



Draft General Management Plan / Environmental Impact Statement



DRAFT
General Management Plan / Environmental Impact Statement
Big Thicket National Preserve
Hardin, Jasper, Jefferson, Liberty, Orange, Polk, and Tyler Counties, Texas

Big Thicket National Preserve was authorized by Congress on October 11, 1974. The last comprehensive management plan for Big Thicket National Preserve was completed in 1980. Much has changed since then, including the addition of 22% more land. As a result, visitor use and resource management needs have changed. These changes have implications for how visitors access and use Big Thicket National Preserve, how resources are managed, and how the National Park Service manages its operations. Consequently, a new general management plan is needed.

The *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement* (general management plan) has been prepared by the National Park Service in consultation with associated tribes, federal and state agencies, state and local governments, and the general public. Big Thicket National Preserve is in Hardin, Jasper, Jefferson, Liberty, Orange, Polk and Tyler counties in southeast Texas.

The plan provides background on the preserve's legislation, its purpose, the significance of its resources, special mandates and administrative commitments, and servicewide laws and policies. Further, the plan details the planning opportunities and issues that were raised during public scoping meetings and initial planning team efforts. The plan also describes alternatives for managing the preserve including the continuation of current management practices and trends in the preserve (alternative 1). Three action alternatives for managing the preserve are presented: (1) the preferred alternative (alternative 2), which uses partnerships and collaboration to support a broad ecosystem approach for preserve management; (2) alternative 3, which emphasizes natural resource preservation and research while providing self-reliant recreational opportunities; and (3) alternative 4, which seeks to increase the relevancy of the preserve and the National Park Service to the people in the communities of southeast Texas and to visitors from all over the world. The areas and resources that would be affected by implementing the actions contained in the alternatives are also described. The impacts of the various alternatives to cultural resources, natural resources, visitor use and experience, socioeconomic environment, and preserve operations and facilities are also included in the plan.

More information about this general management plan can be provided by contacting headquarters at

Big Thicket National Preserve Headquarters
Doug Neighbor, Superintendent
6044 FM 420
Kountze, TX 77625

This general management plan for Big Thicket National Preserve will be released to the public for a 60-day comment period.

HOW TO COMMENT ON THIS GENERAL MANAGEMENT PLAN

Comments on the general management plan are welcome and will be accepted during the 60-day public review and comment period. During the comment period, comments may be submitted using one of the methods noted below.

Online:

<http://parkplanning.nps.gov/bithdraftgmp.htm>

We prefer that readers submit comments online through the park planning website identified above so the comments become incorporated into the National Park Service planning, environment, and public comment system (PEPC). An electronic public comment form is provided through this website.

Mail:

Big Thicket National Preserve General
Management Plan
National Park Service
Denver Service Center – P, Erin Flanagan
PO Box 25287
Denver, CO 80225

Hand Delivery:

May be made at preserve headquarters or at public meetings, which are announced in the media following the release of this general management plan. Headquarters is located at

National Park Service
Big Thicket National Preserve Headquarters
6044 FM 420
Kountze, TX 77625

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. Although 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.

SUMMARY

This general management plan describes the general path the National Park Service (NPS) intends to follow in managing Big Thicket National Preserve for the next 15–20 years. More specifically, the *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement* is intended to

- confirm the purpose and significance of Big Thicket National Preserve
- clearly define resource conditions and visitor uses and experiences to be achieved in Big Thicket National Preserve
- provide a framework for preserve managers to use when making decisions about how to best protect preserve resources, how to provide quality visitor experiences, how to manage visitor use, and what types of facilities, if any, to develop in or near Big Thicket National Preserve

The general management plan does not describe how particular programs or projects should be prioritized or implemented. Those decisions will be addressed in future more detailed planning efforts. All future plans will tier from the approved general management plan.

This *General Management Plan / Environmental Impact Statement* examines four alternatives for managing Big Thicket National Preserve. In all of the alternatives, NPS managers would continue to strive to protect and maintain natural and cultural resource conditions. Natural and cultural resource management would concentrate on long-term monitoring, research, restoration, and mitigation where appropriate. Interpretation and education programs would continue to provide a variety of personal and nonpersonal services.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Under this alternative, the current management approach for the preserve would continue into the future. The management direction would be in accordance with the 1980 general management plan (GMP), previous NPS practices and approved actions, and all applicable laws, regulations, and policies. Lands acquired after the 1980 general management plan (including the Big Sandy Creek corridor unit, Village Creek corridor unit, and Canyonlands unit) would be managed in a manner compatible with existing units. New or expanded uses would not be anticipated.

Impacts to soils, water quality, vegetation, and wetlands would be negligible to minor and adverse over the long term. Fish and wildlife and endangered and threatened species and species of concern would experience a negligible, long-term adverse impact. These impacts to natural resources would be due to visitor use and some minimal facility development. Impacts to archeological resources in this alternative would be negligible to minor, long-term, adverse, and localized. Negligible to minor, long-term, and adverse and beneficial impacts would occur to historic structures, sites, and cultural landscapes. Ethnographic resources would experience negligible to minor, long-term, adverse, and beneficial impacts. These impacts to cultural resources would occur from ongoing visitor use, routine preserve operations, preservation undertakings, and other factors. Negligible to minor, long-term, and adverse impacts would occur to visitor opportunities and interpretation and education. Impacts to socioeconomics would be minor to moderate, long term, and beneficial. Minor to

moderate, localized, long-term, adverse, and beneficial impacts would occur to operations and facilities.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Alternative 2 would emphasize a broad ecosystem perspective for protection of the historic “Big Thicket.” This alternative recognizes the challenges associated with management of cross-boundary resource issues and recognizes the importance of encouraging partnerships to address and resolve resource problems. From this perspective, the National Park Service would proactively engage in regional planning and policy efforts for the benefit of resource protection, compatible visitor use, and other issues both within and outside the preserve boundaries. Elements of this alternative would support the resilience of the preserve with regard to expected impacts from climate change, such as saltwater intrusion in freshwater environments, advancing shorelines interfering with preserve ecosystems, changes in composition in flora and fauna, and more intense storm surges and flooding threats to cultural resources, all of which may affect cultural and natural resources, as well as visitor experience at Big Thicket National Preserve.

The National Park Service would emphasize the preserve’s status as a globally important biological protection area. Initiatives that advance the long-term protection of the preserve’s natural resources would receive the primary focus of management attention and funding. The preserve’s important cultural resources would continue to be protected and preserved as required by law. Appropriate visitor uses and experiences would also be improved and expanded. As a means to achieve these objectives, the preserve staff would expand and encourage new partnership agreements with outside public and private organizations having similar overall objectives for resource protection, law enforcement, public education and interpretation, and other

operational requirements. preserve operations would incorporate strong environmental protection and sustainable development practices.

Impacts to soils under this alternative would be minor to moderate, long-term, and adverse. Water quality, vegetation, and endangered and threatened species and species of concern would experience minor, long-term, and adverse impacts. Impacts to wetlands and fish and wildlife would be negligible to minor, long-term, and adverse under this alternative. These impacts to natural resources would be due to visitor use and some minimal facility development. Impacts to archeological and ethnographic resources in this alternative would be minor, long-term, adverse, and localized. Historic structures, sites, and cultural landscapes would experience minor, long-term, adverse impacts as well as minor to moderate, long-term, beneficial impacts. These impacts to cultural resources would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors. Visitor opportunities would experience negligible to minor, adverse, long-term impacts, while interpretation and education would see minor to moderate, long-term, beneficial impacts. Impacts to socioeconomics would be minor to moderate, long-term, and beneficial. Minor to moderate, localized, long-term, adverse, and beneficial impacts would occur to operations and facilities.

Alternative 3: Leadership in Biodiversity and Sustainability

Alternative 3 would emphasize natural resource preservation and research while providing self-reliant recreational opportunities. This alternative would provide the highest emphasis on protection, restoration, and maintenance of native biodiversity in the preserve. Restoration and active management would restore native vegetation communities, species assemblages, and ecological functions. The National Park Service would engage communities in

neighborhood partnership programs and citizen science activities with the goals of increasing volunteerism and developing local stakeholder interest in the preserve and its natural resources. Preserve operations would feature strong environmental protection and sustainable development and practices. In addition, the National Park Service would increase patrols and improve signage to increase the visibility of preserve-managed lands and waters to the public.

Impacts to soils in this alternative would be minor to moderate and adverse over the long term. Water quality would experience moderate, long-term, and beneficial impacts. Vegetation and wetlands would both experience negligible to minor and adverse impacts over the long term. Beneficial, negligible to minor, and long-term impacts would occur to endangered and threatened species and species of concern. These impacts to natural resources would be due to visitor use and some minimal facility development. Archeological and ethnographic resources would experience minor, long-term, adverse, and beneficial impacts; historic structures, sites, and cultural landscapes would experience minor, long-term adverse and minor to moderate, long-term beneficial impacts. These impacts to cultural resources would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors. Negligible to minor, long-term, and adverse impacts would occur to visitor opportunities; minor to moderate, long-term and beneficial impacts would occur to interpretation and education. Impacts to socioeconomics would be minor to moderate, long term, and beneficial. Minor to moderate, localized, long-term, adverse, and beneficial impacts would occur to operations and facilities.

Alternative 4: Connecting People to the Preserve

The purpose of this alternative is to increase the relevancy of Big Thicket National Preserve and the National Park Service to the

people in the communities of southeast Texas and to visitors from all over the world.

Nature, history, and recreational opportunities would encourage people to connect to and support the preserve's mission. In this alternative, management would emphasize personal connections to the preserve through family and cultural history, recreational opportunities, and personal experiences. Opportunities to visit the preserve using technology would be considered. This alternative recognizes that the cultural history of the preserve is also a history of the surrounding communities and the region. This history includes the history of the tribes, early settlers through today's inhabitants. Visitors would continue to have the opportunity to enjoy a range of recreational activities consistent with the purpose of the preserve. There would be improved access in some areas (e.g., Lance Rosier and Canyonlands units) as well as enhanced recreational and interpretive opportunities. Resource management efforts would support and maintain the biodiversity of the preserve, appropriate visitor experiences, as well as a landscape that reflects the historic native ecosystems. Preserve operations would feature strong environmental protection and sustainable development and practices.

Impacts to soils and water quality in this alternative would be minor to moderate and adverse over the long term. Vegetation would experience minor and adverse impacts over the long term. Adverse, negligible to minor, and long-term impacts would occur to both wetlands and fish and wildlife; endangered and threatened species and species of concern would experience negligible and adverse long-term impacts. These impacts to natural resources would be due to visitor use and some minimal facility development. Archeological and ethnographic resources would experience minor, long-term, adverse, and beneficial impacts; historic structures, sites, and cultural landscapes would experience minor, long-term adverse and minor to moderate, long-term beneficial impacts. These impacts to cultural resources

would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors.

Negligible to minor, long-term, and adverse impacts would occur to visitor opportunities; minor to moderate, long-term, and beneficial impacts would occur to interpretation and education. Impacts to socioeconomics would be minor to moderate, long-term, and beneficial. Minor to moderate, localized, long-term, adverse, and beneficial impacts would occur to operations and facilities.

Summary of Public Scoping Comments

During the official public scoping comment period for the general management plan, 384 total comments were received. These comments focused on a number of topics. These topics included

- Values—Respondents stated that they value biodiversity, natural resources, and wildlife as well as scenery, quiet, and solitude. Other respondents value recreation activities and opportunities allowed within the preserve.
- Issues and Concerns—The issues and concerns shared by the respondents included incompatible uses or development on adjacent lands, urban sprawl, and encroachment as well as impacts of oil and gas and logging activities on preserve resources. Trash, litter, and vandalism were other issues to be addressed as well as poaching and the presence of houseboats.
- Recreation and Visitor Experience—There was overwhelming support for the development of more hiking and/or canoe trails. Other recreation activities commented on included on- or off-road biking, camping, recreational vehicle (RV) camping, horseback riding, GPS-based recreation activities, the use of motorboats and all-terrain vehicles (ATVs), and ecotourism.
- Boundary—While some comments did not support land acquisition or boundary expansion, the vast majority of comments were in support in order to decrease fragmentation or increase connectivity and to provide buffering. Some respondents also supported the use of conservation easements.
- Facilities—Comments concerning facilities addressed the desire for improved boat ramps, signage, parking areas, restrooms, picnic areas, and campgrounds as well as the desire for the preserve to provide alternative transportation.
- Natural Resources—Respondents stated that they support keeping the preserve as natural as possible and advocated the need for more natural resources improvement programs as well as the designation of wilderness of the Neches River as a wild and scenic river.
- Interpretation and Education—Comments focused on the desire to have more access to interpretative handouts, as well as more interpretive and educational opportunities, including educational outreach to surrounding communities.

Next Steps and Implementation of the General Management Plan

After the distribution of the *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement*, there will be a 60-day public review and comment period. After this comment period, the NPS planning team will evaluate comments from other federal agencies, state and local governments, tribes, organizations, businesses, and individuals regarding the plan. Following the review of public comments, substantive issues or new alternatives to be considered that are not

covered adequately in the plan would be incorporated in the *Big Thicket National Preserve Final General Management Plan / Environmental Impact Statement*, and following comment on this document the record of decision (ROD) would be prepared.

Once the planning process is completed, the selected alternative would become the new management plan for the preserve and would be implemented over 15–20 years. Not all of the actions in the alternative would necessarily be implemented immediately.

The implementation of the approved plan, no matter which alternative is selected, will depend on future NPS funding levels and servicewide priorities, and on partnership funds, time, and, effort. The approval of a general management plan does not guarantee that funding and staffing needed to implement the plan will be forthcoming. Full implementation of the plan could be many years in the future.

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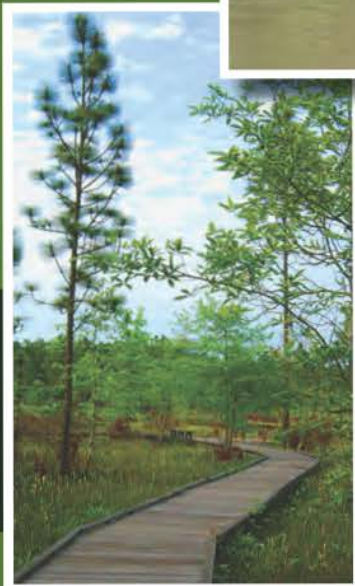
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Chapter 1 INTRODUCTION



INTRODUCTION

The purpose of a general management plan is to articulate a management philosophy and establish a framework for long-term decision making. A general management plan is a programmatic document and is expected to provide management guidance for 15–20 years. However, changes in the preserve could necessitate the preparation of a GMP amendment or the preparation of a new general management plan sooner.

This general management plan has been prepared in conjunction with an environmental impact statement (EIS). The document is organized in accordance with the Council on Environmental Quality’s implementing regulations for the National Environmental Policy Act (NEPA), NPS “Park Planning Program Standards,” and NPS Director’s Order 12: (DO) and Handbook: *Conservation Planning, Environmental Analysis, and Decision-making*.

The general management plan includes four alternatives: a continuation of current management (no-action alternative [alternative 1]) and three action alternatives (alternatives 2, 3, and 4). Alternative 2 is the NPS preferred alternative. In accordance with regulations and policies, the potential environmental impacts of all alternatives have been identified and discussed in this general management plan.

This general management plan is organized as follows:

CHAPTER 1: INTRODUCTION

The chapter sets the framework for the entire document. It describes why the general management plan is being prepared and what needs it must address. It gives guidance for the management alternatives that are being considered—guidance that is based on the

preserve’s legislation, its purpose, the significance of its resources, special mandates and administrative commitments, and servicewide laws and policies.

The chapter also details the GMP planning opportunities and issues that were raised during public scoping meetings and initial planning team efforts; the alternatives in chapter 2 address these issues and concerns. In addition, chapter 1 defines the scope of the environmental impact analysis—specifically what impact topics were or were not analyzed in detail. The chapter concludes with a description of next steps in the GMP planning process and caveats on implementation of the general management plan.

CHAPTER 2: ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE

The chapter begins by describing the development of the alternatives and identifies the management zones that would be used to manage the preserve in the future. It includes the description of the four alternatives: the continuation of current management practices and trends in the preserve (alternative 1), the preferred alternative (alternative 2), alternative 3, and alternative 4. Mitigative measures proposed to minimize or eliminate the impacts of some proposed actions in the alternatives are described, followed by a discussion of future studies or implementation plans that would be needed. The environmentally preferable alternative and the NPS preferred alternative are identified next, followed by a discussion of alternatives or actions that were considered but dismissed from detailed evaluation. Also discussed in the chapter are potential boundary adjustments and user capacity. The chapter concludes with summary tables of

the alternatives and the environmental consequences of implementing those alternatives.

CHAPTER 3: THE AFFECTED ENVIRONMENT

The chapter describes those areas and resources that would be affected by implementing the actions contained in the alternatives. It is organized according to the following topics: cultural resources, natural resources, visitor use and experience, socioeconomic environment, and preserve operations and facilities.

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

The chapter describes the methods used for assessing impacts. Further it analyzes the

effects of implementing the alternatives on the impact topics described in the “Affected Environment” chapter.

CHAPTER 5: CONSULTATION AND COORDINATION

The chapter describes the history of public and agency coordination during the GMP planning effort, including Native American consultation, and any future compliance requirements. It also lists agencies and organizations that will be receiving copies of the document.

APPENDIXES, SELECTED REFERENCES, AND PREPARERS AND CONSULTANTS

The appendixes, selected references, and preparers and consultants are found at the end of the document.

BRIEF DESCRIPTION OF THE PRESERVE

Big Thicket National Preserve (see figure 1) is in southeast Texas just north of Beaumont and 75 miles northeast of Houston. The preserve consists of nine land units and six water corridors encompassing more than 108,208 acres scattered across a 3,500-square-mile area. The Big Thicket, often referred to as a “biological crossroads,” is a transition zone between four distinct vegetation types—the moist eastern hardwood forest, the southwestern desert, the southeastern swamp, and the central prairie. Species from all of these different vegetation types come together in the thicket, exhibiting a variety of vegetation and wildlife that has received national interest.

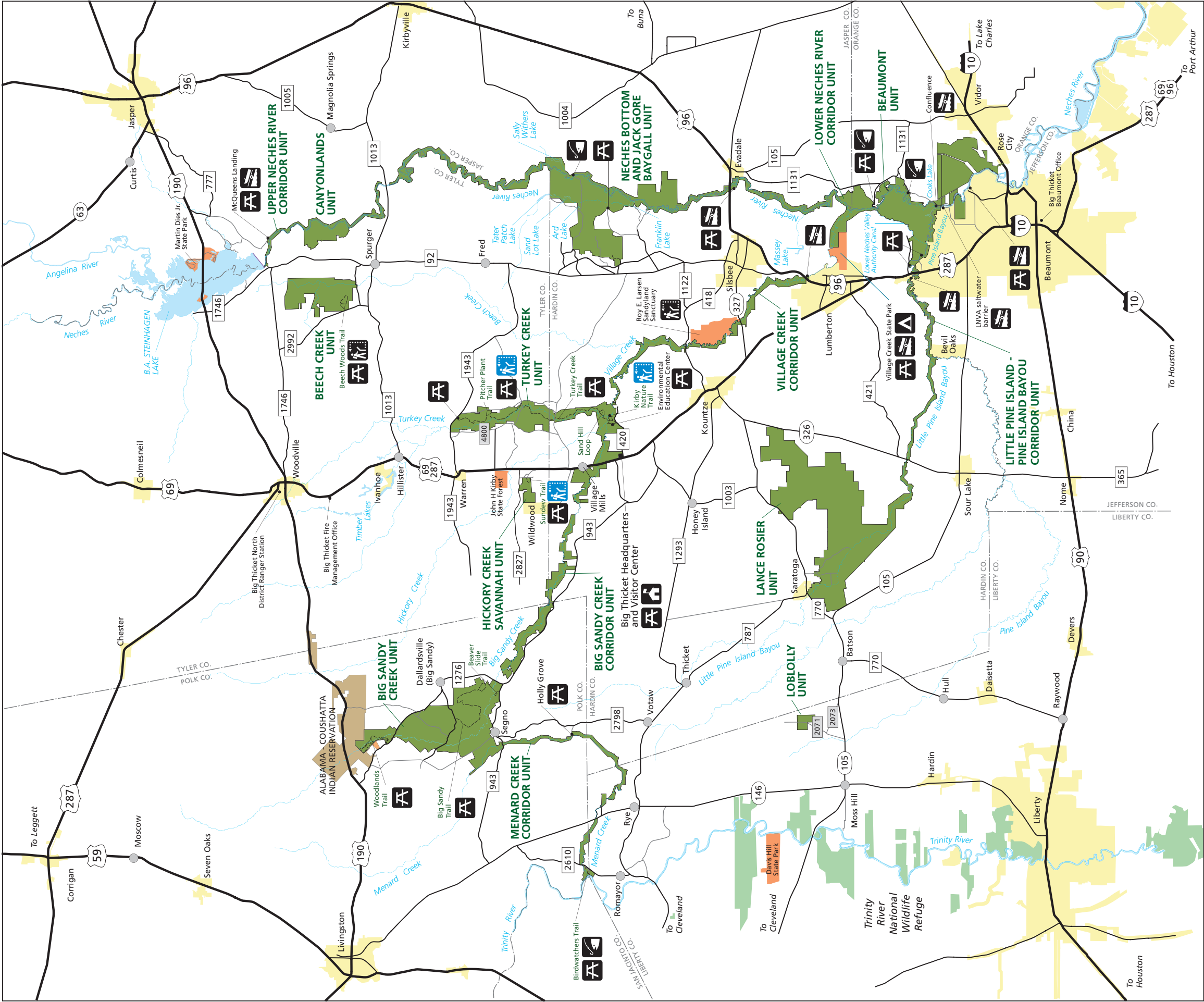
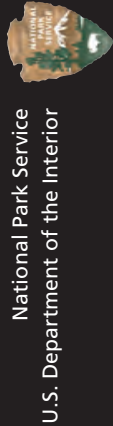
The ecological area represented by the preserve once covered over 3 million acres of southeast Texas and contained large quantities of natural resources such as gas, oil, and timber. Since the late 1800s, widespread logging and oil production has reduced the original area to approximately 300,000 acres, little of which remains in a pristine state. In 1974 concern that the unique ecological values of the thicket would eventually be completely lost led to the designation of representative segments of the

thicket as the first national preserve in the national park system.

Historically, the area was wilderness until the early 1800s and 1890s when cattle ranching, timber industry, and railroads moved into the region. An oil well was drilled at Saratoga in 1866. This pioneer effort led to the east Texas oil boom, which developed between 1901 and 1903, when Spindle Top (Beaumont) and Hooks 7 (Saratoga) came into production. In the three decades after 1900, a wave of new settlers poured into the new oil boom towns in Hardin, Polk, and Tyler counties. Many sawmill communities also experienced renewed prosperity.

