Allison Pena**
Title: **NHPA Specialists**
Date:

D. SUPERINTENDENT'S APPROVAL

The proposed work conforms to the NPS *Management Policies* and *Cultural Resource Management Guideline*, and I have reviewed and approve the recommendations, stipulations, or conditions noted in Section C of this form.

Name/Signature of Superintendent _____ for Carol Clark
Date: 12/17/09

The letter on the next page was addressed and sent to the following tribal representatives of affiliated American Indian tribes.

Alabama-Coushatta Tribe of Texas

- Oscola Clayton M. Sylestine, Principal Chief
- Bryant J. Celestine, THPO

Caddo Nation

- Brenda G. Edwards, Tribal Chairperson
- Robert Cast, THPO

Chitimacha Tribe of Louisiana

- Lonnie Martin Jr., Tribal Chairman
- Kimberly Walden, Cultural Resources Director & NAGPR Representative

Choctaw Nation of Oklahoma

- Gregory E. Pyle, Chief
- Terry Cole, THPO

Coushatta Tribe of Louisiana

- Kevin Sickey, Tribal Chairman
- Bertney Langley, Heritage Center Director
- Linda Langley, Heritage Center Director

Jena Band of Choctaw Indians

- Christine Norris, Principal Chief
- Michael Tarpley, THPO

Mississippi Band of Choctaw Indians

- Beasley Densen, Miko
- Ken Carleton, THPO & NAGPR Representative

Quapaw Tribe of Oklahoma

- John Berrey, Chairman
- Carrie V. Wilson, THPO

Seminole Nation of Oklahoma

- Enoch Kelly Haney, Principal Chief
- Natalie Deere, THPO

Seminole Tribe of Florida

- Mitchell Cypress, Chairman
- Willard S. Steele, THPO
- Dawn Hutchings, Compliance Review Supervisor

Tunica-Biloxi Tribe of Louisiana

- Earl Barbry Sr., Tribal Chairman
- Earl Barbry Jr., THPO & NAGPRA Representative

United States Department of the Interior

NATIONAL PARK SERVICE
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

IN REPLY REFER TO:

H4217 (JELA)

October 2, 2009

Address

Dear Tribal Representative:

Federal regulations for the implementation of Section 106 of the National Historic Preservation Act of 1966, as amended, require consultation with federally recognized American Indian tribes (36 CFR 800.2) on a government-to-government basis, as specified in Executive Order 13175. The administration of Jean Lafitte National Historical Park and Preserve is committed to honoring in full good faith its obligations and responsibilities toward the sovereign, federally recognized Indian tribes under all United States laws, regulations, and policies. As part of my responsibility to "make a reasonable and good faith effort to identify Indian tribes…that shall be consulted in the 106 process," I am writing to inquire if the TRIBE desires to consult with the park regarding the proposed project. A brief description of the proposal follows this paragraph, and I have enclosed a map of the area potentially affected. An initial public scoping notice regarding the proposed project was sent to you on September 30, 2009.

The project under consideration would reclaim more than 20 miles of canals in the Barataria Preserve, a unit of Jean Lafitte National Historical Park and Preserve located just south of the greater New Orleans metropolitan area. The proposed project would restore functions, resources, and values related to hydrology in the park that are affected by non-historic canals and spoilbanks, and increase the resiliency of park ecosystems to subsidence, sea level rise, and storm events. Potential alternatives include the reclamation of canals by degrading their spoilbanks and dikes built by developers to the level of the surrounding wetlands, partially filling the open water with this material. This is a restoration technique that has been widely used in wetland habitats in southeast Louisiana, and has previously been used successfully in the Barataria Preserve.

The park's legislative mandate, general management plan, and resource management plan direct that the Preserve is to be managed to preserve natural resources and values. The legislation creating the park specifically instructs that the freshwater drainage patterns, vegetative cover, integrity of ecological and biological systems, and water quality be preserved and protected within the Barataria Preserve (16 U.S.C §230a(c)). Canals impede natural functions and

undermine the ability of the park to preserve and protect those values.