Today, forest products and petrochemical industries remain major contributors to the region’s economy. Some agriculture is increasing, creating a greater demand for agricultural land. Housing developments are pressing on the margins of the thicket and creating countless openings through its interior. However, the Big Thicket is also an area where visitors may choose to experience outdoor solitude as well as a variety of recreational opportunities.

Big Thicket National Preserve



Camping

Public boat launch

River access (no boat launching)

Ranger station

Picnic area and parking

Self-guiding trail

Wheelchair-accessible self-guiding trail

State road

Farm-market road

County road

Unpaved road

Trail

Big Thicket National Preserve

Other conservation areas (non NPS)

Trinity River National Wildlife Refuge

Alabama Coushatta Indian Reservation

Municipal boundary

North

0

5 Kilometers

0

5 Miles

OVERVIEW OF THE NPS PLANNING PROCESS

The National Parks and Recreation Act of 1978 (PL 95-625) and the Redwood Amendment of 1978 (PL 95-250 Sec. 101[6][b]) requires the preparation and timely revision of general management plans for each unit of the national park system. *NPS Management Policies 2006* call for each general management plan to “set forth a management concept for the park [and] establish a role for the unit within the context of regional trends and plans for conservation, recreation, transportation, economic development, and other regional issues.” Congress has also specifically directed the National Park Service, as part of the planning process, to address the following elements (16 *United States Code* (USC) 1a-7[b]):

General management plans for each unit shall include, but not be limited to

- measures for preservation of the area’s resources
- indications of types and general intensities of development (including visitor circulation and transportation patterns, systems, and modes) associated with public enjoyment and use of the area, including general locations, timing of implementation, and anticipated costs
- identification of an implementation commitment for visitor carrying capacities [now called user capacity] for all areas of the unit
- indications of potential modifications to the external boundaries of the unit, and the reasons therefore

The purpose of a general management plan is to ensure that a national park system unit (park unit) has a clearly defined direction for resource preservation and visitor use that best achieves the National Park Service’s mandate to preserve resources unimpaired

for the enjoyment of future generations. When creating a general management plan, the National Park Service considers the National Park Service Organic Act, the park’s foundation document, and relevant laws and policies (see appendix A). Overall, general management planning makes the National Park Service more effective, collaborative, and accountable by:

- Providing a balance between continuity and adaptability in decision making—this defines the desired conditions to be achieved and maintained in a park unit and provides a touchstone that allows NPS managers and staff to constantly adapt their actions to changing situations, while staying focused on what is most important about the park unit.
- Analyzing the park unit in relation to its surrounding ecosystem, cultural setting, and community—this helps NPS managers and staff understand how the park unit can interact with neighbors and others in ways that are ecologically, socially, and economically sustainable. Decisions made within such a larger context are more likely to be successful over time.
- Affording everyone who has a stake in decisions affecting a park unit an opportunity to be involved in the planning process and to understand the decisions that are made—park units are often the focus of intense public interest. Public involvement throughout the planning process provides focused opportunities for NPS managers and staff to interact with the public and learn about public concerns, expectations, and values. Public involvement also provides opportunities for NPS managers and

staff to share information about the park unit’s purpose and significance, as well as opportunities and constraints for the management of park unit lands.

The ultimate outcome of general management planning for park units is an agreement between the National Park Service, its partners, and the public on why each area is managed as part of the national park system, what resource conditions and visitor experiences should exist, and how those conditions can best be achieved and maintained over time.

REQUIREMENTS OF THE NATIONAL ENVIRONMENTAL POLICY ACT

This general management plan is subject to the requirements of the National Environmental Policy Act (NEPA) that require an assessment of the environmental impacts, both adverse and beneficial, of those actions proposed by the federal government before those actions are implemented. When there are actions that could have a significant impact on the natural or human environment, the agency is required to prepare an environmental impact statement.

The environmental impact statement for this general management plan has been prepared in accordance with the National Environmental Policy Act and implementing regulations, 40 *Code of Federal Regulations* (CFR) Parts 1500–1508, and DO 12 and *Handbook for Environmental Impact Analysis*.

PURPOSE OF THE GENERAL MANAGEMENT PLAN

The approved general management plan will be the basic document for managing Big Thicket National Preserve for the next 15–20 years. The purposes of this general management plan are as follows:

- Confirm the purpose, significance, and fundamental resources and values that help guide management of Big Thicket National Preserve.
- Clearly define resource conditions and visitor uses and experiences to be achieved in Big Thicket National Preserve.
- Provide a framework for park managers to use when making decisions about how to best protect park resources, how to provide quality visitor uses and experiences, how to manage visitor use, and what types of facilities, if any, to develop in or near Big Thicket National Preserve.

The planning process also ensures that this general management plan, which is to be used for decision making, has been developed in consultation with interested stakeholders and adopted by the NPS leadership after an adequate analysis of the benefits and adverse impacts and economic costs of alternative courses of action.

Legislation establishing the National Park Service as an agency and governing its management provides the fundamental direction for the administration of Big Thicket National Preserve (and other units and programs of the national park system). Management of the preserve must also conform with the enabling legislation that established Big Thicket National Preserve and to other federal laws, agency regulations, and policies. This general management plan proposes a set of actions that will help the preserve reach future management conditions that are consistent with this body of laws, regulations, and policies and the preserve’s enabling legislation, as described in “Appendix B: Relevant Laws and Policies.”

NEED FOR THE GENERAL MANAGEMENT PLAN

This general management plan is needed to update the management framework for the preserve. Several units have been added to Big Thicket National Preserve since the 1980 general management plan was approved. Since 1980, the preserve has increase in size by 23,658 acres to a total of 108,208 acres. In 1984, legislation enacted (PL 98-489) authorized the acquisition of approximately 15 acres at the intersection of US Highway 69 and State Farm to Market Road 420 for the purposes of a visitor contact and administrative site. In 1986, this land was acquired and the latter 13.1 acres were donated for the visitor contact and administrative site. In 1993, legislation enacted (PL 103-46) authorized minor revisions of the boundaries of the preserve, and added three additional units to the preserve. These units are the Village Creek corridor unit (≈4,793 acres), Big Sandy corridor unit (≈4,497 acres), and Canyonlands units (≈1,476 acres). Under the authorization of the 1993 legislation, lands immediately adjacent to the preserve boundary continue to be acquired through land donations. Because these parcels were added after the 1980 general management plan was approved, there is no management guidance relative to desired conditions for these areas.

These new units and boundary adjustment contain a variety of vegetative communities that expand the biological diversity for which the preserve was created. Also, the land and water in these units has limited visitor access. Currently, there are five units of the preserve without facilities (i.e., picnic tables, trails, or parking areas). Therefore, a new plan is needed to address management of these lands and the opportunities they present, as well as to address the new challenges facing the preserve not considered in the previous general management plan. Management direction is needed on how best to conserve cultural and natural resources and how to address evolving and expanding

opportunities for interpretation and visitor experience, partnerships, and commercial visitor services.

ELEMENTS OF THE FOUNDATION DOCUMENT

The foundation document defines the legal and policy requirements that direct the park unit's basic management responsibilities, and describes the resources and values that are fundamental to achieving the unit's purpose. Although all units of the national park system must be managed in compliance with a large body of federal laws and policies, each park unit has its own specific purpose, established by Congress or the president, which provides the context for management.

The foundation document provides the base upon which all future planning efforts at the park unit are built, including this general management plan. The document identifies what is most important to the park unit through an examination of the unit's enabling legislation and the development of purpose and significance statements and primary interpretive themes; it also identifies any special mandates that affect management of the park unit. The foundation document also identifies fundamental resources and values that are critical to maintaining the unit's purpose and significance. The foundation document for Big Thicket National Preserve was developed with input from preserve staff and stakeholders. Copies of the enabling legislation and subsequent legislation can be found in appendix A.

The foundation document was instrumental in the development of this general management plan. An increased emphasis on government accountability and restrained federal spending make it imperative that preserve staff and stakeholders have a shared understanding of the preserve's foundation for planning and management purposes to ensure that goals related to the fundamental resources and values of the preserve are achieved.

Preserve Purpose

The purpose is a clear statement of why Congress established the Big Thicket National Preserve as a unit of the national park system.

Big Thicket National Preserve represents a portion of “the Big Thicket” in southeast Texas, which is known for its extensive biological diversity. The Big Thicket National Preserve is dedicated to preserving, conserving, protecting, and enhancing the integrity of the natural and ecological systems in the Big Thicket. The preserve offers both scientific and recreational values and provides for public enjoyment.

Preserve Significance

Statements of significance define what is most important about the preserve’s fundamental resources and values; they are based on the preserve’s purpose. There are five significance statements.

Extraordinary Combination of Habitats and Species and their Scientific Value.

- Big Thicket National Preserve, the first national preserve, was set aside for its biodiversity. The preserve contains remnants of the Big Thicket of Texas and its diverse units are representative of the larger biogeographic region. The preserve serves as a refuge for a combination of plants, animals, and natural communities that include elements from the four distinct vegetation types: the distinct southwestern desert, central plain, eastern forest, and southeastern swamp. The preserve is the only park unit with this combination of resources. The opportunities for scientific research at the preserve include the study of biodiversity and disturbance resulting from land uses and natural

phenomena (e.g., hurricanes and fires).

Flowing Water and Dependent Systems.

- Big Thicket National Preserve has an extensive, dynamic system of hydrologic processes and associated dependent systems important to maintain the diverse yet specific ecological makeup of the Big Thicket. These include contiguous riverine and wetland systems. The preserve provides examples of blackwater systems, which are not typically found outside of the Amazon Basin and southeastern United States, and of rare baygall wetlands that exemplify the original and seemingly impenetrable Big Thicket.

National and International Designations.

- Big Thicket National Preserve has received both national and international recognition. The preserve was designated an international biosphere reserve in 1981 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) to promote cooperation with neighboring communities, individuals, agencies, and institutions to “ensure the preservation of the biological diversity, provide for research, and promote the use of the Big Thicket National Preserve for environmental education, training, and solutions to common problems” (UNESCO 1991). The preserve was also designated a Globally Important Bird Area in 2001 by the American Bird Conservancy because it provides critical cover and forage to migrant neo-tropical birds using the Central and Mississippi flyways.

Visitor Experience.

- In a state where public lands are not widely available, Big Thicket National Preserve offers the visitor a wide array of recreational and educational opportunities in a natural setting within close proximity to large urban areas.

Cultural Resources.

- Big Thicket National Preserve has a rich cultural history spanning centuries and cultures – prehistoric to modern American Indians, Spanish explorers, and early settlers to today's modern users. Resources include remnants of historic land use activities and structures, traces of travel corridors, and archeological sites.

Fundamental Resources and Values

Fundamental resources and values. The most important resources, ideas, or concepts to be communicated to the public about the preserve. These resources and values warrant primary consideration during planning and management because they support and contribute to the preserve's significance and are critical to achieving the purpose for which the preserve was established. They could include systems, processes, features, stories, scenes, sounds, or scents. Without these resources and values, the preserve would not have national importance and could not accomplish the purpose for which it was established. In general, fundamental resources are tangible (e.g., a structure or a place) and fundamental values are intangible.

Resources Related to Visitor Experience (including scenic resources).

- Big Thicket National Preserve provides access to the natural world in a region with very little public land, a growing population, and a

sprawling development pattern. The public has an opportunity to make meaningful connections with the resources at the preserve through an array of traditional, educational, and recreational experiences that are compatible with the preservation of the natural setting and resources in the preserve.

Cultural Resources.

- Several archeological sites have been identified within the preserve providing evidence of prehistoric and historic American Indians use and occupation, and evidence of European American activities primarily from the latter half of the 19th and first half of the 20th centuries (e.g., homesteads, logging camps and mills, roads or trails, steamboat landings, and oil and gas production sites).
- The Big Thicket retains important cultural and ethnographic values, resources, and connections for traditionally associated peoples including the Alabama-Coushatta Tribe of Texas (e.g., the Coushatta Trace bisects the Big Sandy unit) and other groups such as the descendants of European American farmers and stock raisers who settled the area.
- Character-defining elements of the Big Thicket's diverse cultural landscape provide tangible evidence of the area's historical development: land use systems, circulation features and patterns (trails, wagon, and lumber roads; the Coushatta Trace; ferry routes), and vegetation patterns such as those of former farm sites and pine plantations.

Free Flowing Water and Dependent Systems.

- Water is one of the pervasive resources in the preserve. Most of the preserve units either contain or are directly adjacent to high-order, perennial streams. Six of the existing fifteen management units are river or stream corridor units. In addition to these major river and stream reaches, the preserve contains a wide variety of minor hydrologic features: floodplains, sloughs, oxbows, baygalls, acid bogs, and low-order tributary streams. The majority of the streams within the preserve are perennial, free-flowing, and nonchannelized watercourses. The preserve provides examples of blackwater systems and rare baygall wetlands.
- Fluvial features and processes (channel migration, erosion, and flooding) dominate the landscape at Big Thicket and substantially influence vegetation community structure and composition.
- The management units of the preserve lie within four watersheds, the lower reaches of the main stem of the Neches River, Big Sandy or Village Creek, and Pine Island Bayou. With the exception of the Menard Creek unit, following water from almost anywhere in the preserve will lead to the Neches River, from which organic material from the preserve is carried by the river into the marshes below Beaumont, nourishing shrimp larvae and mussels.
- At least 40% of the preserve is composed of wetlands.
- Riparian areas exist throughout the preserve and are ecologically important because they reduce floods, improve water quality, provide a vital groundwater recharge area, provide shade, and provide key

resources that support biological diversity.

- Floodplains account for roughly 50% of the preserve and are where most of the preserve's wetlands are located. The water corridor units and riparian corridors are in floodplains and consist primarily of floodplain forests.

Biodiversity.

- Big Thicket National Preserve was set aside for its biodiversity. The incorporation of diverse plant communities and habitats, including representative terrestrial units connected by linear aquatic corridors, was a central principle of the preserve's establishment, designed in the hopes of protecting the ecosystems, communities, and processes needed to support the native biological diversity of the region amidst a rapidly developing landscape.

Compositional Diversity.

- **Biome Level:** The Big Thicket region lies near the intersection of several major biomes that influence the plant and animal communities. Eastern hardwood forest, Gulf coastal plains, Midwest prairies, and southwest deserts contribute to assemblages and combinations of landforms, species, and climate that are uncommon elsewhere.
- **Community Level:** The preserve includes examples of rare and vulnerable natural communities such as arid sand hills, longleaf pine forests, beech-magnolia forests, wetland baygall shrub thickets, bald cypress-tupelo swamps, and other communities.

- **Species Level:** The preserve is species-rich, including 290 birds, 54 amphibians and reptiles, and 52 mammals that have been identified from incomplete surveys (Cooper et al. 2004). Diggs et al. (2006) estimated that there are 1,826 species of vascular plants in 174 families in the Big Thicket region—and that this is an underestimate. The “Thicket of Diversity” All Taxa Biological Inventory has begun to catalog species diversity in several taxonomic groups including terrestrial and aquatic invertebrates, fungi, and slime molds. Rare species include federal-endangered Texas trailing phlox, five reptile species, and several bird species.
- **Genetic Level:** Species that occur at the limits of their range may possess locally adaptive alleles that are beneficial for survival and growth in the ecological conditions that occur at these margins. Many eastern species of plants occur at the western and southern limits of their range in the Big Thicket region (MacRoberts and MacRoberts 2007), including American beech and swamp titi. Smaller numbers of western species find limits here too. Research into the processes of migration and gene flow (e.g., either “swamping” local adaptation or supplying the genetic variation necessary for adaptation) at environmental margins may provide insight into the rate of evolutionary response and adaption of species and populations to climate change.

Structural Diversity

- Spatial and temporal patterns (i.e., how biodiversity is distributed in space and time) are important elements of diversity. Diggs et al. (2006) notes that the close proximity of “radically different habitats and communities” is one of the most

striking features of the Big Thicket. Broad landscape-scale matrix communities embed smaller patches that have dominant species or other characters that contrast markedly with their surroundings. Disturbances such as hurricanes and fire, or local influences of soil, topography, and hydrology help to create and maintain this diversity. Soil texture gradients are a particularly important factor influencing the vegetation mosaic of the Big Thicket. For example, flat terrain and tight clay soils contribute to the formation of wetland pine savannas, which retard the growth of woody plants and foster carnivorous plant species that are absent from surrounding upland plant communities. Wetland pine savannas contain some of the richest plant diversity in the preserve.

Processes and Functional Diversity

- Fire, floods, and tropical storms are three major ecological drivers of Big Thicket that reveal their evidence in numerous ways, particularly in vegetative structure and composition and fluvial landforms. High productivity and growth and decay are also important functions that result from the long growing season, abundant and evenly distributed rainfall, and frost-free climatic conditions that prevail over the entire Big Thicket landscape. Other important ecosystem-level functions in the Big Thicket include river meanders, erosion, sediment transport and deposition, anthropogenic forces (land use changes, deforestation, hydrologic response changes, environmental releases and spills to air, water, and soil, sound, and light pollution), infestation and disease (e.g., southern pine beetle), and invasive species.

Scientific Value

- The preserve provides the largest protected area in the Big Thicket region for the scientific study of biodiversity. The preserve provides the largest protected area in the Big Thicket region for the scientific study of biodiversity. Scientific research at the preserve, including the “Thicket of Diversity” All Taxa Biological Inventory, holds great promise for the discovery of new species and within-species genetic diversity; improving the understanding of the role of biological corridors for the maintenance of populations and genetic diversity; and understanding the response, resilience, and recovery of plant and animal communities to natural and anthropogenic disturbances.

The Thicket

- The Big Thicket has long been a forbidding landscape, with dense jungle-like forests, bayous and swamps, and innumerable streams deterring attempts to settle it (Gunter 1971). The thicket remained largely impenetrable and unknown until widespread logging by railroads began in the 1880s.
- The diversity of the thicket has made it a challenge to define. Various interpretations and maps of the thicket have been offered by scientists since the 1930s and continue to spark debate and study.
- A reasonably concise definition of the thicket is “the biological boundary area at the southwestern extreme of the southeastern U.S., humid subtropical in climate, geologically and hydrologically complex, rich in species, and characterized by a loblolly pine-white oak-beech-magnolia forest with many associated

and often very distinct vegetation types” (Diggs et al. 2006).

- The exact boundaries of the thicket may always be imprecise but the Big Thicket is a rich and unique part of Texas and North American ecology that warrants long-term protection and preservation (Diggs et al. 2006).

Primary Interpretive Themes

Primary interpretive themes describe what needs to be interpreted to provide people with opportunities to understand and appreciate the purpose and significance of Big Thicket National Preserve.

- By preserving remnants of the unique Big Thicket of Texas, the preserve offers opportunities to better understand and appreciate the interdependence of ecological systems. The amazingly rich biological diversity of Big Thicket National Preserve includes rare and endangered species and habitats in an unusual assemblage of common animals and plants.
- Big Thicket National Preserve’s intimate landscape and its unique combination of distinct and diverse ecosystems prompts a slower-paced exploration of its many wonders and enables opportunities for peaceful reflection, recreation, and a personal sense of discovery.
- The relationships of people with Big Thicket National Preserve prompts us to consider how past, present, and future land-use decisions will continue to influence those relationships.

Special Mandates

Special mandates are legal requirements specific to a national park system unit. They must be incorporated into management decisions even though they may be in conflict

with a unit's legislated purpose. The following special mandates have been summarized. Full text of the relevant legislation is in "Appendix A: Legislation."

PUBLIC LAW 93-439 as amended

Sec. 1 (c), authorizes the Secretary to acquire lands that make a significant contribution to the preserve, even if the lands are located outside the preserve boundary.

Sec. 2 (a), authorizes the Secretary to acquire lands located within boundaries, excluding mineral estates, or easements for public utilities, pipelines, or railroads, unless the NPS determines that if the parcel is not acquired, the purposes and objectives of the preserve are threatened.

Sec. 4 (b), limits construction of roads, campgrounds, and facilities. Authorizes

the Secretary of the Interior to promulgate rules in respect to

1. motorized land and water vehicles;
2. exploration for, and extraction of, oil, gas, and other minerals;
3. new construction of any kind;
4. grazing and agriculture; and
5. such other uses as the Secretary of the Interior determines must be limited or controlled in order to carry out the purpose of this act.

Sec. 4 (c), allows hunting, fishing, and trapping within the preserve, excluding designation zones because of health and safety concerns and resource considerations. The NPS will consult with the appropriate State agency, as required.

NPS LEGAL AND POLICY REQUIREMENTS AND SERVICEWIDE LAWS AND POLICIES

This section (expanded in appendix A) discusses some of the most pertinent servicewide laws and policies related to planning and managing Big Thicket National Preserve that the preserve must comply with regardless of this GMP planning effort. The table in appendix D shows the desired conditions and strategies based on these laws and policies the preserve management must strive to meet. Regardless of which alternative is chosen to implement from this *General Management Plan / Environmental Impact Statement*, Big Thicket National Preserve must comply with all of these laws and policies. The alternatives in this general management plan address the desired future conditions that are not mandated by law and policy and must be determined through a planning process.

The National Park Service must comply with law and policy to protect environmental quality and resources, to preserve cultural resources, and to provide public services. Applicable law and policy related to resource management includes the Clean Water Act, the Endangered Species Act, the National Historic Preservation Act (NHPA), the Native American Graves Protection and Repatriation Act (NAGPRA), and Executive Order 11990, "Protection of Wetlands." Law and Policy related to public services and access includes the Americans with Disabilities Act (ADA) and the Architectural Barriers Act. A general management plan is not needed to decide that it is appropriate to protect endangered species, control nonnative species, protect archeological sites, conserve artifacts, or provide for ADA-compliant access. Laws and policies have already decided these and many other management related actions for the National Park Service. The National Park Service would work to meet these requirements with or without a new general management plan.

Some of these laws and executive orders are applicable solely or primarily to units of the national park system. These include the 1916 Organic Act that created the National Park Service, the General Authorities Act of 1970, the act of March 27, 1978, relating to the management of the national park system, and the National Parks Omnibus Management Act (1998). Other laws and executive orders have much broader application, such as the Endangered Species Act (ESA), the National Historic Preservation Act, and Executive Order 11990, which address protection of wetlands.

The NPS Organic Act (16 USC 1) provides the fundamental management direction for all units of the national park system:

[P]romote and regulate the use of the Federal areas known as national parks, monuments, and reservations. . . by such means and measure as conform to the fundamental purpose of said parks, monuments and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

The national park system General Authorities Act (16 USC 1a-1 et seq.) affirms that while all national park system units remain "distinct in character," they are "united through their inter-related purposes and resources into one national park system as cumulative expressions of a single national heritage." The act makes it clear that the NPS Organic Act and other protective mandates apply equally to all units of the system. Further, amendments state that NPS management of

park units should not “derogate[e]...the purposes and values for which these various areas have been established.”

The National Park Service also has established policies for all units under its stewardship. These are identified and explained in a guidance manual entitled *NPS Management Policies 2006*. The “action” alternatives (alternatives 2, 3, and 4) considered in this general management plan incorporate and comply with the provisions of these mandates and policies.

Public Law (PL) 95-625, the National Park and Recreation Act, requires the preparation

and timely revision of general management plans for each unit of the national park system. Section 604 outlines several requirements for general management plans, including measures for the protection of the area’s resources and “indications of potential modifications to the external boundaries of the unit and the reasons therefore.” *NPS Management Policies 2006* reaffirms this legislative directive.

To truly understand the implications of an alternative, it is important to combine the servicewide mandates and policies with the management actions described in an alternative.

SCOPE OF THE GENERAL MANAGEMENT PLAN

The general public, NPS staff, and representatives from organizations identified various issues and concerns during project scoping (early information gathering) for this general management plan. An issue is defined in this context as an opportunity, conflict, or problem regarding the use and management of public lands. During scoping, NPS staff provided an overview of the proposed project, including the purpose and need for the general management plan. Comments were solicited at public meetings, through two planning newsletters, and on the NPS planning website (see the “Consultation and Coordination” chapter).

Comments received during scoping demonstrated there are many things people like about Big Thicket National Preserve—its management, resources, and visitor opportunities. The issues and concerns expressed generally involve protecting preserve resources from vandals, controlling invasive plant species and other threats to the preserve, and providing for an enjoyable visitor experience. The general management plan alternatives provide strategies for addressing the issues within the context of the preserve’s purpose and significance while remaining compatible with desired resource conditions.

While this general management plan will provide guidance for Big Thicket National Preserve for the next 15–20 years, it will not

- describe how particular programs or projects will be implemented or prioritized—these decisions are deferred to detailed implementation planning
- provide specific details and answers to all the issues facing the preserve
- provide funding commitments for implementation of the plan

ISSUES AND OPPORTUNITIES TO BE ADDRESSED

Many aspects of the desired future conditions at Big Thicket National Preserve are defined in the enabling legislation, the preserve’s purpose and significance statements, and existing laws and policies. The resolution of questions or issues that have not already been addressed by the enabling legislation or laws and policies are the basis for developing different alternatives or approaches to managing the preserve. As with any decision-making process, there are key decisions that, once made, will dictate the direction of subsequent management strategies.

Based on internal and external comments received and information supported by research and management experience, the following management issues and opportunities were identified for Big Thicket National Preserve. The bullets following each issue reflect the goal to be addressed through proposed actions in the general management plan.

Resource Management

- How can the preserve be managed to minimize the impacts of habitat fragmentation?
- How can the National Park Service effectively work with partners, neighbors, agencies, tribes, and others to address changes outside its boundary that have the potential to impact preserve resources?
- What management practices would support protecting, maintaining, and improving water systems in the preserve?
- What management practices would support protecting, maintaining, and

restoring native biodiversity and ecosystem health in the preserve?

- How can the National Park Service best provide curatorial space and staff to appropriately store and manage archival records, historic photos, natural resource specimens, and other museum collection items?
- How can the National Park Service best protect cultural and natural resources from damage by inadvertent visitor use impacts, and from looting and other illegal activities?

Partnerships

- What are the priorities for carrying out comprehensive surveys and determinations of national register eligibility for historic structures, prehistoric and historic archeological sites, cultural landscapes, and ethnographic resources?
- What new or additional partnership opportunities are available to expand the National Park Service presence in the community, and to enhance education, interpretation, stewardship initiatives, and visitor experience?

Visitor Experience

- What opportunities are available for the National Park Service to strengthen its presence in outlying and gateway communities and to better inform visitors that they are within a unit of the national park system?
- What is the appropriate range of recreational activities in the preserve?

Operations and Facilities

- What level and type of access are appropriate to provide for enhanced

visitor experiences given the range of allowable activities?

- What infrastructure or facilities can be provided efficiently and sustainably to support access for appropriate activities in the preserve?
- What commercial visitor services are necessary and appropriate for the preserve?
- How can the National Park Service reduce incidences of illegal uses and activities (e.g., boundary encroachments by adjacent property owners, poaching, and dumping)?
- How can the National Park Service increase the effectiveness of enforcement operations related to the preserve?
- As part of this general management plan, are there lands identified that the National Park Service would want to recommend that Congress consider including in the preserve?

Commercial Visitor Services

Units of the national park system are special places, saved by the American people so that all may experience the country's natural and cultural heritage. The national parks movement of the mid-19th century was fueled by a determination to save beautiful and historic spots in America, in part to keep them from being "populated" with hotels, curio shops, and amusements.

Over commercialization and development can spoil the very character of the places visitors come to see. Yet, some kinds of commercial activities are appropriate and may be necessary in national park units. They help visitors enjoy natural and cultural wonders to which they might not otherwise have access. Often commercial providers help protect park resources, too.

All commercial activities that occur within lands administered by the National Park Service must be authorized by a permit,

contract, or other written agreement (36 CFR 5.3). Commercial activities may be authorized through a range of legal authorities using a variety of legal instruments, depending upon the type and location of the activity involved. The National Park Service must determine what types and levels of commercial activities are permissible under applicable laws and regulations. At a minimum, all commercial activities must operate in a manner that is consistent with the mission of the park and should provide high-quality visitor experiences while protecting important natural, cultural, and scenic resources. Other requirements may also apply. For example, the NPS Concessions Management Improvement Act of 1998 (1998 Concessions Act) limits the development of concession services to those that are necessary and appropriate for public use and enjoyment of the park unit and that are consistent to the highest practicable degree with the preservation and conservation of the resources and values of the unit. Necessary and appropriate commercial visitor services are described in the table below.

The NPS Organic Act of 1916 that established the National Park Service and the 1998 Concessions Act emphasize conservation and preservation of park resources, while allowing for their use and enjoyment by means that leave them unimpaired for future generations. The 1998 Concessions Act mandates the use of concession contracts for

authorizing any visitor services, except as may otherwise be authorized by law (such as through a commercial use authorization in limited circumstances). That act further places limitations on the types and kinds of public accommodations, facilities, and services that may be authorized by concession contracts. Such public accommodations, facilities, and services must be “necessary and appropriate for public use and enjoyment” of the unit in which located and must be “consistent to the highest practicable degree with the preservation and conservation of the resources and values of the unit” (16 USC 5951).

Depending on the analysis of commercial activities, different types of authorizations may be issued by the National Park Service. If an activity is found to be appropriate, but not necessary, then a commercial use authorization may be issued. If an activity is found to be necessary and appropriate, then a concession contract may be issued.

The NPS Organic Act, the purpose and significance of the preserve, and this general management plan together form the basis for determining commercial services that are necessary or appropriate for Big Thicket National Preserve. The criteria in table 1 would be used to evaluate the existing and potential future commercial activities at the preserve to determine if these activities are necessary or appropriate.

TABLE 1. COMMERCIAL SERVICES EVALUATION CRITERIA

Necessary	Appropriate
<p>A service that is necessary accomplishes one or more of the following:</p> <ol style="list-style-type: none"> 1. The service contributes to visitor understanding and appreciation of preserve purpose and significance. 2. The service enhances visitor experiences consistent with preserve area philosophies. 3. The service assists the preserve in managing visitor use and educating preserve visitors. 4. The service is an essential service or facility not available within a reasonable distance from the preserve. 	<p>A service that is appropriate accomplishes all of the following:</p> <ol style="list-style-type: none"> 1. The service is consistent with the purpose and significance of Big Thicket National Preserve. 2. The service is consistent with laws, regulations, and policies. 3. The service does not compromise public health and safety. 4. The service does not significantly impact or impair preserve resources or values. 5. The service does not unduly conflict with other preserve uses and activities. 6. The service does not exclude the general public from participating in limited recreational opportunities.

Based on the above criteria, the GMP planning team has identified the following types of commercial operations that could be considered necessary or appropriate at Big Thicket National Preserve:

- water-based tours (e.g., canoe and kayak tours)
- horseback riding tours
- hiking tours (e.g., bird-watching walks)
- education-based tours
- backpacking tours

Over the life of this general management plan, additional activities may be considered and will be evaluated on the necessary and appropriate criteria. Some activities are illegal within the preserve and therefore would not be considered either necessary or appropriate activities and so would not be eligible for any type of commercial visitor use agreement with the National Park Service. These activities include but need not be limited to the use of off-road vehicles (ORVs) or personal watercraft (PWC) in the preserve.

ISSUES AND OPPORTUNITIES NOT BEING ADDRESSED IN THIS GENERAL MANAGEMENT PLAN

Not all of the issues and concerns raised by the public are included in this general management plan; they may be part of the day-to-day management of the preserve, the suggested actions are against law or policy, or the suggested actions may be covered by existing law or policy (e.g., management of endangered species).

Some of the issues and concerns raised by the public and the reasons for excluding them are as follows:

- Some commenters expressed interest in the preserve acquiring additional land or conservation easements; others expressed opposition to this action. General management plans are required to address boundary adjustments and this general management plan discusses criteria for boundary adjustments as well as other mechanisms to manage land that meets the criteria but does not evaluate specific parcels for addition to the preserve.
- Some commenters expressed concern about vandalism and other illegal

activities in the preserve. The National Park Service is addressing and will continue to address illegal activities when they occur in the preserve. This general management plan includes programmatic actions that should also help to address these concerns. Specific actions related to preventing illegal activities are operational issues and are not addressed in the plan.

- Some commenters suggested that the preserve be converted to a national park. The preserve does not fit the criteria established for a national park. In particular there are activities included in the preserve that are not consistent with national park designation, such as oil and gas operations and hunting. As noted in the General Authorities Act of 1970 (16 USC 1a-1 et seq.), the NPS Organic Act and other protective requirements apply to all units of the system. Thus, although Big Thicket National Preserve does not have “national park” in its name, the same management requirements apply. It should also be noted that only Congress can designate national parks.

Climate Change

Climate change refers to any substantial changes in average climatic conditions (such as average temperature, precipitation, or wind) or climatic variability (such as seasonality or storm frequencies) lasting for an extended period of time (decades or longer). Recent reports by the U.S. Climate Change Science Program, National Academy of Sciences, and United Nations Intergovernmental Panel on Climate Change (IPCC 2007) provide clear evidence that climate change is occurring and will accelerate in the coming decades. The effects of climate change on national parks are beginning to emerge as climate change data are substantiated by scientific research and

evidentiary impacts; however, it is difficult to predict the full extent of the changes that are expected under an altered climate regime.

The National Park Service recognizes that the major drivers of climate change are outside the control of the agency. However, climate change is a phenomenon whose impacts throughout the national park system cannot be discounted. The National Park Service has identified climate change as one of the major threats to natural park units and has developed a *Climate Change Response Strategy* (NPS 2010d) that focuses on science, adaptation, mitigation, and communication. Some climate change impacts are already occurring or are expected in Big Thicket National Preserve in the time frame of this management plan. Therefore, climate change is included in this document to recognize its role in the changing environment of the preserve and to provide an understanding of its impact.

The general management plan recognizes that the management actions and facilities being proposed in all of the alternatives need to be adopted with future climate change in mind because past conditions are not necessarily useful guides for future planning. Per guidance issued by the Department of the Interior (USDI), the National Park Service, and the Council on Environmental Quality (CEQ), the GMP planning team has carried forward some discussion of the current state of knowledge as it relates to the resources that could be affected by the management alternatives described in this general management plan. This discussion is included in “Chapter 3: Affected Environment.”

IMPACT TOPICS (INCLUDING TOPICS CONSIDERED AND TOPICS DISMISSED)

Identification of Impact Topics

An important part of planning is seeking to understand the consequences of making one decision over another. To this end, this

general management plan is accompanied by an environmental impact statement. Environmental impact statements identify the anticipated impacts of possible actions on park unit resources and values and on park unit visitors and neighbors. Impacts are organized by topic, such as “impacts on the visitor experience” or “impacts on archeological resources.” Impact topics serve to focus the environmental analysis and to ensure the relevance of impact evaluation. The impact topics identified for this general management plan are outlined in this section; they were identified based on federal laws and other legal requirements, CEQ guidelines, NPS *Management Policies 2006*, staff subject-matter expertise, issues and concerns expressed by the public and other agencies early in the planning process, and the potential for that topic to be affected by the actions outlined in the alternatives. Also included is a discussion of some impact topics that are not addressed in this general management plan and why they are not addressed. “Chapter 4: Environmental Consequences” contains a more detailed description of each impact topic to be

affected by the actions described in the alternatives.

Impact Topics Retained and Dismissed

Impact topics are retained if there could be appreciable impacts from the actions of the alternatives considered. Dismissed impact topics may not be relevant to the development of the general management plan because either (a) implementing the alternatives would have no effect, negligible effect, or minor effect on the impact topic, or (b) the resource does not occur in that particular park unit. Table 2 identifies all of the impact topics considered for this general management plan or environmental impact statement and states whether they were retained or dismissed. The table is organized by theme (e.g., natural resources, cultural resources, visitor use and experience, socioeconomics, and preserve operations) and includes a brief rationale as to why the impact topic was retained or dismissed.