The Barataria Preserve Unit of Jean Lafitte National Historical Park and Preserve contains the Barataria Unit Historic District and a number of prehistoric and historic sites and historic structures. The canals proposed for backfilling are in areas without adjacent sites, with one exception: 16-JE-56, a shell midden associated with the Baytown and Mississippian Cultural Periods. We propose, therefore, to leave the spoilbank intact near 16-JE-56 and to refrain from backfilling the canal in that vicinity. No other known sites within the project area have the potential to be impacted by the project.

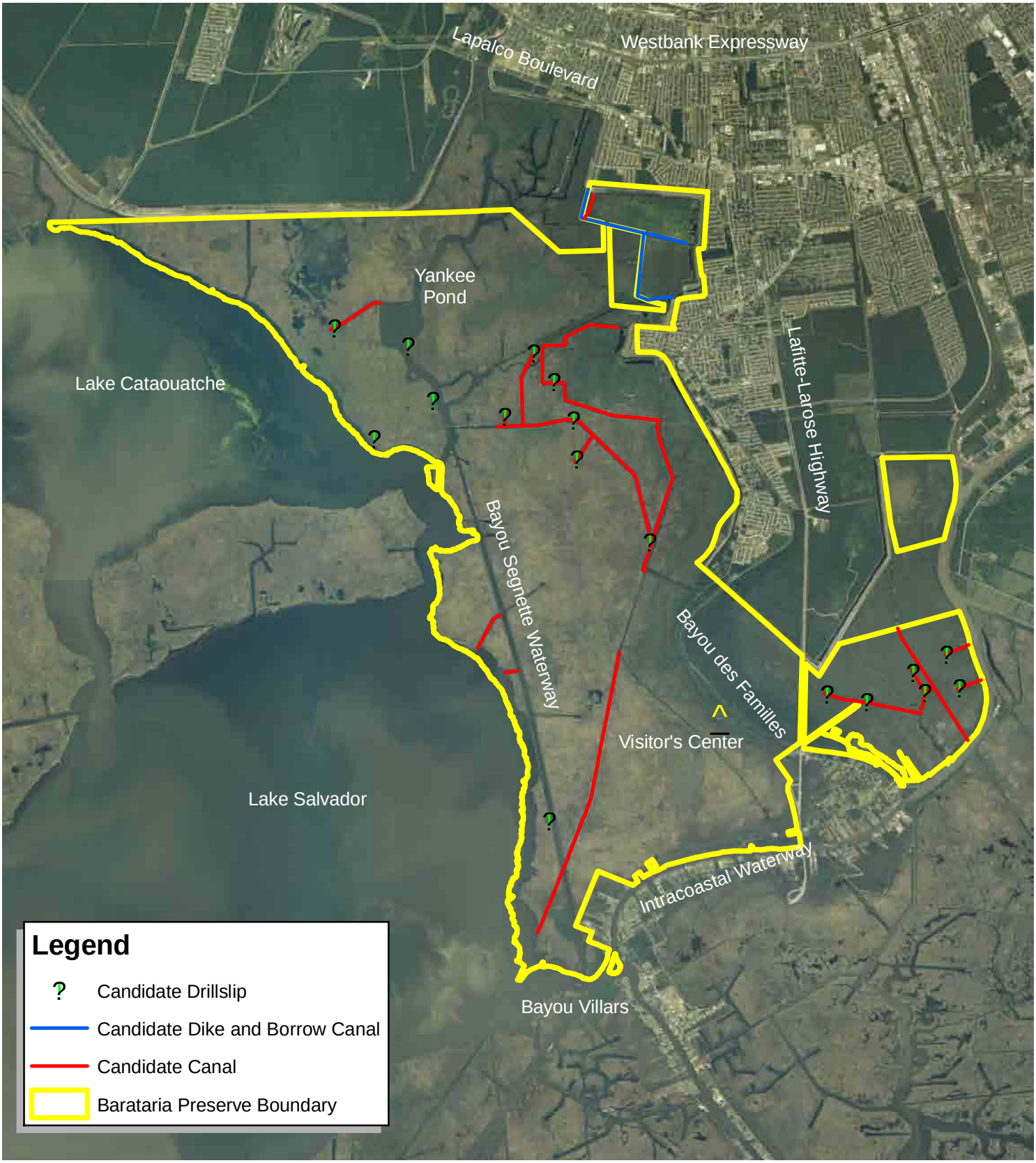
If you wish to consult with us regarding the project as provided for under the regulations for the National Historic Preservation Act, please write to me at the letterhead address, or contact me by phone at 504 589-3882 x111 or e-mail at jela_superintendent@nps.gov, so that we may arrange mutually agreeable time(s) and location(s) for consultation. We are looking forward to your reply.