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Cultural Resources		
Archeological Resources	Retained	<p>Archeological sites representing thousands of years of prehistoric activity as well as sites associated with more recent historic use and settlement have been recorded in the preserve. Archeological resources can be adversely impacted by ground-disturbing construction and other management activities. Disturbance of archeological resources can also result from inadvertent visitor use (e.g., erosion from visitor trail traffic), looting, and other factors. NPS staff ensures that archeological surveys are undertaken in proposed project areas prior to construction and measures are implemented to avoid identified sites to the extent possible. Because actions proposed under the GMP alternatives could potentially impact archeological resources because of new construction, visitor use, etc., the topic of archeological resources was retained for analysis in this GMP / EIS.</p> <p>Relevant Law, Regulation, or Policy. Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended (16 USC 470); Advisory Council on Historic Preservation's implementing regulations regarding the "Protection of Historic Properties" (36 CFR 800); Archaeological Resources Protection Act of 1979; NPS Director's Order 28: <i>Cultural Resources Management Guideline</i>; <i>Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation</i>; <i>NPS Management Policies 2006</i>; National Environmental Policy Act; Director's Order 28A: <i>Archeology</i> (2004)</p>
Historic Buildings, Structures, and Cultural landscapes	Retained	<p>Historic buildings, structures, and cultural landscape features associated primarily with late 19th-century and early 20th-century homesteading, logging and milling activities, and oil and gas development exist in the preserve. Because identified properties meeting the criteria of eligibility for the National Register of Historic Places (NRHP) would be protected and preserved under approved treatments, and incorporated as appropriate into enhanced interpretive programs under the GMP alternatives, the topic of historic buildings, structures, and cultural landscapes was retained for analysis in this GMP / EIS.</p> <p>Relevant Law, Regulation, or Policy. Sections 106 and 110 of the National Historic Preservation Act; Advisory Council on Historic Preservation's implementing regulations regarding the "Protection of Historic Properties" (36 CFR 800); Director's Order 28: <i>Cultural Resources Management Guideline</i>; <i>Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties</i>; <i>Secretary of the Interior's Standards and Guidelines for the Treatment of Historic Properties (with Guidelines for the Treatment of Cultural Landscapes)</i>; <i>NPS Management Policies 2006</i>; National Environmental Policy Act</p>
Ethnographic Resources	Retained	<p>Although information on ethnographic resources at Big Thicket National Preserve is limited, the preserve's archeological resources are also likely to retain ethnographic importance for the Alabama-Coushatta Tribe of Texas, other culturally associated tribes, or other groups having cultural associations with the preserve. Therefore, ethnographic resources can be at potential risk of disturbance by construction and visitor use activities.</p> <p>The GMP alternatives include increased emphasis on preserving and interpreting the preserve's cultural heritage and history. Because the alternatives have the potential to affect or inadvertently disturb ethnographic</p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
		<p>resources, this impact topic was retained for analysis.</p> <p>Relevant Law, Regulation, or Policy. Sections 106 and 110 of the National Historic Preservation Act; Advisory Council on Historic Preservation's implementing regulations regarding the "Protection of Historic Properties" (36 CFR 800); Director's Order 28: <i>Cultural Resources Management Guideline</i>; Native American Graves Protection and Repatriation Act; Archaeological Resources Protection Act of 1979; NPS <i>Management Policies 2006</i>; National Environmental Policy Act; Executive Order 13007, "Indian Sacred Sites" (1996); American Indian Religious Freedom Act of 1978</p>
Museum Collections	Dismissed	<p>The preserve's museum collection consists of over 5,000 natural and cultural history objects and specimens. Cultural and archeological materials include prehistoric lithic and ceramic artifacts, historic photographs and documents. Among the natural history items are plant, mammal, insect, and mineral specimens. A recently discovered mammoth tusk remnant was added to the collection. Research records and field notes/reports of scientific collecting activities are also included. Additional biological and archival collection items are expected to be generated by investigations carried out under the NPS Inventory and Monitoring Program and the NPS systemwide All Taxa Biodiversity Inventory project.</p> <p>Although some of the collections are stored in a small secured space in the preserve's headquarters building, most items are stored off-site in university facilities because of the limited storage space at the preserve. Collections are distributed among several regional universities including Lamar University, Rice University, Stephen F. Austin State University, Sam Houston State University, Baylor University, Texas A&M University, Tulane University, and The University of Texas (NPS 2010b). In accordance with recommendations presented in the <i>Museum Collection Facilities Strategy</i> (NPS 2005) and the servicewide <i>Park Museum Collection Storage Plan</i> (NPS 2007), the preserve's archeological, archival, historical, and ethnological museum collections would eventually be relocated to a multipark facility at the Lyndon B. Johnson National Historical Park in Johnson City, Texas. The NPS Western Archeological and Conservation Center (WACC) in Tucson, Arizona could serve as an alternative facility, and Louisiana State University (Baton Rouge) is identified as a potential curatorial storage facility for natural history collections. This strategy was determined to best provide cost-effective, secure, and environmentally controlled storage conditions for the preserve and the other NPS units served by the multipark facility. The consolidation of collections from several outlying facilities would improve curatorial efficiencies and would provide adequate storage space to accommodate new acquisitions.</p> <p>The topic of museum collections has been dismissed from further analysis in this GMP/EIS because no changes in the management of the preserve's museum collections are presented in the GMP alternatives. Under all alternatives, museum collections would be acquired, accessioned and cataloged, preserved, protected, and made available for access and use according to NPS standards and guidelines. The details and timing of a possible relocation of the collections to a multipark facility are indefinite.</p> <p>Relevant Law, Regulation, or Policy. National Historic Preservation Act; NPS Director's Order 28: <i>Cultural Resources Management Guideline</i>; Native American Graves Protection and Repatriation Act; NPS <i>Management Policies 2006</i>; National Environmental Policy Act; Director's Order 24: <i>Standards for NPS Museum Collections</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
		<i>Management; NPS Museum Handbook</i>
Indian Trust Resources	Dismissed	<p>The federal Indian trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native tribes. Secretarial Order 3175 requires that any anticipated impacts to Indian trust resources from a proposed project or action by USDI agencies be explicitly addressed in environmental documents.</p> <p>There are no Indian trust resources at Big Thicket National Preserve. Therefore, this topic was dismissed from further analysis.</p> <p>Relevant Law, Regulation, or Policy. <i>NPS Management Policies 2006</i>; National Environmental Policy Act; Director's Order 72: <i>Receiving or Generating Individual Indian Trust Data</i></p>
Natural Resources		
Soils	Retained	<p>This impact topic has been retained because the Organic Act and <i>NPS Management Policies 2006</i> require the National Park Service to protect and conserve geologic resources, including soils that could be affected by visitors and managers. Big Thicket National Preserve's soils are a key resource; the soils help determine where native vegetative communities occur in the preserve, and they affect the areas' productivity, drainage patterns, and erosion. Soils also provide structural support to buildings and other facilities in the preserve. Soils generally take thousands of years to develop.</p> <p>Management actions described in the alternatives, include developments such as potential trail, road, and facilities, and also may result in increased visitor use. Retaining this impact topic will provide an opportunity to analyze the effectiveness of the action alternatives at resolving these natural resource management issues.</p> <p>Relevant Law, Regulation, or Policy. <i>NPS Organic Act; NPS Management Policies 2006</i></p>
Water Quality	Retained	<p>This impact topic has been retained because the preserve's water resources support the preserve's natural ecosystems and are important for contact recreational activities, including fishing, boating, wading, and kayaking. The management actions described in the alternatives may result in increased visitor use within the waterways. The actions also address mitigating uses that currently degrade water quality. Retaining this impact topic will provide an opportunity to analyze the effectiveness of the action alternatives at resolving these natural resource management issues.</p> <p>Relevant Law, Regulation, or Policy. Clean Water Act; Executive Order 12088: "Federal Compliance with Pollution Control Standards"; <i>NPS Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Wetlands	Retained	<p>Executive Order 11990 and Director's Order 77-1 require the National Park Service to protect and enhance natural wetland values, and examine impacts on wetlands. Wetlands are significant water resources in the region due to their importance for providing a buffer against flooding and storm events, assisting in the regulation of river flow, acting as filters for pollutants, and providing important fish and wildlife habitat. The alternatives being considered could affect wetlands in the Lance Rosier unit. Retaining this impact topic will provide an opportunity to analyze the effectiveness of the action alternatives at resolving these natural resource management issues.</p> <p>Relevant Law, Regulation, or Policy. Clean Water Act; NPS <i>Management Policies 2006</i>; Executive Order 11990, "Protection of Wetlands"; Director's Order 77-1: <i>Wetland Protection</i></p>
Vegetation	Retained	<p>This impact topic has been retained, because one of the primary natural resources of the preserve is its vegetative communities. The Organic Act and NPS <i>Management Policies 2006</i> require the National Park Service to protect and conserve native plants and vegetative communities that could be affected by visitors, management actions, and external sources. Actions in the alternatives could beneficially or adversely affect these resources, which would be of concern to many people as well as park unit managers. The spread of nonnative species is also a major concern in the preserve.</p> <p>Retaining this impact topic will provide an opportunity to analyze the effectiveness of the action alternatives at resolving these natural resource management issues.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>
Fish and Wildlife	Retained	<p>This impact topic has been retained because the preserve's wildlife populations are an important resource and one of the attractions that add to the quality of the visitor experience in the preserve. As with the above resources, the Organic Act and NPS <i>Management Policies 2006</i> require the National Park Service to protect and conserve native wildlife populations that could be affected by visitors, management actions, and external sources. Changes in wildlife habitat or in wildlife populations due to the alternatives would be of concern to visitors, the public, and preserve unit managers.</p> <p>A variety of different species of fish use the preserve's waters. Many of the preserve's fish are sought by sport anglers. None of the action proposed in the alternatives would adversely affect fish populations found in the preserve, including impacts to water quality that would be large enough to adversely affect fish populations. Increased sportfishing may occur with slightly increased recreational use in some areas under the alternatives, but it is expected that NPS monitoring would prevent adverse impacts to the preserve's fish populations.</p> <p>Retaining this impact topic will provide an opportunity to analyze the effectiveness of the action alternatives at resolving these natural resource management issues.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Selected Federal and State Species Listed as Endangered, Threatened, or Candidate for Listing: <ul style="list-style-type: none"> Red-cockaded woodpecker Sprague's pipit Louisiana black bear Louisiana pine snake Texas trailing phlox Navasota ladies'-tresses Neches River rose-mallow 	Retained	<p>The Endangered Species Act of 1973, as amended, requires an examination of impacts on all federal-listed threatened or endangered plant and animal species. NPS <i>Management Policies 2006</i> repeat this requirement and add the further stipulation that the analysis examine impacts on state-listed endangered, threatened, or rare species, and federal species proposed for listing. The preserve is actively restoring habitat and monitoring for the red-cockaded woodpecker, Louisiana pine snake, and Louisiana black bear. The endangered Texas trailing phlox is a fire-dependent species and is also being monitored.</p> <p>This impact topic has been retained because actions described in the alternatives, such as potential trail, road, and facility development, may affect federal- or state-listed animal species that have been documented to occur within the preserve. Due to possible habitat impacts from the actions listed above and the potential for increased visitor use, this impact has been retained for detailed analysis for these species.</p> <p>Relevant Law, Regulation, or Policy. Endangered Species Act; NPS <i>Management Policies 2006</i></p>
Federal and State Endangered and Threatened Species Other Than Those Identified Above	Dismissed	<p>This document does not analyze in site-specific detail the environmental effects that the alternatives might have on several federal- and state-listed threatened and endangered species, including the bald eagle and peregrine falcon. The preserve falls within the potential range of other species such as the red wolf, although no verified sightings have ever been recorded in the preserve. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. Endangered Species Act; NPS <i>Management Policies 2006</i></p>
Wild and Scenic Rivers	Retained	<p>The Neches River and several tributaries in the preserve are included in the nationwide rivers inventory as a potential wild and scenic river. Related to this GMP, a wild and scenic river eligibility analysis will be completed by the National Park Service. Results of the eligibility analysis will be published separately from this document.</p> <p>Relevant Law, Regulation, or Policy. National Wild and Scenic Rivers Act; NPS <i>Management Policies 2006</i></p>
Water Quantity (including groundwater)	Dismissed	<p>This impact topic was dismissed from further analysis because none of the alternatives being considered would be expected to substantially change surface or groundwater flows in the preserve, or affect the preserve's water supply. Visitor use levels would increase under some of the alternatives, but water consumption would not be expected to increase to the point where there would be a noticeable impact on surface or groundwater flows. Therefore, any impacts would be negligible.</p> <p>Relevant Law, Regulation, or Policy. Director's Order 77-2: <i>Floodplain Management</i>; Executive Order 11988, "Floodplain Management"; NPS <i>Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Floodplains	Dismissed	<p>This impact topic was dismissed because no actions are being proposed that would noticeably affect the functions and values of the Neches River floodplain. The river's floodplain is important for wildlife and vegetation as well as recreation and cultural values. But the alternatives propose no substantial changes in the floodplain and how it is used. Although additional trails and waysides would be built, they would have a negligible effect on the floodplains, primarily affecting floodplain soils and vegetation, which are analyzed in the soils and vegetation sections. The alternatives would have no effect on river hydrology or flooding. Although more people would be in the floodplain, they would not be expected to be present at times when flooding typically occurs (i.e., the monsoon season).</p> <p>Relevant Law, Regulation, or Policy. Clean Water Act; Executive Order 12088, "Federal Compliance with Pollution Control Standards"; <i>NPS Management Policies 2006</i></p>
Prime and Unique Agricultural Lands	Dismissed	<p>There are no prime or unique agricultural lands within the boundaries of Big Thicket National Preserve. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. Council on Environmental Quality 1980 memorandum; Farmland Protection Policy</p>
Geologic Resources (other than soils)	Dismissed	<p>This impact topic has been dismissed from further analysis because the preserve's geologic resources, excluding soils, would be largely unaffected by actions described in the alternatives.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; <i>NPS Management Policies 2006</i></p>
Air Quality	Dismissed	<p>The Clean Air Act of 1955, as amended, was established to promote public health and welfare by protecting and enhancing the nation's air quality. The act established programs that provide special protection for air resources and air quality-related values associated with national park units. Section 118 of the Clean Air Act requires park units to meet all state, federal, and local air pollution standards.</p> <p>In all of the alternatives, the National Park Service would continue to protect and conserve air quality as required under the NPS Organic Act and <i>NPS Management Policies 2006</i>. None of the alternatives being considered would substantially alter the preserve's air quality or affect either the management of air quality in the preserve or uses within the preserve that could affect air quality. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. Clean Air Act; <i>NPS Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Soundscape	Dismissed	<p>Under the NPS Organic Act, NPS Director's Order 47: <i>Soundscape Preservation and Noise Management</i>, and NPS <i>Management Policies 2006</i>, the National Park Service is required to protect to the greatest extent possible the natural soundscape. None of the alternatives in this general management plan would alter the preserve's soundscape. Although potential developments could increase noise levels in localized areas, it is not likely that a substantial change would occur in the preserve's soundscape. The primary sources of noise in the preserve would continue to be motorboats in certain areas, traffic on adjacent highways, oil and gas development, and people at the existing primary developments. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. NPS <i>Management Policies 2006</i>; Director's Order 47: <i>Soundscape Preservation and Noise Management</i></p>
Carbon Footprint	Dismissed	<p>For the purpose of this GMP planning effort, "carbon footprint" is defined as the sum of all emissions of carbon dioxide and other greenhouse gases (e.g., methane and ozone) that would result from implementation of either of the action alternatives.</p> <p>The action alternatives described in this document would emit a negligible amount of greenhouse gases. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan. The reasons for dismissing this impact topic are that (1) the alternatives would not be expected to result in a substantial increase in preserve visitation, including a substantial increase in vehicular traffic; and (2) there would be minimal new developments built under the alternatives, and newer sustainable building practices should help limit greenhouse gas emissions. Because of the negligible amount of greenhouse gas emissions that would result from each alternative, a quantitative measurement of their carbon footprint was determined by the GMP planning team not to be practicable.</p> <p>Relevant Law, Regulation, or Policy. NPS <i>Management Policies 2006</i></p>
Viewsheds	Dismissed	<p>This impact topic was dismissed because the actions and developments described in the alternatives would have a negligible effect on the preserve's viewsheds. None of the proposed new structures would substantially affect views from the preserve or into the preserve. Although the action alternatives call for steps such as planting vegetation to screen views of nearby developments, because of the scale of nearby developments this would likely have only a minor beneficial effect on the viewshed. Non-NPS actions, such as ongoing residential and commercial developments along the preserve boundary, could further degrade the preserve's viewshed, but these actions are not part of the alternatives being analyzed.</p> <p>Relevant Law, Regulation, or Policy. NPS <i>Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Lightscape	Dismissed	<p>Under the NPS Organic Act and <i>NPS Management Policies 2006</i>, the National Park Service is required to protect to the greatest extent possible the natural lightscapes (i.e., night sky) of the preserve. In particular, the policies call for the National Park Service to protect natural darkness. None of the alternatives in this general management plan would alter the preserve's lightscape. It is likely that potential developments would have only a negligible impact on the night sky. Most potential developments, such as campsites, trails, and picnic areas, would not have artificial light sources. If lights were needed, they would be localized, affect only a small area, and be designed to not adversely affect the lightscape. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. <i>NPS Management Policies 2006</i></p>
Energy Requirements and Conservation Potential	Dismissed	<p>None of the alternatives would result in a measureable change in energy consumption compared to current conditions. The use of energy could slightly increase due to the need to take more trips to maintain existing and new land and water trails and campsites. However, the change in energy consumption due to these actions in alternatives 2, 3, and 4 would be expected to be negligible compared to the overall energy consumption of the preserve.</p> <p>The National Park Service would pursue sustainable practices whenever possible in all decisions regarding preserve operations, facilities management, and developments in Big Thicket National Preserve, as called for in <i>NPS Management Policies 2006</i>. As with the existing facilities, any new future developments would be built to the highest achievable LEED standards, striving for Platinum certification. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. Council on Environmental Quality Regulations</p>
Natural Resource Requirements and Conservation Potential	Dismissed	<p>None of the alternatives being considered would result in the extraction of resources from the preserve. Relatively small quantities of depletable resources would be used in improvements to existing facilities and the limited development of new facilities in the alternatives, but the impact on these resources would be negligible. Under all of the alternatives ecological principles would be applied to ensure that the preserve's natural resources were maintained and not impaired. Therefore, this impact topic has been dismissed from detailed analysis in this general management plan.</p> <p>Relevant Law, Regulation, or Policy. Council on Environmental Quality Regulations</p>
Visitor Use and Experience		
Visitor Opportunities	Retained	<p>This topic is retained for further analysis as an impact topic because of potential impacts associated with the development of a greater variety of visitor opportunities to experience the preserve.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; <i>NPS Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Interpretation and Education	Retained	<p>This topic is retained for further analysis as an impact topic because of potential impacts associated with engaging visitors in the history and resources of the preserve through additional interpretive and educational opportunities.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>
Public Health and Safety	Dismissed	<p>This topic is dismissed from further analysis because the potential impacts of the proposed actions to public health and safety are negligible to minor.</p> <p>Relevant Law, Regulation, or Policy. Council on Environmental Quality Regulations; Director's Order 12 and Handbook; Director's Order 50C: <i>Public Risk Management Program</i>; NPS <i>Management Policies 2006</i></p>
Socioeconomics		
Socioeconomics	Retained	<p>Money generated from visitors to and the operation of Big Thicket National Preserve contributes to the economy of surrounding communities in southeast Texas. Accordingly, preserve neighbors and businesses in the county are concerned about changes in management or operations of the preserve. The alternatives presented in this general management plan could change the visitation levels or the need for housing, supplies, or materials from the current situation. Because implementing the alternatives in this general management plan could affect the socioeconomic of nearby communities, and the National Environmental Policy Act requires an examination of social and economic impacts caused by federal actions, this topic is retained for further analysis.</p> <p>Relevant Law, Regulation, or Policy. National Environmental Policy Act of 1968</p>
Environmental Justice	Dismissed	<p>Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities.</p> <p>According to the Environmental Protection Agency, environmental justice is the...</p> <p><i>fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies.</i></p> <p>None of the alternatives being considered would have a disproportionately high and adverse effect on any</p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
		<p>minority or low-income population or community. This conclusion is based on the following information:</p> <ul style="list-style-type: none"> ▫ The proposals in the alternatives would not result in any identifiable adverse human health effects. Therefore, there would be no direct, indirect, or cumulative adverse effects on any minority or low-income population or community. ▫ No natural resource adverse impacts were identified due to the alternatives that would significantly and adversely affect minority or low-income populations or communities. ▫ The alternatives would not result in any identified effects that would be specific to any minority or low-income community. ▫ The GMP planning team actively solicited public comments during the development of the general management plan and gave equal consideration to all input from persons, regardless of age, race, sex, income status, or other socioeconomic or demographic factors. ▫ No impacts were identified that would substantially alter the physical and social structure of the nearby communities. <p>Therefore this topic will not be analyzed further.</p> <p>Relevant Law, Regulation, or Policy. Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations"; EPA <i>Environmental Justice Guidance</i>.</p>
Operations and Facilities		
Operations and Facilities	Retained	<p>This topic covers such things as NPS staffing, maintenance activities, management flexibility, productivity, operational efficiencies, and response times. Preserve operations would be affected by the actions in the alternatives, including staffing changes, facility construction, and facility or infrastructure maintenance. Therefore, this topic was retained for further analysis.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>
Conformity with Local Land Use Plans	Dismissed	<p>Actions proposed in the alternatives would not be in conflict with any local, state, or tribal land use plans, policies, or controls for the area.</p> <p>The basic land use of the preserve as a public recreation and resource management area is in conformance with local land use plans. The creation of additional recreation and visitor service opportunities in the preserve as proposed in the alternatives would be consistent with existing preserve land uses or local (non-NPS) or tribal land use plans, policies, or controls for the area. Therefore, this topic was dismissed from further analysis.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>

TABLE 2. TOPICS RETAINED AND DISMISSED FOR BIG THICKET NATIONAL PRESERVE

Topic	Retained or Dismissed	Rationale
Operations and Facilities		
Urban Quality and Design of the Built Environment	Dismissed	<p>The quality of urban areas is not a concern in this general management plan. Preserve-compatible design would be taken into consideration for structures built under all of the action alternatives. Emphasis would be placed on designs and materials and colors that blend in and do not detract from the natural and built environment. Therefore, adverse impacts would be expected to be negligible. Therefore, this topic was dismissed from further analysis.</p> <p>Relevant Law, Regulation, or Policy. NPS Organic Act; NPS <i>Management Policies 2006</i></p>

RELATIONSHIP OF OTHER PLANNING EFFORTS TO THIS GENERAL MANAGEMENT PLAN

Big Thicket National Preserve lies within seven counties in southeast Texas. Properties surrounding and near the preserve include land owned and managed by the Alabama-Coushatta Tribe of Texas, the U.S. Forest Service, the state, and private entities. Land use in the area is mainly agricultural with some rural residential use. Timber harvesting and oil and gas exploration and production are common through much of the region. The Alabama-Coushatta Tribe of Texas Reservation borders the Big Sandy Creek unit of the preserve.

Several plans have influenced or would be influenced by the approved *Big Thicket National Preserve General Management Plan*. These plans have been prepared (or are being prepared) by the National Park Service, the U.S. Forest Service (USFS), U.S. Fish and Wildlife Service (USFWS), U.S. Army Corps of Engineers (USACE), the State of Texas, and adjacent counties and cities. Some of these plans are described briefly here, along with their relationship to this management plan.

TRIBAL PLANS

Alabama-Coushatta Tribe of Texas Plans

The Alabama-Coushatta Tribe of Texas has entered into a partnership agreement with the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA), and the Texas Forest Service. The agreement is for the reforestation of longleaf pine stands on about 400 acres of tribal land. Longleaf pines have long-standing cultural importance for the tribe; among other uses, pine needles from these trees have traditionally been used by tribal members for making handmade baskets. The reforestation project is being conducted under NRCS

Wildlife Habitat Incentives Program, with technical and management assistance provided by the Natural Resources Conservation Service and the Texas Forest Service. Further anticipated benefits of the project are the restoration of native plants, grasses and wildlife habitat in reforested areas (see Alabama-Coushatta Tribe of Texas website).

There are few other substantial changes planned at the Alabama-Coushatta Tribe of Texas Reservation; residential, tribal government, and public service uses are not anticipated to change extensively. Overall timber management and oil and gas development are expected to continue under current tribal management guidelines. Should Texas gambling laws change, there is the potential for the resumption of casino or gaming development on the reservation. Such development could generate increased traffic and the need for infrastructure changes to the area. Although tribal plans are unlikely to have a substantial bearing on the operations or management of the preserve, the tribe's longleaf pine reforestation project points out the potential for future collaborative resource conservation and other management efforts among the Alabama-Coushatta Tribe of Texas, the National Park Service, and other partners.

FEDERAL PLANS

U.S. Forest Service Plans

Angelina National Forest. There are a variety of efforts in Angelina National Forest that could have a minimal indirect impact on the preserve. These actions include thinning for longleaf regeneration, prescribed burns to reduce hazardous fuels, and ongoing seismic exploration. Recreation enhancement projects include a proposal to expand or reroute trails

such as the Sawmill Hiking Trail (USFS 2011). There is no significant concern with forest service plans.

U.S. Fish and Wildlife Service Plans

North Neches National Wildlife Refuge (proposed 2005). Although considerably north of the preserve, the proposal for the North Neches National Wildlife Refuge (NWR) could influence protection of the Neches River. According to the proposal for this refuge, “The U.S. Fish and Wildlife Service (Service) proposes to establish a new National Wildlife Refuge in east Texas along a 38 mile reach of the upper portion of the Neches River dividing Anderson and Cherokee Counties.” According to the preliminary project proposal approved in 1988, the refuge would be “approximately 35 miles south-southeast of Tyler and 100 miles southeast of Dallas. The proposed refuge lies on both sides of the Neches River and includes overflow bottomlands and adjacent pine and pine or hardwood forests. If approved, the establishment of the refuge would then allow the Service to initiate proposals for the acquisition of lands within an acquisition boundary, up to 25,281 acres within that boundary. A refuge would exist only after an interest in land is acquired by the United States and therefore included in the U.S. Fish and Wildlife Service National Wildlife Refuge System (NWRS). Establishment of the refuge acquisition boundary would allow the Service to acquire from willing sellers lands within that boundary.” (USFWS 2005)

The U.S. Fish and Wildlife Service would manage acquired lands in order to conserve, protect, and enhance a diversity of habitats and the wildlife resources thereon. Such management will be in accord with the authorities granted to the U.S. Fish and Wildlife Service under the NWRS Improvement Act of 1997 and other statutes governing the management of fish and wildlife resources on NWRS lands. These plans would have a complementary effect of preserving land within the Big Thicket region.

Trinity National Wildlife Refuge Comprehensive Conservation Plan. The Trinity River National Wildlife Refuge is west of the preserve, within the historic Big Thicket region. The primary purpose of this refuge is to protect a 25,000-acre remnant of the bottomland hardwood forest ecosystem along the Trinity River. It is one of only 14 high priority bottomland sites identified for protection in the Texas Bottomland Protection Plan. This habitat type is used during migration or nesting by nearly 50% of the migratory bird species listed by the U.S. Fish and Wildlife Service. Migratory waterfowl are the management focus of the refuge. Wading birds, shorebirds, white-tailed deer, coyote, bobcat, and other wildlife species thrive on the refuge as well. The U.S. Fish and Wildlife Service seeks partnerships with landowners, local and regional organizations, and state and federal agencies to achieve national and regional conservation goals. The refuge management intends to provide and develop high quality programs and facilities for hunting, fishing, wildlife observation, photography, interpretation, and environmental education. This will allow people to connect to nature while building support for the refuge and enhancing the local community (USFWS 2009). These plans would have a complementary effect of preserving land and supporting wildlife species within the Big Thicket region.

U.S. Army Corps of Engineers Plans

Five dam and water management projects have been authorized by Congress in the Angelina-Neches River Basins. Three have been built: (1) B.A. Steinhagen Lake behind Town Bluff Dam, completed in 1953; (2) Sam Rayburn Dam and Reservoir completed in 1965; and (3) Neches River Saltwater Barrier, completed in 2003. The two other projects, “Dam A” and “Rockland,” have been authorized but never built. A separate dam and reservoir project called the Blackburn Crossing Dam (and the upstream Palestine Lake Reservoir) is located over 150 river miles north of Town Bluff Dam in the upper reaches of the Neches River Basin.

Two new reservoirs and expansion of an existing one are being considered for the Neches River; if built, they could divert water that currently flows through the preserve, disrupting native plant communities, affecting wildlife, and compromising recreational opportunities. Since the 1940s, regional planners have periodically discussed the prospect of building a dam and reservoir on the Neches River 25 miles upstream of B.A. Steinhagen Lake. Most recently, the Lower Neches Valley Authority raised the dual possibility of building the Rockland project in tandem with enlarging Town Bluff Dam. The Lower Neches Valley Authority is proposing the dam to the Texas Water Development Board as a regional effort to increase water supplies for the state. The projects would enlarge B.A. Steinhagen Lake from 13,000 surface acres to 21,000 surface acres and create a 100,000-surface-acre reservoir at Rockland. Combined, they would inundate a 12,000-acre Texas Parks and Wildlife Management Area above the dam and submerge most of Martin Dies, Jr. State Park, a heavily used recreation site that complements recreational river use at the preserve (NPS 2010a). An additional proposal is the building of the Fastrill Dam at river mile 288 to support water needs for the Dallas area. “Expected beneficiaries of the dependable water supply afforded by the development of Fastrill Reservoir and potential system operation with Lake Palestine include water user groups within Anderson, Cherokee, Henderson, and Smith counties and the city of Dallas (in Region C) (TWDB 2005) (see figure 2).

Both reservoirs were still under consideration by the Texas Water Development Board as of 2010, but timing and implementation of the proposals are unclear based on funding and consideration of state endangered and

threatened species in these portions of the Neches River, including paddlefish and two species of freshwater mussels (TWDB 2011).

National Park Service Plans

Fire Management Plan. The current fire management plan (2004) details fire management actions in the preserve and makes sure they meet resource management, health, and public and fire fighter safety objectives. It outlines the use of prescribed fire and mechanical and chemical treatments to manage fire-adapted vegetation communities and allows fire to function in its natural ecological role, restore ecosystem balance, and manage hazardous fuels in the urban interface. In accordance with NPS policy, the five-year review and revision (including the National Environmental Policy Act) to the current fire management plan is underway. This review and revision is expected to be completed in January 2013. The *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement* would provide the overarching guidance on how fire is managed within the landscape. Reviews and revisions of future fire management plans will continue to outline management strategies, goals, and objectives. The fire management plan and the general management plan have been developed concurrently in coordination with appropriate park staff. The general management plan is the guiding document and the fire management plan implements management approaches. There is nothing in the current fire management plan that is inconsistent with the direction taken in this general management plan.

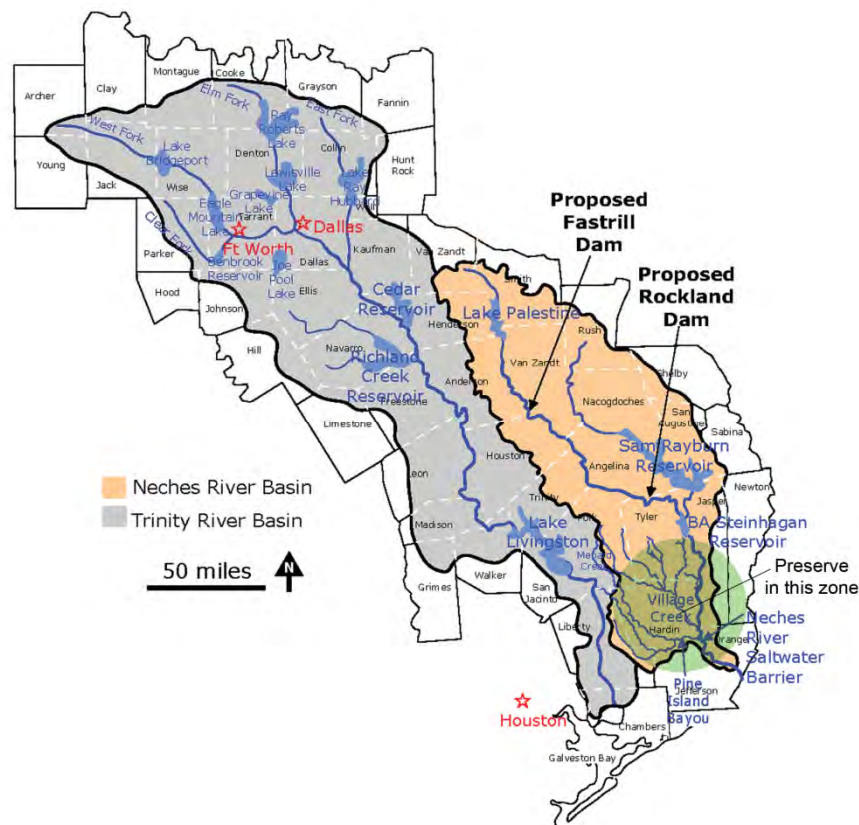


FIGURE 2. EXISTING AND PROPOSED DAMS AND RESERVOIRS ON THE NECHES RIVER

Big Thicket National Preserve Oil and Gas Management Plan. The *Big Thicket National Preserve Oil and Gas Management Plan* (OGMP) (2006) identifies preserve resources and values susceptible to adverse impacts from oil and gas operations and establishes performance standards and impact mitigation measures for oil and gas operations to minimize impacts on human health and safety, visitor use and enjoyment, and preserve resources. The plan provides holders of oil and gas rights reasonable access for exploration and development and provides pertinent information to oil and gas operators to facilitate planning and compliance with the National Park Service and other applicable regulators. The *Big Thicket National Preserve Oil and Gas Management Plan*, combined with NPS nonfederal oil and gas regulations found

at 36 CFR Part 9 Subpart B, will continue to provide guidance on the NPS regulation of oil and gas activity within the preserve; therefore, oil and gas management is not addressed in the plan beyond any management measures of note that are already in the oil and gas management plan.

Other Federally Related Efforts

Environmental Impact Statement for TransCanada Keystone XL Pipeline from Hardisty, Alberta, to Port Arthur and East Houston Areas of Texas.

The U.S. Department of State is leading the effort for this environmental impact statement. The 36-inch pipeline would carry crude oil from Canadian tar sands. The proposed routing of

the pipeline would cross Menard Creek near State Highway 146 in a gap in the Menard Creek corridor unit. The National Park Service understands that TransCanada Keystone XL would establish work areas on either side of the preserve at this creek crossing, and install the pipeline utilizing horizontal directional drilling. The National Park Service expressed support for project alternatives that include

- best management practices for the control of erosion, sediment, and contaminants, especially as they relate to construction at waterbody crossings
- planning for spill prevention, control, and countermeasures
- procedures for addressing potential horizontal directional drilling complications and applicable corrective actions, including expected potential impacts and appropriate mitigation measures in the event of a loss of drilling fluid circulation
- planning for stormwater pollution prevention

However, should the project result in the loss of drilling mud, spills, or other actions, there could be impacts to wildlife, particularly fish and freshwater mussels. Recreation impacts from drilling mud seepage or spills could include impacts to water quality, diminished scenery, and impaired fishing activities (NPS 2009a).

STATE AND REGIONAL PLANS

Texas Water Development Board Regional Water Plans impact Big Thicket National Preserve because they determine use of groundwater and surface water and they impact flows into and through the preserve that are critical to maintaining the ecosystem. The preserve is primarily in Region I with a smaller portion in Region H. Existing plans do not adequately reflect the need for ecological flows and normal seasonal variation. The

regional water plans may have impact on management actions that might be needed to protect biodiversity and other fundamental resources and values.

Regional Water Plan for Region I East Texas Regional Water Plan Area

To be consistent with the long-term protection of state water resources, the 2011 regional water plan must recommend strategies that minimize threats to the region's sources of water over the planning period. The recommended strategies represent a comprehensive plan for meeting the needs of the region while effectively minimizing threats to water resources. Some of the major strategies for the 2011 regional water plan are as follows:

- water conservation
- indirect reuse
- development of Lake Columbia
- use of water from Toledo Bend by Regions C and D
- optimized use of existing surface water resources
- optimized use of groundwater

Region I contains abundant natural resources, which must be considered in water planning. Natural resources include endangered and threatened species; local, state, and federal parks and public lands; and energy reserves. The regional plan had the following findings; however, preserve staff remain concerned about the hydrological impacts, especially to species of concern.

- The *East Texas Regional Water Plan Area* (ETRWPA) includes 20 species of birds, 6 mammals, 21 reptiles and amphibians, 9 fish, and 13 mollusks that are considered species of special concern, including some species classified as endangered and threatened. In general, water management strategies planned for the

East Texas Regional Water Plan Area would not affect endangered and threatened species.

- The *East Texas Regional Water Plan Area* contains national forests, wildlife refuges, and a preserve as well as state parks, forests, and wildlife management areas. None of the water management strategies currently proposed for the East Texas Regional Water Plan Area is expected to adversely impact state or local parks or public lands.
- Much of the *East Texas Regional Water Plan Area* is heavily forested and timber is an important economic resource for the region. In general, water management strategies for the region would not be expected to significantly affect this use.
- Numerous oil and gas wells are located within the *East Texas Regional Water Plan Area*, including the East Texas Oil Field, and four of the top 10 producing gas fields in the state. These resources represent an important economic base for the region. None of the water management strategies is expected to significantly impact oil, gas, or coal production in the region (TWDB 2011).

Sabine and Neches Rivers and Sabine Lake Bay Basin and Bay Area (Environmental Flows). There are currently efforts to define environmental flows for the Sabine and Neches Rivers by the Texas Commission on Environmental Quality. Big Thicket staff has participated in the stakeholder process and provided written comments regarding the process. These comments include concerns about water quality contributing to fish and freshwater mussel decline; the need to strengthen subsistence flow requirements; the need for defining and requiring overbank flows; the need to address sediment transport in the future study; concern about the summer, dry, subsistence flow being insufficient to prevent

saltwater intrusion from impacting freshwater marsh and cypress-tupelo wetlands; and the need for refinement of the methodology for calculating hydrological condition as part of the rulemaking. The preserve staff has concerns that current proposed environmental flows do not adequately provide long-term protection for the natural resources that are part of the fundamental resources and values of the preserve (TCEQ 2011a, 2011b).

Lake Columbia Water Supply Project

Creation of Lake Columbia, which is upstream of Big Thicket National Preserve, is a recommended water supply strategy in the 2007 state water plan and the 2006 regional water plan. These plans recognize the proposed reservoir site as a “unique reservoir site” suitable for the development of a reservoir and legislative confirmation. This project could impact water flowing into the Neches River and the preserve.

The U.S. Army Corps of Engineers currently expects to release the Lake Columbia environmental impact statement for public comment in summer 2011. The primary purpose of Lake Columbia is water supply. Lake Columbia is not a flood control reservoir nor is it envisioned to have any hydroelectric capabilities. The lake will be in the Mud Creek floodplain, with the dam being approximately 5 miles southeast of Jacksonville, Texas. The lake will primarily lie in Cherokee County, with the northern limits of the lake extending into Smith County. It will be 14.0 miles in length, approximately 1.5 miles wide at its widest point; and cover 10,133 acres of land at normal pool. The lake will impound 195,500 acre feet of water and provide a firm yield of 85,507 acre feet of water per year (ANRA 2010).

Texas Department of Transportation

Texas Department of Transportation Beaumont District. There are numerous resurfacing, road improvements and minor road widening projects, with the larger

projects generally in Beaumont, Port Arthur, or outside the immediate area of the preserve. Examples of projects include the widening of State Highway (SH) 146 in and near Dayton and SH 105 in Cleveland. The replacement of the Neches River Bridge on Interstate 10 (I-10) and widening of I-10 through Beaumont is in design and is anticipated to go out for bid in the next few years. Replacement of the U.S. Route (US) 190 bridge over the Neches River at B.A Steinhagen Lake is funded and in design. The projects mentioned above could support easier access to the preserve from various locations outside the region, which could have a long-term impact on visitation.

The recommendation for the proposed Trans-Texas Highway corridor, which included Highway 69, has been revised to recommend the use of existing roadways; the focus is now west and north of the regions surrounding the preserve.

More information on highway projects in the area can be found through the Texas Department of Transportation regional offices in Lufkin and Beaumont. (Information can be accessed on the Web at http://txdot.gov/local_information/.)

LOCAL PLANS

None of the counties or cities in the area has extensive development planned. Most development consists of small subdivision replatting. The City of Beaumont plans to build a new events center west of downtown, which is anticipated to spur new retail and residential development in the area in the long term.

Over the next decade or more, industrial development in southern Jefferson County is expected to include refinery expansions, construction of liquefied natural gas plant(s),

and port facility expansions; however, these are not expected to significantly change overall land use or employment patterns. Impacts from expanded industrial operations could include air quality impacts and increased employment and populations, which could support increased local visitation.

PARTNERSHIPS

The preserve has had long-standing relationships with private and public organizations that hold similar overall objectives for resource protection, stewardship, education and interpretation, land protection, and many other operational support requirements. The partner list and projects accomplished for the preserve are extensive. The Big Thicket Association and its members represented the driving force for the establishment of the preserve. For decades, the Big Thicket Association has continued to support the preserve in countless ways. Resource research and inventorying is conducted through the Gulf Coast Cooperative Ecosystems Study Unit, Gulf Coast Inventory and Monitoring Program, a citizen scientist, a master naturalist, and more recently the Thicket of Diversity All Taxa Biological Inventory partnership.

Recent lands are acquired from a diverse array of nongovernmental organizations, and private and corporate donors. Land restoration efforts are conducted with the assistance of garden clubs, private citizens, nongovernmental organizations, and schoolchildren. Preserve educational programs are supported by corporate donations, foundations, teachers, universities, and school districts. Interpretative field trips and clean-up days at the preserve are supported by local canoe companies. County, state, and federal agencies assist with protecting preserve resources and visitors.

NEXT STEPS IN THE PLANNING PROCESS

FINALIZING THE GENERAL MANAGEMENT PLAN

After distribution of the general management plan, there will be a 60-day public review and comment period, after which the NPS planning team will evaluate comments from other federal agencies, organizations, businesses, and individuals regarding the draft plan.

Appropriate changes will be incorporated into the final general management plan / environmental impact statement. The final plan will also include letters from governmental agencies and tribes, any substantive comments on the draft document, and NPS responses to those comments.

Following distribution of the final plan and a 30-day no-action period, the “Record of Decision” would document the NPS selection of an alternative for implementation. Once it is signed, the plan can then be implemented as funding and staffing allows.

Once the planning process is completed, the selected alternative would become the new management plan for the preserve and would be implemented over 15–20 years. Not all of the actions in the alternative would necessarily be implemented immediately.

IMPLEMENTING THE GENERAL MANAGEMENT PLAN

The approval of this general management plan does not guarantee that the funding and staffing needed to implement the plan will be forthcoming. The implementation of the approved plan will depend on future NPS funding levels and servicewide priorities, and on partnership funds, time, and effort. It could also be affected by factors such as changes in NPS staffing, visitor use patterns, and unanticipated environmental changes. Full implementation could be many years in the future. Once the general management plan has been approved, additional feasibility studies and more detailed planning, environmental documentation, and consultations would be completed, as appropriate, before certain actions in the selected alternative can be carried out.

Future program and implementation plans, describing specific actions that managers intend to undertake and accomplish in the preserve, will tier from the desired conditions and long-term goals set forth in this general management plan.



Chapter 2 THE ALTERNATIVES, INCLUDING THE PREFERRED ALTERNATIVE



INTRODUCTION

This chapter describes four alternatives for managing Big Thicket National Preserve over the next 15–20 years. The alternatives reflect the range of actions and desired conditions for the preserve that the public and NPS staff would like to see accomplished regarding natural and cultural resource conditions, visitor use and experience, and NPS operations within the preserve. Alternative 1 presents a continuation of current management direction and is included as a baseline for comparing the consequences of implementing each of the other action alternatives. Alternative 2 (preferred alternative), alternative 3, and alternative 4 present different ways for the National Park Service to manage resources and visitor use and to improve facilities and infrastructure in the preserve.

As noted in the “Elements of the Foundation Document” section in chapter 1, the National Park Service would continue to follow existing agreements, servicewide laws, and policies regardless of the alternative selected. Therefore, these laws and policies are not repeated in this chapter. In addition, the

desired future conditions for Big Thicket National Preserve are further defined in the establishing legislation and the preserve’s purpose and significance statements.

Before describing the alternatives, this chapter explains how the alternatives were developed and how alternative 2 was identified. Other sections describe the management zones (a key element of the alternatives) and the approaches taken to address user capacity and boundary adjustments. After the alternatives are described, mitigative measures that would be used to reduce or avoid impacts are listed, needed future studies and implementation plans are noted, the environmentally preferable alternative is identified, and several actions are noted that the GMP planning team considered but dismissed. At the end of the chapter, there are tables that summarize the key differences among the alternatives, the costs of the alternatives, and the differences in impacts that would be expected from implementing each alternative based on the analysis in “Chapter 4: Environmental Consequences.”

FORMULATION OF THE ALTERNATIVES

The National Environmental Policy Act and NPS *Management Policies 2006* require that park unit managers consider a full range of reasonable alternatives, including a “no-action” alternative. An “alternative” is a set of actions or directions that address management of the entire park unit, including its resources, visitors, facilities, and staff operations. Each alternative typically includes an overall management concept; a management zoning scheme; a description of area-specific desired conditions and actions; the identification of partnership opportunities if applicable; potential boundary adjustments, if appropriate; and implementation and cost considerations.

The no-action alternative, which is required under the National Environmental Policy Act, is a baseline for comparing the effects of the action alternatives. It is the continuation of current management actions and directions into the future.

The GMP planning team developed the alternatives in this document using a variety of sources. Many aspects of the desired conditions of Big Thicket National Preserve are defined in the establishing legislation, the preserve’s purpose and significance statements, fundamental resources and values, and the servicewide laws and policies that were described earlier. Within these parameters, the National Park Service solicited input from the public, NPS staff, governmental agencies, tribal officials, and others regarding issues and desired conditions for the preserve. Planning team members also gathered information about existing visitor use and the condition of the preserve’s resources and facilities.

The GMP alternatives for Big Thicket National Preserve were developed under a broad conceptual framework intended to highlight potential differences among competing sets of resource conditions and visitor experiences. These alternatives have focused on *what*

resource conditions and visitor uses and experiences and opportunities should be at the preserve, rather than on details of *how* these conditions and uses and experiences should be achieved. Thus, the alternatives do not include many details on how actions related to resource or visitor use management would be implemented.

More detailed plans or studies would be required before most conditions proposed in the alternatives are achieved. The implementation of any alternative also depends on future funding and environmental compliance. This general management plan does not guarantee that funding will be forthcoming. The general management plan establishes a vision of the future that will guide day-to-day and year-to-year management of the preserve, but full implementation could take many years.

Because all of the proposed actions must be consistent with the purpose and significance of the preserve, a number of proposed actions are common to more than one alternative. However, these actions could be emphasized or implemented differently under the various alternative concepts. As noted in the discussion of servicewide laws and policies in chapter 1, the National Park Service would continue to follow existing agreements and servicewide laws and policies regardless of the alternatives considered in this general management plan. For example, all new facilities would be designed to address NPS standards and guidelines for energy efficiency and environmental sustainability. All the alternatives would also be carried out to ensure natural and cultural resources are managed in accordance with applicable laws and policies.

There were some actions considered by the GMP planning team and discussed with the public that were not carried forward as actions under the alternatives. While consistent with the objectives of the general management plan

in general and one or more of the alternatives in particular, these actions were not carried forward because it is unlikely that the preserve staff could focus on and implement these actions in the time frame of this general management plan. These actions are noted in the description of alternatives but are not part of the proposed actions in this general management plan; therefore, they have not been included in the cost estimate for each alternative nor have the impacts of these actions been analyzed. If in the future the resources became available to implement these actions it would be necessary for the preserve staff to complete any necessary environmental compliance prior to implementation of the action. However, because the action is already consistent with the general management plan, no amendment to the plan would be required.

IDENTIFICATION OF THE ENVIRONMENTALLY PREFERABLE ALTERNATIVE

Section 1505.2(b) of the CEQ regulations implementing the National Environmental Policy Act requires identification of the environmentally preferable alternative. The environmentally preferable alternative is defined as "...the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources." The environmentally preferable alternative is determined based on the sum results of the analysis of natural and cultural resource impacts described in chapter 4.

IDENTIFICATION OF THE NPS PREFERRED ALTERNATIVE

In addition to identifying the environmentally preferable alternative, an NPS preferred alternative is identified. Although the environmentally preferable alternative and NPS preferred alternative are often the same, there is no requirement that they be the same.

The National Park Service uses a value analysis method called "Choosing by Advantages" (CBA) to identify which GMP alternative is the preferred alternative. The CBA process is a tool for determining the specific advantages that each alternative would provide toward meeting the specific objectives of the park unit. The advantages described in the CBA process represent the benefits that would be gained under each alternative. The advantages for each alternative are compared to the expected costs of each alternative to determine a cost or benefit ratio of each alternative. The alternative that provides the most benefit per dollar—that is the alternative that provides the greatest overall benefit at the most reasonable cost—is the best value alternative and is labeled "preferred" in this general management plan.

POTENTIAL BOUNDARY ADJUSTMENTS

The National Parks and Recreation Act of 1978 requires general management plans to address whether boundary modifications should be made to park units. Boundary adjustments may be recommended in order to

1. protect significant resources and values or to enhance opportunities for public enjoyment related to park unit purposes
2. address operational and management issues, such as the need for access or the need for boundaries to correspond to logical boundary delineations such as topographic or other natural features or roads
3. otherwise protect park unit resources that are critical to fulfilling park unit purposes

Additionally, all recommendations for boundary changes must meet the following two criteria:

4. The added lands will be feasible to administer considering their size, configuration, and ownership; costs;

the views of and impacts on local communities and surrounding jurisdictions; and other factors such as the presence of hazardous substances or nonnative species.

5. Other alternatives for management and resource protection are not adequate.

For a boundary adjustment to be recommended, at least one of criteria 1–3 above must be met as well as both criteria 4 and 5.

In accordance with the preserve’s enabling legislation, Big Thicket National Preserve may consider the acquisition of properties outside the current authorized boundaries with the consent of willing sellers or donors and provided acquisition would expand NPS protection of sensitive resources or make a significant contribution to the purposes for which the preserve was created. Boundary expansion would focus on areas that have unique features, provide access, act as buffer zones, and improve connectivity between units. Where fee simple acquisition may not be feasible, protective easements would also be sought to provide buffer for areas adjoining the preserve.

The acquisition of any lands for visitor or operational facilities outside the existing NPS boundaries of the preserve would likely require congressional approval. This general management plan does not preclude future consideration of boundary adjustments should needs or conditions change.

USER CAPACITY

The General Authorities Act of 1970, section 604, amended section 12(b), requires that general management plans establish a user (carrying) capacity for a unit of the national park system, saying, among other things, that there must be “identification of an implementation commitment for visitor carrying capacity for all areas of the [national park system] unit.” In addition, NPS *Management Policies 2006* (section 8.2.1)

requires that general management plans address the issue of user capacity. The use of the concept of user capacity in planning infrastructure and visitor management programs is expected to result in more effective and efficient management.

The National Park Service defines user capacity as the types and level of visitor use that can, or should, be accommodated while sustaining desired resource conditions and visitor experiences that complement the purpose of a park unit. In addressing user capacity, the National Park Service identifies indicators, standards, and potential future management strategies, allocated by management zones.

The basis for user capacity decision making is comprised of the qualitative descriptions of desired resource conditions, visitor experience opportunities, and general levels of development that are described in the management zones. It is an iterative, ongoing process that includes the following steps:

1. Prescribe the desired conditions of resources and visitor experiences for a given area; don’t prescribe a maximum number of visitors. These conditions are based on the preserve’s purpose, significance, and fundamental resource values.
2. Select measurable indicators—characteristics or conditions—that reflect the status of resource and visitor conditions.
3. Set quantifiable standards, or minimum acceptable conditions, against which the indicator is measured.
4. Develop a systematic and periodic monitoring system to measure the established indicators.
5. Assess existing conditions, thereby establishing a baseline for future measurements.
6. Assess whether or not a management action must be taken because existing

conditions are determined to be close to violating standards, and then taking the action.

7. Continue to monitor conditions to determine the effectiveness of ongoing or new management actions.
8. Adapt by revising management strategies when indicated.

These components provide a defensible process for taking informed action to manage elements of visitor use that may influence desired conditions in a park unit.

The user capacity program described here would be implemented as part of any of the action alternatives (alternatives 2, 3, and 4).

MANAGEMENT ZONES

INTRODUCTION

Management zones are a key element of the alternatives for managing Big Thicket National Preserve. These zones are only applied to the three action alternatives, and describe the desired conditions for cultural and natural resources, visitor experiences, and appropriate kinds and levels of management, development, and access in different areas of the preserve. Together, they identify the widest range of potential resource conditions, visitor experiences, and facilities for the preserve that fall within the scope of its purpose and significance. The management zones also contribute directly to the identification of user capacity, which is discussed later in the chapter.

Six management zones were identified for Big Thicket National Preserve in the three action alternatives: developed or administrative, frontcountry, backcountry, primitive, water-based mixed use, and water-based nonmotorized. Each of these zones has its own set of desired resource conditions, expected visitor experiences, and appropriate activities and facilities. Table 3 defines the potential management zones. In formulating the action alternatives, the management zones were placed in different locations or configurations on a map of the preserve according to the overall concept of each alternative.

Land-based Zones

- **Developed or Administrative**—lands in this zone would support administrative facilities for park operations and maintenance.
- **Frontcountry**—lands in this zone would be managed to support visitor orientation, recreational access, and day use areas.
- **Backcountry**—lands in this zone would be managed to support a natural landscape while still allowing for low-impact recreational opportunities.
- **Primitive**—lands in this zone would be managed to support landscape with opportunities for self-reliant recreational opportunities.

Water-based Zones

- **Mixed Use**—portions of rivers and creeks managed to support a mix of motorized and nonmotorized boating opportunities.
- **Nonmotorized**—portions of rivers and creeks would be managed to support nonmotorized boating opportunities; electric trolling motors would be allowed at speeds limited to no-wake.