Sincerely,

Carol A. Clark
Acting Superintendent

Enclosure

Canal Reclamation at Barataria Preserve



0 0.5 1 2 3 4 Miles

Note: Basemap is 2008 true color DOQQ aerial imagery from the USGS National Wetlands Research Center and the CWPPRA Task Force.

Produced 10/01/2009

FILE: BARA_CanalRestoScopeBmap.mxd

rec'd. 10/23/09

ALABAMA-COUSHATTA TRIBE OF TEXAS

571 State Park Rd 56 • Livingston, Texas 77351 • (936) 563-1100

October 20, 2009

Carol A. Clark
Jean Lafitte National Historical Park
& Preserve
419 Decatur Street
New Orleans, Louisiana 70130

Dear Ms. Clark:

On behalf of Chief Oscola Clayton Sylestine and the Alabama-Coushatta Tribe, our appreciation is expressed on your efforts to consult us regarding the Barataria Preserve Canal Reclamation proposal.

Our Tribe maintains ancestral associations within the state of Louisiana despite the absence of written records to completely identify Tribal activities, villages, trails, or burial sites. However, it is our objective to ensure significances of Native American ancestry, especially of the Alabama-Coushatta Tribe, are administered with the utmost considerations.

Upon review of your October 2, 2009 submission, no known impacts to religious, cultural, or historical assets of the Alabama-Coushatta Tribe of Texas should occur in conjunction with this proposal. However, in the event of inadvertent discovery of human remains and/or archaeological artifacts, activity in proximity to the location must cease and appropriate authorities, including this office, notified without delay.

Should you require additional assistance, please do not hesitate to contact us.

Respectfully submitted,

Bryant J. Celestine
Historic Preservation Officer

Choctaw Nation of Oklahoma

P.O. Box 1210 • Durant, OK 74702-1210 • (580) 924-8280

Gregory E. Pyle
Chief

Gary Batton
Assistant Chief

rec 11/17/09

November 9, 2009

ack 11/16/09

Carol A. Cook
US Dept of the Interior
National Park Service
Jean Lafitte National Historical Park & Preserve
419 Decatur Street
New Orleans, Louisiana 70130

Dear Carol Cook:

We have reviewed the following proposed project (s) as to its effect regarding religious and/or cultural significance to historic properties that may be affected by an undertaking of the projects area of potential effect.

Project Description: Canal Reclamation at Barataria Preserve

Comments: After review of the above-mentioned project(s), to the best of our knowledge, it will have no adverse effect on any historic properties in the project's area of potential effect. However, should construction activities exposed human remains, buried archaeological materials such as chipped stone, tools, pottery, bone, glass or metal items, or should it uncover evidence of buried historic building materials such as rock foundations, brick, or hand-poured concrete, this office should be contacted immediately at 1-800-522-6170 ext. 2137.

Sincerely,

Terry D. Cole
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma

By: Caren Johnson

Caren Johnson
Administrative Assistant
Choctaw Nation of Oklahoma

CAJ:vr

As the nation's principal conservation agency, the Department of the Interior has the responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historic places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. Administration.

NPS 645/100734 December 2009

United States Department of the Interior ✧ National Park Service