TABLE 3. BIG THICKET NATIONAL PRESERVE MANAGEMENT ZONES

	Land-based Zones				Water-based Zones	
	Developed or Administrative	Frontcountry	Backcountry	Primitive	Mixed Use	Nonmotorized
Overview	Administrative uses would be emphasized in this zone. The primary visitor orientation and education facilities would be in this zone. All visitor center and administrative facilities would be in this zone.	Visitor orientation, recreation, and access would be emphasized in this zone. This zone would include day use areas, boardwalks, land- and water-based trails, boat ramps, trailheads, and parking. Most transportation routes and access points (roads, trails, parking, launching) would be in this zone.	Visitors would experience a natural landscape through a variety of low-impact recreational opportunities supported by a network of roads and designated trails. Preservation of natural and cultural resources, restoration of degraded resources, and continuation of natural processes would be emphasized in this zone.	Visitors would experience a natural landscape with opportunities for primitive and unconfined recreation directly dependent on ability, knowledge, and self-reliance. Preservation of natural and cultural resources, restoration of degraded resources, and continuation of natural processes would be emphasized in this zone.	Portions of rivers, creeks, and wetlands would be managed to support a mix of motorized and nonmotorized boating opportunities. All waterways would be mixed use unless otherwise designated on the alternative maps. The natural setting would predominate, but sights and sounds of human activity would be evident during peak use and near access points.	Portions of rivers, creeks, bayous, and wetlands would be managed to support nonmotorized boating opportunities. Electric trolling motors would be allowed at speeds limited to no wake. Visitors would experience natural sights and sounds except during peak use when recreational activities would be more apparent. A relatively high degree of self-reliance would be required for visitors to safely navigate waterways in this zone.
Resource Conditions	<ul style="list-style-type: none">• The natural environment could be modified for essential visitor and operational needs.• Impacts to natural and cultural resources would be avoided to the extent possible or adverse impacts would be mitigated appropriately.• The introduction of nonnative species is prevented to the extent possible, and attempts are made to eliminate introduced species before they became established.• Human-related sounds would predominate. Natural sounds may be audible during low visitor use periods.• Viewsheds could be impacted by private development along preserve boundary.• Facilities would be designed and managed to be environmentally friendly and sustainable and to ensure resource protection and public safety.	<ul style="list-style-type: none">• The natural environment could be modified for essential visitor and operational needs.• Impacts to natural and cultural resources would be avoided to the extent possible or adverse impacts would be mitigated appropriately.• The introduction of nonnative species would be prevented to the extent possible, and attempts would be made to eliminate introduced species before they became established.• More extensive preservation treatments (e.g., rehabilitation, restoration) could be carried out for historic structures and cultural landscapes.• Natural sounds may exist, but they would be frequently interrupted by human activity.• Viewsheds could be impacted by private development along the preserve boundary.• Facilities would be designed and managed to ensure resource protection and public safety.	<ul style="list-style-type: none">• Native species and natural processes would predominate.• Evidence of human impact would be apparent along roads, trail corridors, and designated camping areas, but would be infrequent and limited in extent elsewhere in this zone.• The introduction of nonnative species would be prevented to the extent possible, and attempts would be made to eliminate introduced species before they became established.• The National Park Service would maintain close control over resource-damaging activities.• Monitoring would be carried out regularly, and restoration measures (revegetation and reintroduction of extirpated species) would be carried out as needed. Uses would be controlled or dispersed if necessary to protect resources.• Cultural resources would be protected and preserved or stabilized as appropriate.• Natural sounds would be audible in this zone, but they would be interrupted by noises from motors and other human activity.• Viewsheds could be impacted by private development along the preserve boundary.	<ul style="list-style-type: none">• Native species and natural processes would predominate.• Evidence of human impact would be infrequent and limited in extent.• Uses would be controlled or dispersed if necessary to protect resources. A backcountry permit system would be implemented if resources or solitude are threatened.• The introduction of nonnative species would be prevented to the extent possible, and attempts would be made to eliminate introduced species before they became established.• The National Park Service would maintain close control over resource-damaging activities.• Monitoring would be carried out regularly, and restoration measures (revegetation and reintroduction of extirpated species) would be completed as needed. Uses would be controlled or dispersed if necessary to protect resources.• Cultural resources would be protected and preserved or stabilized as appropriate.• Natural sounds would be prevalent in this zone; however, human-related noise would become more audible near other zones, primary visitor use areas, and preserve boundary.• Viewsheds could be impacted by private development along the preserve boundary.	<ul style="list-style-type: none">• Native species and natural processes would predominate.• Evidence of human impact would be apparent near boat launches and water access points, but would be infrequent and limited in extent elsewhere in this zone.• The introduction of nonnative species would be prevented to the extent possible, and attempts would be made to eliminate introduced species before they became established.• The National Park Service would maintain close control over resource-damaging activities.• Natural resource conditions would be managed to ensure that water quality and natural processes in rivers and wetlands systems are maintained or improved.• Natural hydrological processes would be maintained, including quantity and timing of clean water needed to support aquatic and terrestrial systems (flow regimes), preservation of native streamside vegetation, and	<ul style="list-style-type: none">• Native species and natural processes would predominate.• Evidence of human impact would be apparent near boat launches and water access points, but would be infrequent and limited in extent elsewhere in this zone.• The introduction of nonnative species would be prevented to the extent possible, and attempts would be made to eliminate introduced species before they became established.• The National Park Service would maintain close control over resource-damaging activities.• Natural resource conditions would be managed to ensure that water quality and natural processes in rivers and wetlands systems are maintained or improved.• Resource conditions would be enhanced by limiting portions of the preserve waters to nonmotorized use.• Natural hydrological processes would be maintained, including quantity and timing of clean water needed to support

TABLE 3. BIG THICKET NATIONAL PRESERVE MANAGEMENT ZONES

	Land-based Zones				Water-based Zones	
	Developed or Administrative	Frontcountry	Backcountry	Primitive	Mixed Use	Nonmotorized
Resource Conditions (continued)					<p>instream structural diversity.</p> <ul style="list-style-type: none">• Cultural resources would be protected and preserved or stabilized as appropriate.• Natural sounds would be audible in this zone, but they would be frequently interrupted by noises from motors and other human activity.• Viewsheds could be impacted by private development along the preserve boundary.	<p>aquatic and terrestrial systems (flow regimes), preservation of native streamside vegetation, and instream structural diversity.</p> <ul style="list-style-type: none">• Cultural resources would be protected and preserved or stabilized as appropriate.• Natural sounds would be prevalent in this zone; however, human-related noise, including sounds from outside the preserve boundary, would be more frequent toward the edges of the zone and near primary visitor use areas.• Viewsheds could be impacted by private development along the preserve boundary.
Visitor Experience	<ul style="list-style-type: none">• Visitor facilities would be convenient and easily accessible.• Visitors should expect frequent encounters with other visitors and NPS staff—relatively high levels of human-related noise would be expected.• Relatively high levels of human-related sounds would be expected.	<ul style="list-style-type: none">• Visitor attractions would be convenient and easily accessible.• NPS and self-guiding opportunities would be available.• Frequent encounters with other visitors and NPS staff would be expected.• Visitors may experience natural sounds, but they would be frequently interrupted by human activity.• Natural and cultural/historic resources could be interpreted.	<ul style="list-style-type: none">• Variety of visitor experiences would be available—from NPS-led to self-discovery.• Some opportunities for solitude, challenge, adventure, and self-reliance would be provided.• The number of encounters with other visitors could be low to moderate with a possibility of moderate to high during peak season. A high density of use could be accommodated, especially at key access points along trails and water.• Visitors would experience natural sounds with some potential for interruptions from human-related sounds (particularly within a 300-foot buffer from roads, easements, water bodies, and preserve boundary).	<ul style="list-style-type: none">• Opportunities would be available for challenge, adventure, solitude, and self-reliance.• Visitors could find discovery areas with no on-site interpretation and very limited facilities.• Encounters with NPS staff and other visitors would be infrequent.• Visitors should primarily experience natural sounds, with some potential for interruption by human-related sounds (particularly within a 300-foot buffer from roads, easements, water bodies, and preserve boundary).• Evidence of recreational use would generally not be readily apparent.• Resource manipulation would be kept to a minimum, but some resource management actions may be required to reduce the impacts of visitor use.	<ul style="list-style-type: none">• Visitors could engage in a diverse mix of motorized and nonmotorized boating experiences.• The number of encounters with other visitors could be low to moderate with a possibility of moderate to high during peak use and near water access points. Encounters with NPS staff would vary based on level of use.• Sights and sounds of recreational activities would be evident.	<ul style="list-style-type: none">• Visitors would have the opportunity to enjoy the water without disruptions from motorized boats.• Numerous opportunities would be available for challenge, adventure, solitude, and self-reliance.• Encounters with NPS staff and other visitors could be infrequent in some areas during low periods of use, and would be more frequent during peak use.• During low periods of use, visitors would be able to experience the natural soundscape of the river.• Activities could include picnicking, scenic viewing, nature observation, bird-watching, hunting, trapping, fishing, canoeing, camping, kayaking, and rafting.

TABLE 3. BIG THICKET NATIONAL PRESERVE MANAGEMENT ZONES

	Land-based Zones				Water-based Zones	
	Developed or Administrative	Frontcountry	Backcountry	Primitive	Mixed Use	Nonmotorized
Appropriate Facilities and Activities	<ul style="list-style-type: none">• Activities could include visitor orientation and interpretation.• Facilities for visitor orientation and interpretation facilities, such as visitor centers.• NPS administrative facilities—offices, housing, support facilities for NPS management (maintenance shops, storage areas, communication facilities), water and wastewater treatment facilities, research facilities, ranger stations, and fire management office.• Comfort stations.• Closed to hunting and trapping.• Some facilities could support commercial visitor services if present or as appropriate.	<ul style="list-style-type: none">• Activities could include visitor orientation and recreational access.• Facilities to support access including transportation routes, trailhead parking, picnic areas, and kiosks.• Boardwalks and trails to access adjacent natural or cultural features; some trails would be accessible.• Selected cultural resources could be rehabilitated, adaptively used ,and/or interpreted.• Designated campground.• May include appropriate sanitation facilities (flush or vault toilet depending on location).• Water access points could include developed boat docks, launches and ramps, sanitation facilities, picnic tables, and trash receptacles.• Closed to hunting and trapping.• Commercial visitor services could be permitted that are consistent with NPS goals for visitor opportunities and activities.	<ul style="list-style-type: none">• Activities could include hiking, backpacking, hunting, trapping, fishing, horseback riding, camping, bird-watching, bicycling, and water-based activities.• Vehicle use allowed only on designated roads.• Information/interpretation kiosks and signs.• Support facilities.• Resource protection and monitoring equipment.• Administrative vehicle use of roads, trails, rights of ways, and easements would be managed to minimize impacts to resources and visitor experience.• Trails and routes may be designated for hiking, horseback riding, and bicycling.• May include sections of raised trail or boardwalks due to terrain or for resource protection.• Dispersed camping allowed.• Water access points could include developed boat docks, launches and ramps; sanitation facilities; picnic tables; and trash receptacles.• Water navigational markers may be provided.• Hunting and trapping allowed in designated areas and seasons as determined by the National Park Service in consultation with the Texas Parks and Wildlife Department.• Accessible trail(s) for hunting could be provided.• Commercial visitor services (e.g., outfitter or guide services) could be permitted that are consistent with NPS goals for visitor opportunities and activities.	<ul style="list-style-type: none">• Activities could include hiking, backpacking, hunting, trapping, fishing, camping, bird-watching, and water-based activities.• Administrative motor vehicle use of roads, trails, rights-of-way, and easements would be managed to minimize impacts to resources and visitor experience.• Limited or no visitor facilities; primitive trails or routes with minimal maintenance for resource protection.• A limited number of interpretive exhibits or signs may be needed to meet resource protection objectives.• Dispersed camping allowed.• Hunting and trapping allowed in designated areas and seasons as determined by the National Park Service in consultation with the Texas Parks and Wildlife Department.• Commercial visitor services (e.g., outfitter or guide services) could be permitted that are consistent with NPS goals for visitor opportunities and activities.• Water navigational markers would not be provided.	<ul style="list-style-type: none">• Activities could include picnicking, scenic viewing, nature observation, bird-watching, hunting, trapping, fishing, boating, canoeing, kayaking, rafting, and using canoe and kayak trails.• Moderate levels of development could be provided to accommodate launching and retrieving motorized and nonmotorized boats in the water.• Canoe and kayak paddle trails would be minimally maintained to reduce excessive portages under normal flow conditions.• Water-based facilities could include maintained canoe and kayak trails, camping platforms, and possible sanitation facilities (e.g., composting toilets).• Navigational markers may be provided.• Commercial visitor services (e.g., outfitter or guide services) could be permitted that are consistent with NPS goals for visitor opportunities and activities.	<ul style="list-style-type: none">• Administrative use of motorized boats would be managed to minimize impacts to resources and visitor experience.• Limited visitor facilities.• Canoe and kayak paddle trails would be minimally maintained to reduce excessive portages under normal flow conditions.• Water-based facilities could include maintained canoe and kayak trails, camping platforms and possible sanitation facilities (e.g., composting toilets).• Navigational markers may be provided.• Commercial visitor services (e.g., outfitter or guide services) could be permitted that are consistent with NPS goals for visitor opportunities and activities.

Special Management Areas

In addition to management zones, the alternatives also include special management areas (SMAs); these were identified by preserve staff during the development of the *Big Thicket National Preserve Oil and Gas Management Plan* (NPS 2006). These areas contain resources that are essential to maintaining the ecological integrity of the preserve. While the identification and protection of these areas are related to impacts and stipulations associated with oil and gas operations, the special management areas, with limited exceptions, would be

protected from the placement and development of roads, trails, and facilities. An example of an exception would include a floating dock or camping platform placed along the Neches River. The placement of a floating dock or camping platform will be within a swamp cypress-tupelo forest or floodplain hardwood forest.

The special management areas that are applicable to this general management plan are described in table 4. A special management area could be in any management zone.

TABLE 4. SPECIAL MANAGEMENT AREAS

Resource or Value	Special Management Area	Basis for Designation
Vegetation	<p>The Riparian Corridors Special Management Area includes</p> <ul style="list-style-type: none"> • floodplain hardwood forests • floodplain hardwood pine forests <p>This special management area consists of complexes of these vegetation types; where not defined by the above vegetation types, this area includes up to 300 feet from banks of major streams.</p>	Riparian corridors are critical in maintaining the ecological integrity of the preserve. Integral to preserving riparian corridors is the protection of floodplain functions and uses, plant and animal species diversity and composition, water quality, and other preserve resources and values in riparian areas.
	<p>The Rare Vegetation Communities Special Management Area includes</p> <ul style="list-style-type: none"> • upland pine forests • beech-magnolia-loblolly pine forests • sandhill pine forests • old growth trees 	These communities are rare, necessary to maintain the biodiversity in the preserve, and contain habitat for species of special concern.
Wetlands	<p>The Rare Forested Wetland Communities Special Management Area includes</p> <ul style="list-style-type: none"> • wetland baygall shrub thickets • swamp cypress-tupelo forests • wetland pine savannas • old growth trees <p>Ecological Research Monitoring Plots, including</p> <ul style="list-style-type: none"> • Royal Fern Bog Research Plot 	Forested wetland communities are rare or unique in the preserve.
Distinctive Landforms	Sand mounds	Sand mounds may assist scientists in reconstructing environmental conditions under which mounds formed. They may offer a means of investigating the physical and biological processes for creating and modifying landforms. Further, the integrity of mounds may be adversely affected by certain types of development and use.

USER CAPACITY

General management plans are required by law to address the topic of user capacity, also known as carrying capacity. The National Park Service defines user capacity as the types and extent of visitor use that can be accommodated while sustaining the quality of resources and visitor opportunities consistent with the purposes of the park. It is a process involving planning, monitoring, and management actions to ensure that a park unit's values are protected.

Managing user capacity in national parks is inherently complex and depends not only on the number of visitors, but also on where they go, what they do, and the “footprints” they leave behind. In managing for user capacity, the park staff relies on a variety of management tools and strategies, rather than solely on regulating the number of people in a park or simply establishing limits on visitor use. In addition, the ever-changing nature of visitor use in parks requires a deliberate and adaptive approach to user capacity management.

The basis for making user capacity decisions in this general management plan are the park's purpose, significance, laws and policies, and management zones. These define why the park was established and identify the most important resources and values—including visitor experience opportunities—that will be protected or provided. The management zones qualitatively describe the desired resource conditions and visitor experiences, including appropriate recreation activities, for different locations throughout the preserve. These elements direct the National Park Service on how to protect resources while offering a diversity of visitor opportunities.

Based on the desired conditions described in the management zones, indicators and standards are identified in this general management plan. An indicator is a

measurable variable that can be used to track changes in resource and social conditions related to human activity so that existing conditions can be compared to desired conditions. A standard is the minimum acceptable condition for an indicator. The indicators and standards help translate the broader qualitative descriptions of desired conditions in the management zones into measurable conditions. As a result, preserve managers can track changes in resource conditions and visitor experiences, and provide a basis for the preserve staff to determine whether desired conditions are being met. The monitoring component of this process also helps test the effectiveness of management actions and provides a basis for informed adaptive management of visitor use.

The general management plan also includes a range of actions that would be taken to maintain or restore desired conditions. For example, management actions may include providing information about low impact recreational use and the principles of Leave No Trace; directing visitors to designated facilities or areas; adding or altering facilities (e.g., trails, campsites) in order to confine use to designated areas; directing visitors to lesser-used areas or off-peak times; restricting the types of recreation activities permitted; and reducing the amount of visitor use in certain areas.

With limited staffs and budgets, NPS managers will focus more frequently on areas where there are likely visitor use changes or clear evidence of problems, or where problems can reasonably be anticipated during the life of this general management plan. This means monitoring will more frequently take place where conditions are approaching or violate standards, conditions are changing rapidly, specific and important values are threatened by visitation, or the effects of management actions taken to address impacts are uncertain.

User capacity decision making is a continuous process; decisions are adjusted based on monitoring the indicators and standards. Management actions are taken to minimize impacts when needed. The indicators and standards included in this management plan would generally not change in the future. However, as monitoring of the preserve's conditions continues, managers may decide to modify, add, or eliminate indicators if better ways are found to measure important changes in resource and social conditions. Also, if new use-related resource or visitor experience concerns arise in the future, additional indicators and standards would be identified as needed to address these concerns. The results of the monitoring efforts, related visitor use management actions, and any changes to the preserve's indicators and standards would be available to the public.

In summary, this general management plan addresses user capacity in the following ways:

- It outlines the preserve's purpose, significance, and management zones, which provide the basis for user capacity management.
- It describes the preserve's most pressing use-related resource and visitor experience concerns. This helps NPS managers focus limited resources on specific issues that may need management attention now or into the future. It also helps determine the most important potential indicators and standards to consider.
- It identifies the most important indicators that will be monitored and sets standards to determine if desired conditions are not being met due to impacts from visitor use.

It outlines representative examples of management actions that might be used to avoid or minimize impacts from visitor use.

OVERVIEW OF CURRENT AND POTENTIAL USE-RELATED IMPACTS

This section discusses existing and potential use-related impacts that may occur in the preserve, challenging managers' abilities to manage for the desired conditions outlined in this general management plan.

Excessive littering and dumping is a prominent problem in the preserve. This does not contribute to a positive visitor experience and also affects natural resources through trampling, the leaching of harmful chemicals into the soil and water, and degrading wildlife habitat. Further, *Escherichia coli* (*E. coli*) levels may be high in areas where visitors participate in water-based recreation activities. When *E. coli* levels are high, closures take effect in these areas, impacting the visitor experience. Natural resources are also impacted through diminished water quality and degraded wildlife habitat.

Some resource-related impacts also have occurred from illegal activities taking place within the preserve. The illegal use of off-road vehicles has created an extensive network of social trails (i.e., those created by visitors) compacting the soils and creating ruts, as well as trampling vegetation and causing wildlife disturbances. Poaching is another illegal use taking place in the preserve and has impacts on wildlife population levels.

There are no substantial impacts to cultural resources in the preserve currently attributed to visitor use. Although structural remnants of the former Voth Mill have been vandalized, the site previously lost considerable integrity following the closing of milling operations in the 1950s and is not recommended eligible for the National Register of Historic Places. Social trails resulting from visitors illegally using off-road vehicles or creating undesignated pedestrian trails present threats to the preserve's archeological sites and other cultural resources. This could occur, for example, as a

result of compaction or erosion disturbing the stratigraphic context of buried archaeological resources, or by contributing to the erosion of historic trails, road traces, and other cultural landscape features.

Hunting in the preserve can cause impacts to animal density and age or class structure as well as to visitor experience by crowding and over-hunting if this use is not properly managed and monitored.

Although there are no substantial crowding or use conflicts affecting visitor opportunities in the majority of the preserve, visitor crowding and conflicts between user groups is of particular concern at one popular day use area, Village Creek at White Sand Beach.

INDICATORS AND STANDARDS

This section identifies several measurable indicators that would be monitored in Big Thicket National Preserve. The indicators focus on key aspects of visitor experiences and resources, and more specifically on the most pressing use-related concerns described in the previous section. The GMP planning team considered many potential indicators that would identify visitor use impacts of concern, but those included in the following table are considered the most salient at this time given the preserve's desired conditions and existing visitor use patterns.

After selecting indicators, standards that represent the minimum acceptable condition for each indicator were identified. The standards selected for each indicator were based on best professional management judgment that was informed by the desired conditions outlined in the management zones, the preserve's baseline conditions for each indicator, and relevant preserve-specific and national research studies.

Eleven indicators and standards were selected as measures of visitor use effects at Big Thicket National Preserve. Table 5 includes the indicators, standards, related

monitoring, and potential future management strategies that would be implemented as a result of this GMP planning effort. The majority of these indicators and standards are related to illegal uses or litter, waste, and dumping. These are considered the priority visitor use-related issues and impacts at this time as well as the most feasible indicators for long-term evaluation. However, there are other issues and impacts that are already being assessed in some form by staff and will continue to be tracked during the life of the general management plan, including soundscapes, invasive species, presence of informal trails, improperly disposed human waste, number of campfires, and crowding on sections of the river, creeks and bayou. As needed and feasible, additional indicators and standards related to these other issues and impacts may be selected as part of future planning and assessment efforts. In the near future, a hunting management plan would be developed, which would include additional indicators and standards to guide the management of hunting at the preserve.

The staff would also continue general monitoring of use levels and patterns and would conduct periodic visitor surveys of visitor characteristics, expectations, and preferences. In addition, the preserve staff will add the user capacity indicators identified in the zone descriptions that are not already included in the current monitoring program. Monitoring protocol of the indicators identified in table 5 would be developed upon implementation of the general management plan. The rigor of monitoring the indicators (e.g., frequency of monitoring cycles, amount of geographic area monitored) may vary considerably depending on how close existing conditions are to the standards. If the existing conditions are well below the standard, the rigor of monitoring may be less than if the existing conditions are close to or trending toward the standards.

In addition, the initial phases of monitoring for the indicators and standards defined above would help the NPS staff identify if any revisions are needed. The initial testing of the

indicators and standards would determine if the indicators are accurately measuring the conditions of concern. Preserve staff may decide to modify the indicators or standards and revise the monitoring program if more effective and efficient methods are found to measure changes caused by visitor use. Most of these changes should be made within the first several years of incorporating changes to current monitoring. This iterative learning and refining process is the strength of this approach to managing user capacity—it can be adapted and improved as knowledge grows. After this initial testing period of monitoring indicators and standards, adjustments should not occur unless there is a compelling reason.

Finally, if use levels and patterns change substantially, the preserve staff may need to initiate additional monitoring of new

indicators to ensure that desired conditions are maintained. Some of the potential future user capacity indicators may relate to those already noted above as well as crowding at other high-use areas and attraction points, and use conflicts on the river or any of the creeks and bayous.

The selection of any new indicators and standards for monitoring purposes, changes to the indicators and standards identified in this general management plan, or the implementation of any management actions that affect use would comply with the National Environmental Policy Act, the National Historic Preservation Act, and other laws, regulations, and policies, as needed. NPS staff would also inform the public of progress and revisions to indicators and standards through regular reporting on the user capacity program.

TABLE 5. USER CAPACITY INDICATORS AND STANDARDS

Indicators	Assigned Zone	Standards	Management Strategies
Dumping Number of new and existing dumping sites encountered and incidences recorded in areas currently patrolled	All Zones	No more than six incidences ¹ of dumping per area ² annually ¹ Incidences defined as one or more large items or multiple bags of trash. ² Area consists of locations geographically close together (e.g., Timber Slough Road parking lot and day use area)	<ul style="list-style-type: none"> • Increase targeted enforcement • Increase education and information distribution • management site with placement of physical barriers and improved boundary marking • Develop partnerships and community involvement (e.g., Park Watch) • Change visitor use hours • Increase ongoing cleanup response
ORV Impacts Number of illegal ORV instances (instances being new trails, or continued use of existing illegal trails) per unit of the preserve	All zones	Zero tolerance of unauthorized ORV use	<ul style="list-style-type: none"> • Install signs in ORV-impacted area • Educate public about adverse impacts of off-road vehicles using brochures, outreach programs, and website information • Develop partnerships with nearby landowners where ORV users could be directed • Install physical barriers • Close and restore areas • Increase enforcement
Houseboats Presence of a noncompliant houseboat	All water-based zones	Zero tolerance for noncompliant houseboats	<ul style="list-style-type: none"> • Install signs at areas where people are putting in houseboats (i.e., Timber Slough Road, boat ramps in general) • Increase education and information • Increase enforcement • Impound and remove
Poaching or Illegal Taking of Resources Number of incidences of citations or encounters of obvious removal, as evidenced by shovel holes or other signs of activity.	All zones	No more than five incidences of poaching or illegal taking of resources in all nonwater-based zones per unit annually	<ul style="list-style-type: none"> • Increase education and information • Implement a "Park Watch" Program • Install signs at trailheads (stating that resource removal and unauthorized collecting is illegal and punishable by law) • Install signs at trailheads and boat ramps (stating that the use of untagged trot lines, netting, shocking, and dynamite is illegal and punishable by law) • Increase boundary marking

TABLE 5. USER CAPACITY INDICATORS AND STANDARDS

Indicators	Assigned Zone	Standards	Management Strategies
			<ul style="list-style-type: none"> • Increase enforcement • Adopt state fishing laws via a special regulation • Adopt a permitting system and supply preserve tags via a special regulation
Water Quality <i>Escherichia coli</i> (<i>E. coli</i>) levels in areas where visitors participate in water-based primary contact recreation activities	High-use areas within water-based zones	<i>E. coli</i> levels do not to exceed Texas state water quality standards as tested on a quarterly basis per year	<ul style="list-style-type: none"> • Increase education and information • Coordinate with Texas Commission on Environmental Quality • Increase monitoring • Temporary closures • Install comfort facilities
Vandalism of NPS Assets Number of occurrences of vandalism that results in damage to NPS assets	All zones	Two or more occurrences of vandalism that results in damage that requires repair or replacement on NPS assets per location over a two year period	<ul style="list-style-type: none"> • Increase visitor education, including signage • Improve design of facility to minimize potential for vandalism • Identify Park Watch, community partnerships, and volunteer opportunities to monitor targeted areas • Increase targeted patrols, surveillance, and visitor contacts, including continued partnerships with local law enforcement entities • Depending on cost of replacement, amount and type of use, and potential for resource and safety concerns, consider not replacing the facility
Visitor Conflicts Percent of any use group population (e.g., hunting, hiking, boating) that experiences conflicts either within or between user groups (can be reported or observed)	All zones	5% of any use group population (e.g., hunting, hiking, boating) that experiences conflicts either within or between user groups (can be reported or observed) per activity season	<ul style="list-style-type: none"> • Increase education regarding recreation etiquette and park regulations, including working with local user groups • Adjust to group size or number, increase separation of groups by location or season, adjust the number of users per area • Site management to separate user groups or adjust use levels • Increase roving patrols • Minimize conflicts by planning times and locations of educational, large group programs
Visitor Crowding	Backcountry and water-based zones, specifically	400 vessel trips (canoes, kayaks, and tubes) per day on Village Creek	<ul style="list-style-type: none"> • Initiate further analysis of visitor experiences and satisfaction

TABLE 5. USER CAPACITY INDICATORS AND STANDARDS

Indicators	Assigned Zone	Standards	Management Strategies
<p>Number of vessel trips (canoes, kayaks, and tubes) per day on Village Creek south of FM 418 and north of US 96</p> <p>[Note: FM is Farm to Market Road; CR is County Road; US refers to United States Numbered Highways]</p>	Village Creek between FM 418 and US 96	between FM 418 and US 96 for 50% of weekends and holidays during the peak boating season	<p>associated with on-water activities to determine the most effective adaptive management strategies</p> <ul style="list-style-type: none"> • Increase education regarding alternate times, days, and locations to voluntarily distribute use to lesser used times, days, and locations • Increase targeted patrols and visitor contacts • Improve other canoe trails or increase access points to distribute use • Partner with outfitters to better distribute use temporally and spatially • Regulate group sizes and use levels
<p>Quality Hunting Opportunities</p> <p>Percent of additional requested hunting permits above previous hunting permit limits by unit</p>	Backcountry, primitive, and water-based zones	20% additional requests per year for hunting permits above previous hunting permit limits by unit	<ul style="list-style-type: none"> • Initiate additional analysis of hunting satisfaction, safety and resource conditions to consider the need for developing new hunting permit limits, including consideration of how permits would be issued • Increase education of low-impact practices • Encourage voluntary distribution of use • Increase targeted enforcement • Increase access points to better distribute use • Change length of hunting seasons per type of species, or remove certain species from permitted hunting • Change available acreage • Change permitted weapons • Charge a use fee for hunting permits

ALTERNATIVE 1: CONTINUATION OF CURRENT MANAGEMENT (NO-ACTION ALTERNATIVE)

CONCEPT

Under this alternative, the current management approach for the preserve would continue into the future. The management direction would be in accordance with the 1980 general management plan, previous NPS practices and approved actions, and all applicable laws, regulations, and policies. Lands acquired after the 1980 general management plan (including the Big Sandy Creek corridor unit, Village Creek corridor unit, and Canyonlands unit) would be managed in a manner compatible with existing units. New or expanded uses would not be anticipated. Because currently there are no management zones designated for alternative 1, the management zones described earlier in this chapter have not been applied to this alternative (see figure 3).

NATURAL RESOURCES MANAGEMENT

Lands would continue to be administered to assure their natural and ecological integrity in perpetuity. Management of natural resources would continue to emphasize the mitigation of impacts from oil and gas operations and other preserve uses, management of nonnative plants and animals, biological inventory, and restoration of fire-adapted communities.

Biodiversity and Science

The National Park Service staff would continue to work with partners such as the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program to complete biological inventories (e.g., “Thicket of Diversity” All Taxa Biological Inventory), implement vital signs monitoring, and promote scientific research on the biodiversity of the Big Thicket.

The preserve staff would also continue to adaptively manage resources using the best available scientific information regarding climate change. Opportunities to conduct research on species and vegetation communities that are susceptible to the effects of climate change would be pursued. The staff would continue to meet agency goals for sustainability, energy conservation, and greenhouse gas emission reduction.

Nonnative Species

The National Park Service would continue current management of invasive and nonnative species. The preserve staff would continue efforts to control Chinese tallow, Japanese climbing fern, and other invasive nonnative species that pose the greatest resource threats. Management actions would mainly be conducted and coordinated with NPS exotic plant management teams and be targeted on limited populations and areas that can be feasibly controlled. A variety of integrated pest management principles would be used including mechanical and chemical methods of nonnative plant control. Cooperative control efforts with volunteers and neighboring agencies would continue on a limited basis, including educational and prevention-oriented activities. Planning for management of nonnative feral hogs and other animal species would continue.

Endangered and Threatened Species and Species of Concern

The preserve staff would continue to comply with law and NPS *Management Policies 2006* for management of endangered and threatened species and species of management concern; this would include consultation with the U.S. Fish and Wildlife Service and participation with Texas Parks and Wildlife and other groups in monitoring, education,

and recovery of listed species. Preserve staff would continue to focus on the monitoring and recovery of Texas trailing phlox, restoration of habitat for fire-adapted species of concern, and participation in the East Texas Black Bear Task Force.

Water

The National Park Service would strive to ensure that there is adequate flow (quantity and timing) of clean water to optimize the ecological support of aquatic and terrestrial systems. The preserve staff would continue to manage for natural processes in rivers and wetland systems, including natural meanders, protection of overbank flows and other hydrologic processes that sustain wetland and floodplain vegetation, and preservation of native streamside vegetation and instream structural diversity. Staff would continue to conduct water quality monitoring at selected sites in the preserve through the Gulf Coast Inventory and Monitoring Program. They would continue to work with partners, researchers, and agencies to inventory and monitor fish, freshwater mussels, and other aquatic organisms. The preserve staff would continue to work toward the definition of environmental flow requirements for aquatic species and floodplain vegetation communities, and would work with neighboring agencies and partners to improve water quality, implement high-pulse flows, and reduce trash and pollutants.

Oil and Gas Management

As specified in the enabling legislation, the National Park Service would continue to regulate the exploration for, and extraction of oil and gas. The preserve staff would continue to manage oil and gas operations under the servicewide regulations governing the exercise of nonfederal oil and gas rights in park units at 36 CFR Part 9, Subpart B and the *Big Thicket National Preserve Oil and Gas Management Plan*. A variety of measures would continue to be implemented to minimize the impacts of oil and gas operations such as encouraging directional drilling, and

requiring that mitigation measures be addressed for operations with surface locations in the preserve. Voluntary mitigation from operations with surface locations outside the preserve would be encouraged. Abandoned oil and gas sites, abandoned pipeline and road rights-of-way would be reclaimed where appropriate and feasible. Standard operating procedures would continue to be used to mitigate the impacts of rights-of-way operations and maintenance activities.

Fire Management

The preserve staff would continue to use a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities in order to allow fire to function in its natural ecological role, restore ecosystem balance (e.g., stand structure and diversity), and manage hazardous fuels in the urban interface. Fire management actions in the preserve would continue to be consistent with overall resource management objectives, public health, firefighter and public safety, environmental laws and regulations, and be based upon best available science. Fire management activities would include hazardous fuel reduction and restoration, especially of longleaf pine and wetland pine savanna communities. Wildfires would be managed safely and effectively using tactics that minimize impacts to resources. The preserve staff would continue to work cooperatively with the Texas Forest Service, counties, and other partners on mutual support for response to wildfires, prescribed fire management, fire prevention and preparedness, and restoration as appropriate.

CULTURAL RESOURCES MANAGEMENT

The National Park Service would continue efforts to protect, preserve, and stabilize cultural resources (i.e., archeological resources, historic buildings and structures such as the Staley Cabin, cultural landscapes,

ethnographic resources, and museum collections) as staffing and funding priorities allow. Appropriate cultural resources studies and investigations would be undertaken. In fulfillment of section 106 compliance requirements, the preserve staff would continue to carry out surveys of areas proposed for construction or ground disturbance (e.g., oil and gas operations) to identify and document cultural resources within areas of potential effect that may be eligible for the National Register of Historic Places. The anticipated effects on these resources would continue to be assessed in consultation with the Texas state historic preservation officer (SHPO), associated tribes, and other concerned parties. Adverse impacts on significant resources would be avoided or adequately mitigated.

Cultural resources studies and investigations would be carried out as necessary with available staffing and funding, including surveys conducted with contracted services to fulfill project compliance requirements. Information compiled and synthesized from these investigations would be incorporated in cultural resource management databases. The preserve staff would continue to consult with NPS regional staff, the Texas SHPO, the Alabama-Coushatta tribal historic preservation officer (THPO), and other concerned parties to ensure that potential cultural resources in areas of proposed activities are identified, documented, and protected. Existing cultural and education partnerships would continue.

VISITOR USE AND EXPERIENCE

Visitors would continue to have opportunities to enjoy a wide range of land and water-based recreational activities consistent with the purpose of the preserve. The traditional range of visitor use activities would continue with few substantial changes anticipated. Visitors would continue to receive information from NPS staff primarily in the headquarters and visitor center area, and could expect to encounter NPS presence in areas with high

visitor use. NPS staff would continue to inform visitors of the preserve boundaries and regulations, and emphasize water safety measures.

Visitor Opportunities

Houseboats. The management of houseboats would be prioritized as resources allow, ensuring compliance with local, state, and federal laws.

Motorized Boats. Consistent with legislation, the preserve staff would continue to limit and control the use of motorized boats. Existing boat ramps and launch facilities would remain; no new facilities would be anticipated.

Off-road Vehicles and Personal Watercraft. Off-road vehicles and personal watercraft use would continue to be prohibited.

Horses. Existing horseback riding opportunities within the preserve would continue to be restricted to the designated route in the Big Sandy unit. New uses would not be considered.

Bicycling. Existing bicycling opportunities within the preserve would continue to be restricted to the designated route in the Big Sandy unit. New uses would not be considered.

Hunting, Fishing, and Trapping. The preserve staff would continue to permit hunting, fishing, and trapping where currently authorized, including over 47,000 acres in portions of the Beaumont, Beech Creek, Big Sandy Creek, Neches Bottom and Jack Gore Baygall, and Lance Rosier units. Other locations would continue to be closed to hunting and trapping for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment.

Roads and Trails. No substantial changes to roads and trails, including water and land trails and those accessible to mobility-impaired individuals, would occur under the alternative 1. This would include those lands recently added to the preserve.

Paved roads (Sunflower Road, Gore Store Road) and unpaved roads would remain as they are currently. Unpaved roads include the following:

- **Big Sandy Creek Unit:** Lily Road, Firelane Road
- **Turkey Creek Unit:** Pin Oak Road (CR 4850), CR 4825, Ranch House Road
- **Neches Bottom and Jack Gore Baygall Unit:** Timber Slough Road (including spur to Tater Patch Lake) and Zig Zag Road
- **Lance Rosier Unit:** Teel Road, Cotton Road, Little Rock Road, and Fire Tower Road
- **Loblolly Unit:** CR 2071

The preserve staff would continue to maintain existing trails and uses:

- **Big Sandy Unit:** Woodlands Trail, Big Sandy Trail, Beaver Slide Trail
- **Turkey Creek Unit:** Turkey Creek Trail, Pitcher Plant Trail, Kirby Nature Trail, Sandhill Loop
- **Beech Creek Unit:** Beech Woods Trail
- **Hickory Creek Savannah Unit:** Sundew Trail
- **Menard Creek Corridor Unit:** Birdwatchers Trail

There are three existing minimally maintained water trails in the preserve.

Camping. Backcountry camping would continue to be allowed consistent with existing rules and regulations.

Interpretation and Education. The preserve staff would continue to offer interpretive and educational activities and programs that are consistent with the purpose of the preserve. New or expanded activities would not be anticipated. Educational programs would continue to encourage effective collaboration with educators, address preserve interpretive themes and meet the audience's curriculum objectives. Programs would be offered based on available staffing.

OPERATIONS AND FACILITIES

Operations

Staffing. The National Park Service would continue to operate the preserve within the approved ceiling of 24.5 full-time equivalent (FTE) and related positions (one FTE is one person working 40 hours per week for one year or the equivalent).

Commercial Visitor Services. Commercial visitor services could be authorized if these uses are determined necessary and appropriate (e.g., rentals and guide services).

Partnerships. Cooperative management agreements and efforts would be maintained to enhance preserve operations and expand common goals and interests related to administration, interpretation, natural resource management and protection, and maintenance.

Environmental Leadership. The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction, and would incorporate LEED construction standards. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would continue, including recycling of office materials and green purchasing.

Facilities

The National Park Service would continue to limit new construction within the preserve for public use and administrative facilities, including roads, vehicular campgrounds, and employee housing. As facilities and equipment are replaced or renovated, designs and selections would, as feasible, minimize impacts to the night sky and soundscapes. The preserve boundary would be marked or improved as necessary to reduce boundary incursions and other illegal activities.

To increase the visibility of National Park Service staff and their interactions with gateway communities, district ranger stations could be maintained or established inside or outside the preserve. In some instances, visitor contact stations would be jointly located with existing facilities, possibly in Beaumont, Woodville, Saratoga, and Silsbee (Seale House).

The headquarters and visitor center complex on FM 420 would remain at the current location. In addition, the preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues.

The National Park Service would reestablish a visitor contact station in the Beaumont area using an existing U.S. General Services Administration (USGSA) lease. Hurricanes Rita (2005) and Ike (2007) caused extensive damage to the combined administrative and visitor contact building leased through U.S. General Services Administration. Reestablishing a visitor contact station would restore our accessibility to hundreds of thousands of daily travelers along I-10 corridor, at no additional cost to the preserve. The preserve staff would continue to maintain the fire management facility in Woodville, which could include a ranger station, and would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory.

Boat Ramps and Launches. Existing boat ramp and launch facilities would be maintained and new public facilities would not be anticipated. The cooperative maintenance of existing public boat ramps would continue on the Neches River (McQueen's Landing, Highway 96 bridge, Confluence, Saltwater Barrier, and Pine Street), Village Creek Highway 96, and Pine Island Bayou Highway 69/96/287. The U.S. Army Corps of Engineers, Lower Neches Valley Authority, and Texas Department of Transportation would continue to provide access through or on their respective agencies property. These agencies constructed and would continue to maintain boat ramps, canoe launch sites, and parking areas that provide preserve visitors access to preserve water corridor units. The preserve would continue to provide information boards and trash facilities at these locations and lead interpretative and educational programs from these sites.

Roads, Trails, and Public Access. The National Park Service would continue to maintain existing paved roads and unpaved roads and existing trails and uses. Existing trailheads, parking areas, and associated facilities (picnic tables, benches, restrooms, kiosks, etc.) would remain in their current general locations at existing trails, boat ramps, and other day use areas (Holly Grove, Franklin Lake, Lakeview, Four Oaks Ranch Road, Cook's Lake Road, Edgewater, White Sands Beach).

New roads and trails in newly acquired lands would not be anticipated. Existing facilities for public access would remain and substantial new access would not be anticipated.

Camping. The preserve staff would continue to manage current backcountry camping opportunities consistent with existing rules and regulations.

Housing and Related Facilities. The current *Housing Needs Assessment and Housing Management Plan* documents the need for

three housing units. Current preserve employee housing includes the Lily Bunkhouse, Ranch House, and Seale House. Future housing could include the Lily Estate House (life estate). Once the Lily Estate House becomes preserve property, it along with the other three existing houses would be assessed for condition and suitability for housing, for a determination as to which three to maintain. The field research station and Brammer House would continue to accommodate preserve researchers.

ESTIMATED COSTS AND STAFFING

Cost estimates for alternative 1 are identified in table 6. These cost estimates, in 2010 dollars, are only intended to indicate a very general relative comparison of costs among the alternatives; they are not to be used for budgeting purposes.

Identification of these costs does not guarantee future NPS funding. Project funding may not come all at once; it would likely take many years to secure and may be partially obtained through partners, donations, or other non-NPS federal sources. Although the National Park Service hopes to secure this funding, the preserve may not receive enough funding to achieve all desired conditions within the time frame of this management plan (the next 15–20 years). Costs have been broken down into two categories: annual operating costs and one-time costs. Annual costs include the costs associated with ongoing maintenance, utilities, staffing, supplies and materials, and any leasing costs. One-time costs include projects such as construction of new buildings, trail building, native species restoration, and structure rehabilitation.

Annual Costs

The preserve may employ up to the equivalent of 24.5 FTE staff. This staffing level would be maintained for this alternative. Seasonal and student employees as well as volunteers supplement the preserve staff, and would

continue to support the preserve as needed. Employee salaries and benefits make up a large portion of the preserve's annual operating costs. Under this alternative, the preserve's annual operating budget would remain at \$2.65 million.

One-time Costs

It is estimated that this alternative would require one-time costs of \$2.33 million in 2010 dollars. These costs would improve visitor safety and maintenance for the headquarters and visitor center complex on FM 420, which primarily addresses school bus, visitor, employee, and government vehicle parking concerns. In addition, LEED standards, where possible, would be integrated into these facilities. Further, once the Lily Estate House becomes preserve property, it along with the other three existing houses, would be assessed for condition and suitability for housing to determine which of the three would remain in preserve housing inventory.

Deferred Maintenance

Deferred maintenance refers to maintenance activities for assets in the preserve that were not preformed when scheduled. Assets include infrastructure such as buildings and trails, as well as docks and wayside exhibits. The preserve staff has identified approximately \$2.6 million of deferred maintenance related to assets in the preserve. This figure is representative of when the assessment was made and is not necessarily indicative of future deferred maintenance needs. When the assessment was conducted, the majority of the deferred maintenance costs in the preserve related to new lands that have been recently added to the preserve and have not been fenced. Under this alternative, the preserve would address this and other deferred maintenance activities. In particular, the preserve would address deferred maintenance related to drainage in the headquarters parking lot. The preserve staff would continue to address deferred maintenance of preserve assets as expeditiously as possible.

TABLE 6. SUMMARY OF COSTS FOR ALTERNATIVE 1

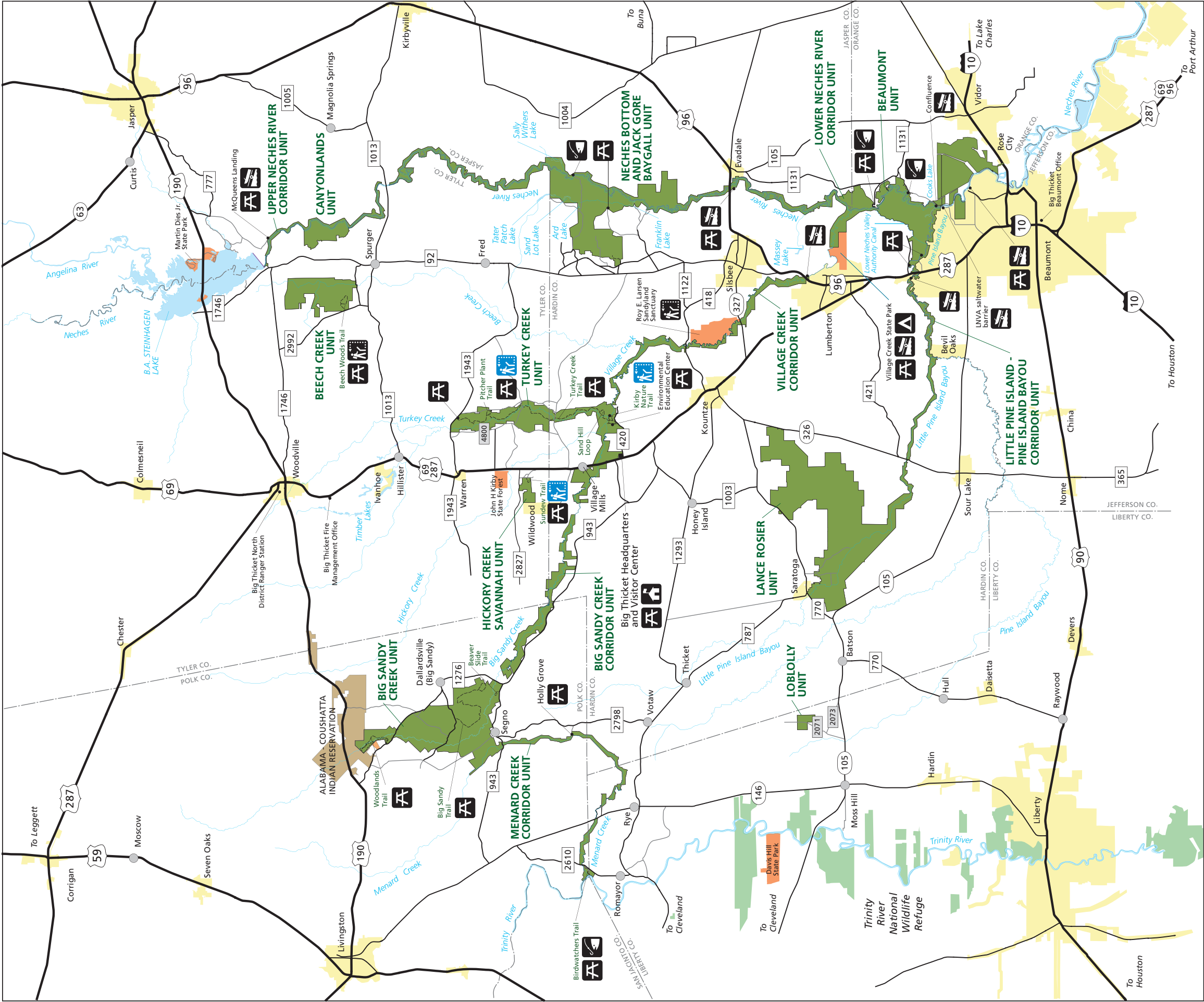
ANNUAL OPERATING COSTS	
Annual Operating Costs ¹	\$2,653,000
Increased Staffing	0
Staffing (additional full-time equivalent)	24.5 (+0)
ONE-TIME CAPITAL COSTS	
Facility (Construction):	
Visitor Infrastructure and Experience	0
Resource Management and Visitor Safety	0
Operational Improvements <ul style="list-style-type: none"> headquarters area and visitor center complex on FM 420 visitor use areas of headquarters and visitor center complex on FM 420 LEED construction standards housing assessment 	\$ 2,330,000
Total One-time Capital Costs	\$ 2,330,000
Deferred Maintenance ²	\$ 2,686,000

¹ 2010 funding level.

² Deferred maintenance is primarily a result of the need to fence additional lands added to the preserve boundary.

Big Thicket National Preserve

Alternative 1: Continue Current Management



Camping



Public boat launch



River access
(no boat launching)



Ranger station



Picnic area
and parking



Self-guiding trail



Wheelchair-accessible
self-guiding trail



State road



Farm-market road



County road



Unpaved road



Trail



Big Thicket National
Preserve



Other conservation
areas (non NPS)



Trinity River
National Wildlife Refuge



Alabama Coushatta
Indian Reservation



Municipal boundary



Big Thicket
National
Preserve



ALTERNATIVE 2: PARTNERSHIPS AND COLLABORATION (PREFERRED ALTERNATIVE)

CONCEPT

This alternative concept endorses a broad ecosystem perspective for protection of substantial portions of the historic “Big Thicket.” This alternative acknowledges the challenges associated with cross-boundary resource management issues and recognizes the importance of encouraging partnerships to address and resolve resource problems. The National Park Service would actively engage in regional planning and policy efforts that benefit resource protection, offer compatible visitor use, and address other issues, both within and outside the preserve boundaries (see figure 4).

The National Park Service would emphasize the status of Big Thicket National Preserve as a globally important biological protection area. Initiatives that advance the long-term protection of the preserve’s natural resources would receive the primary focus of management attention and funding. The preserve staff would continue to protect and preserve significant cultural resources consistent with law and policy. Appropriate visitor opportunities would be expanded. As a means to achieve these objectives, the preserve staff would expand existing partnerships and seek new partnership agreements with outside public and private organizations having similar overall objectives for resource protection, law enforcement, public education, interpretation, and other operational requirements. Preserve operations would incorporate strong environmental protection and sustainable development practices.

NATURAL RESOURCES MANAGEMENT

Management of natural resources within the preserve would focus on resource

management from a regional or ecosystem-wide prospective. The preserve staff would undertake comprehensive restoration activities, including fire management and controlled burns, to maintain the ecological integrity of the preserve in a largely unfragmented condition. The National Park Service would increase its coordination efforts with neighboring land management agencies, researchers, volunteers, and nongovernmental organizations to achieve natural resource management goals. Outside the boundary, the preserve staff would strive to enhance natural resource management through active participation in regional planning, educational programs, and partnerships.

Biodiversity and Science

In addition to the biological inventory and monitoring programs described in alternative 1, the National Park Service would strive to more actively coordinate with researchers in an effort to prioritize scientific research to meet resource management needs. Studies could focus on landscape scale evaluations of restoration methods, the impact of habitat fragmentation, invasive species control, fire management strategies, and species interactions within ecological communities.

As in alternative 1, the National Park Service would continue to adaptively manage resources by using the best available scientific information; conducting research on susceptible species as resources allow; and working to meet agency goals for sustainability, energy conservation, and greenhouse gas emissions. Under this alternative, further efforts would be undertaken to increase understanding of the effects of climate change on preserve resources and to enhance the resiliency of habitats to the effects of climate change. The preserve staff would undertake landscape-

scale restoration activities to maintain the ecological integrity of the preserve. Restoration activities would be prioritized to promote connectivity and to mitigate, as best as possible, habitat fragmentation caused by separation of park units, trans-park utility and transportation corridors, and the effects of adjacent land use practices (e.g., short timber rotations and conversion of land to agriculture and development). Restoration activities would be designed to contribute to the resilience of the landscape as the landscape changes in response to climate change.

The National Park Service would coordinate, when appropriate, with neighboring land management agencies, local universities, and nongovernmental organizations to complete research necessary to develop a regional approach to ecosystem management. The staff would also partner with other agencies, universities, and organization to conduct regionwide scientific studies to address the resiliency of local habitats to climate change, in part by establishing baseline data and identifying at-risk species. They would also partner with local schools to develop educational programs about sustainability, energy conservation, and greenhouse gas emission reduction, and how climate change may affect the region as a whole.

Nonnative Species

As in alternative 1, the preserve staff would continue its current management of the invasive and nonnative species that pose the greatest threats to preserve resources through integrated pest management in cooperation with NPS exotic plant management teams. Also under this alternative, the staff would increase efforts to partner with neighboring land management agencies, volunteers, and nongovernmental organizations to combat nonnative invasive species on a regional scale, employing educational partnerships and cross-boundary control efforts. The National Park Service would increase the acreage for nonnative species management using integrated pest management principles that

include mechanical and chemical methods. Monitoring activities would be improved and expanded, including increased involvement of the NPS exotic plant management team. The preserve staff would work with partners to eradicate nonnative species within and outside the preserve. The staff would develop and implement effective control techniques to limit the damage caused by nonnative animal species, including feral hogs, nutria, and others.

Endangered and Threatened Species and Species of Concern

Under this alternative, the National Park Service would continue the actions described in alternative 1, including consultation with the U.S. Fish and Wildlife Service and participation with partners in monitoring, education, and recovery of listed species. In addition, the preserve staff would expand activities related to monitoring and recovery of all endangered and threatened species and species of management concern that occur in the preserve. In recognition of the important role that protected lands serve in providing habitat for the region's rare species, the National Park Service would research the ecology, restore habitat, and undertake reintroduction actions, where practical, for endangered and threatened species and species of management concern.

Water

Under this alternative, the National Park Service would continue the actions described in alternative 1, including continuing to strive to ensure that there is adequate flow of clean water to optimize the ecological support of aquatic and terrestrial systems and manage for natural processes in rivers and wetlands, including instream structural diversity. The preserve staff would continue to work with partners, researchers, and agencies to provide inventory and monitor activities, improve water quality, implement high pulse flows, and reduce trash and pollutants. The preserve staff would work toward the definition of environmental flow requirements for aquatic

species and floodplain vegetation communities. In addition, under this alternative the preserve staff would work with partners to protect watersheds from source and nonsource pollutants, maintain natural fluvial processes, and practice good watershed management (e.g., maintaining channel structural diversity and processes, native floodplain forest vegetation, and natural runoff). The preserve staff would pursue improved watershed health through community outreach and educational programs (e.g., watershed academies).

Partnerships would focus on working directly with communities to educate residents about the importance of maintaining the flow of water through the preserve and the region. The preserve staff would research, define, and protect the environmental flow regime (instream and overbank flow volumes, duration, and timing) to sustain aquatic species, river and stream ecology, estuaries, and floodplain vegetation. The National Park Service would work with state offices, water authorities, and planning commissions to protect water quality and freshwater environmental flows. In collaboration with the U.S. Army Corps of Engineers and the Lower Neches Valley Authority, the National Park Service would seek management agreements for the Neches River to maintain optimal flows necessary to benefit the health of ecological systems and control the spread of nonnative species.

Oil and Gas Management

In addition to implementing measures to minimize the impacts of oil and gas operations, and managing based on preserve legislation, law, and servicewide regulations described in alternative 1, the National Park Service would work in coordination with the Texas Railroad Commission, the Federal Energy Regulatory Commission, and other jurisdictional agencies to develop a mitigation and management program for within-boundary surface operations that would represent additional actions over and above regulatory requirements.

The National Park Service would implement a variety of measures to improve the protection of preserve resources and values from the impacts of oil and gas operations. The measures would include:

- Requiring the use of improved mitigation measures such as noise reduction cladding, cleaner production technology, and enhanced best management practices for operations with surface locations within the preserve.
- Increasing frequency of oil and gas monitoring activities and increased enforcement of violations by operators in the preserve.
- Encouraging operators to improve voluntary mitigation measures by recognizing and rewarding operators that exceed regulatory requirements and work closely with the National Park Service to protect the environment and public health through state-of-the-art mitigation.

Fire Management

The National Park Service would continue management practices described in alternative 1 by using a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities in order to allow fire to function in its natural ecological role, restore ecosystem balance, and manage hazardous fuels in the urban interface.

CULTURAL RESOURCES MANAGEMENT

As in alternative 1, the preserve staff would continue efforts to protect, preserve, and stabilize cultural resources as staffing and funding priorities allow. Appropriate cultural resources studies and investigations would be undertaken (e.g., archeological surveys, historic structure reports, cultural landscape inventories and reports, traditional use

studies). Evaluative testing of selected archeological sites would be carried out to assist determinations of national register eligibility. In addition to these actions and in accordance with appropriate treatment recommendations and guidance documentation, the National Park Service would actively preserve, stabilize, and rehabilitate selected historic structures and cultural landscapes (e.g., Staley Cabin, Rosier homestead site). Preservation treatments would be carried out to protect historic properties from weathering, erosion, and other impacts including climate change, and to correct unsafe conditions. The Staley Cabin and its associated cultural landscape would be rehabilitated to reflect its 1920s period of significance. Although the Voth Mill may not meet the criteria of eligibility for the National Register of Historic Places because of diminished historical integrity, the National Park Service would stabilize structural remnants to remove safety hazards and retain potential interpretive values. Archeological and ethnographic resources would also be protected and preserved. Expanded research on the cultural resources and the history of the Big Thicket would be conducted.

As part of the overall visitor interpretive experience provided at the preserve, visitors would have greater opportunities to understand and appreciate the relevancy of its history, stories and associated cultural resources. Living history programs could be used to enhance visitor understanding.

As in alternative 1, cultural resources studies would continue to be carried out as necessary with available staffing and funding, and resulting information would be incorporated in cultural resource management databases. In addition to these actions, the preserve staff would promote more extensive research to document the area's history and cultural resources and to plan for the appropriate management of those cultural resources. Similar to alternative 1, partnership assistance would be sought from NPS regional staff, the Texas SHPO, the Alabama-Coushatta THPO, and other historic preservation groups to

carry out cultural resource surveys and documentation, assessment, and monitoring of resources.

VISITOR USE AND EXPERIENCE

This alternative would emphasize low impact recreation and a variety of recreational opportunities ranging from self-guiding to ranger-led experiences. Opportunities to learn through discovery and citizen science would be provided. Connections to outside partners or programs providing experiences not permitted in the preserve would also be encouraged.

Visitor Opportunities

The National Park Service would promote low-impact activities that best conform to the protection of the preserve's resources. The traditional range of visitor use activities would continue under this alternative (e.g., boating, canoeing, kayaking, bird-watching, and hiking). A wide variety of additional visitor use and interpretive activities and programs would be provided, including self-guiding or ranger-led tours, interpretive wayside exhibits, displays, and demonstrations (e.g., living history programs). New technologies, such as GPS-based recreation, mobile phone applications, and virtual field trips, may be used to extend the range of low impact visitor activities.

As a means to encourage increased visitor use, the National Park Service would explore opportunities to partner with recreation providers who may be able to offer certain types of visitor services and activities outside the preserve that are not permitted in the preserve under existing policies. Such development and activities could include ORV trails and campgrounds in areas reasonably close to the preserve. The preserve staff could provide technical assistance to develop wayside exhibits and materials at outside (non-NPS) campgrounds and trailheads to further mutual objectives for resource protection and visitor orientation.

An auto tour route of the preserve could be developed along with trailheads and hiking trails to link the various units. The trails and auto tour route could include self-guiding interpretive information presented in brochures or on wayside exhibits.

Houseboats. It is the intent of this alternative to have all houseboats (generically speaking—a boat that is designed and equipped for use as a dwelling) to comply with laws and regulations, including proof of registration, sanitation, camping as articulated in the Superintendent’s Compendium, and unattended property regulations. The majority of “houseboats” found within the waters of the preserve are not commercially produced and most are not registered as vessels. Additionally, these houseboats are lashed to trees on a permanent basis, which causes damage to preserve resources.

Visitors would have the opportunity to use houseboats in the preserve subject to existing regulations and policies. Houseboats would be required to comply with laws and regulations including proof of registration, sanitation, camping as articulated in the Superintendent’s Compendium, and unattended property regulations. Houseboats left unattended for more than 24 hours would be impounded and removed. The National Park Service would work closely with the Texas Commission on Environmental Quality, Texas Parks and Wildlife, the United States Coast Guard and local authorities to ensure boating, water quality, and other regulations are consistently enforced to enhance visitor experience and resource protection.

Motorized Boats. Motorized boats would be allowed in the Neches River (including Johns Lake, Tater Patch Lake, Lower Cypress area of the Beaumont unit, Lake Bayou, associated canals) and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook’s Lake and Scatterman Lake.

In this alternative, Village Creek from the confluence with the Neches River upstream to

the Highway 96 bridge would allow both motorized and nonmotorized uses. Village Creek upstream from the Highway 96 bridge would be nonmotorized only.

Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized zones). In the nonmotorized zones, trolling motors would be allowed at no-wake speeds.

Off-road Vehicles or Personal Watercraft. As in alternative 1, both off-road vehicle and personal watercraft use would remain prohibited.

Horses. Opportunities for horseback riding would be expanded to include a multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop), the Oxbow area of the Beaumont unit, and the northeast portion of the Lance Rosier unit. Connections to other trails outside the preserve would be encouraged with partner agencies.

Bicycling. Consistent with law and policy, mountain bikes would be allowed only on designated routes within the preserve including new areas identified as appropriate. Opportunities for biking would be expanded to include a multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop); another new trail for biking and hiking along Pine Island Bayou could be developed in cooperation with the city of Beaumont. Connections to other trails outside the preserve would be encouraged with partner agencies.

Hunting, Fishing, and Trapping. As in alternative 1, the National Park Service would continue to permit hunting, fishing, and trapping where currently authorized. Other locations would continue to be closed to hunting and trapping for reasons of public safety, administration, resource protection and management, or public use and enjoyment.

Roads and Trails. Currently, the preserve maintains about 45 miles of designated trails within five units of the preserve; the majority, over 75% of the designated trails are in only two of the 15 units. Four of the preserve's nonwater corridor units do not have any trails; one of which is a new unit and another the largest unit in the preserve (Lance Rosier unit). The current designated trails in the preserve are greatly geographically dispersed and the nearby large metropolitan centers, such as Houston and Beaumont and their surrounding regions, offer relatively few places to hike. Trail development in this alternative would offer more abundant and appropriately located hiking opportunities.

Trail development would focus on those that link areas of the preserve to existing trails inside and outside the preserve, as well as to other entities such as the city of Beaumont. An accessible hunting trail would be provided for use only by wheelchairs and other power-driven mobility devices consistent with applicable *NPS Management Policies 2006*.

Land Trails. Additional hiking trails would be developed where appropriate (e.g., Beaumont, Lance Rosier, and Canyonlands units), and abandoned roadbeds would be assessed for reuse as trails (e.g., Lance Rosier unit). The preserve staff would work with GPS-based recreation groups to ensure activities do not impact resources.

A new frontcountry trail would be developed in the Turkey Creek unit from the visitor center to Village Creek (Village Creek Trail), with trail connections to the Turkey Creek Trail. Portions of the trail would be in backcountry. New backcountry trails would be developed in the following units:

- **Beaumont Unit:** Canal-Saltwater Barrier Trail, a hiking and biking trail in partnership with the Lower Neches Valley Authority
- **Beech Creek Unit:** the Magnolia Trail and Loblolly Loop (multiuse for horses, bicycles, and hikers)

- **Canyonlands Unit:** the Fern Hollow Trail would link to a floating dock on the Neches River
- **Neches Bottom and Jack Gore Baygall Unit:** Old Wagon Road Trail
- **Lower Neches River Corridor Unit:** Oxbow Trail in the Oxbow area of the Beaumont unit would feature hiking on a 6-foot-wide boardwalk.

New primitive trails in the Lance Rosier unit would include an "east/west" hiking trail using abandoned roadbeds where possible, and a multiuse loop trail in the northeast section of the unit for horseback riding, biking, and hiking (includes some backcountry).

New trailheads with visitor parking would be constructed for the Fern Hollow Trail off CR 4415, the Old Wagon Road Trail, off Highway 92, and the Canal-Saltwater Barrier Trail (in partnership with the Lower Neches River Authority).

Minor improvements to existing parking facilities would be made at new trailheads for the Village Creek Trail, the Magnolia Trail, and Loblolly Loop (multiuse), as well as to provide adequate and safe parking for paddle trails.

Water Trails. Water trails with appropriate navigational markers would be developed to help visitors navigate to day use areas and other destinations.

Paddle trails would feature soft put-ins, signs, and minimal to no instream improvement (e.g., selected removal or trimming of snags). The visitor experience would be largely primitive and would create the need for short portages or ducking under bank-to-bank snags. Primitive canoe trails would be established for paddlers in the following units:

- **Village Creek Corridor Unit:** Village Creek Paddle Trail; FM 418 to Highway 96

- **Beaumont Unit:** Cook's Lake to Scatterman Lake
- **Neches Bottom and Jack Gore Baygall Unit:** Johns Lake to Franklin Lake

Existing and new designated water trails would be regularly maintained.

Camping. In addition to the primitive backcountry camping as described by alternative 1, 20 dispersed backcountry sites would be developed along land and water trails.

Interpretation and Education. The National Park Service would continue to offer interpretive and educational activities and programs that are consistent with the purpose of the preserve. Collaborative interpretive activities in partnership with other entities and organizations would be encouraged and developed. Efforts would also be increased to enhance community outreach and educational initiatives. Recreational activities would be managed to provide an interpretive component to ensure minimum impact on preserve resources.

Interpretation. A wide variety of additional visitor uses and interpretive activities and programs would be provided, including self-guiding or ranger-led tours and interpretive wayside exhibits, displays, and demonstrations. New technologies such as GPS-based recreation, mobile phone applications, and virtual field trips may be used to extend the range of low-impact visitor activities. The National Park Service would interpret historic structures (e.g., Staley Cabin, Rosier homestead site), archeological sites, cultural landscapes, and other cultural resources. Living history programs could be used to enhance visitor understanding.

As part of the overall visitor experience provided at the preserve, visitors would have greater opportunities to understand and appreciate the relevancy of its history, stories, and associated cultural resources.

Education. Making the preserve more relevant to community members and visitors would be achieved by the expansion of curriculum-based presentations that connect the educational objectives of the group with the meanings and significance(s) inherent in the preserve's resources. By making the Big Thicket relevant, education programs would encourage lifelong learning and encourage stewardship of natural and cultural resources. Education programs would be interdisciplinary, and tied to or connected with curriculum requirements, the national education standards, and presidential goals for education and fitness.

The National Park Service would strive to expand education programs to all schools in the region. New technologies would be incorporated where appropriate. Increased staffing and facilities would meet the growing demand and preserve goals. Partnerships would be encouraged to provide facilities and support.

Curriculum-based programs would promote the preserve as a learning laboratory to develop greater public awareness, understanding, appreciation, and commitment to the preservation and restoration of Big Thicket National Preserve and the larger environment on which it depends. Education programming would integrate research and interpretive programs into the broader educational goals of communities and schools through partnership approaches.

In partnership with local schools, the preserve staff would take an active role in curriculum development and resource protection activities such as Teacher to Ranger to Teacher programs, and honor student community service activities.

The preserve staff would also partner with local schools and communities to expand environmental education initiatives (i.e., climate change, energy conservation, watershed academies).

OPERATIONS AND FACILITIES

Operations

Staffing. To fully implement this alternative and to build the capability of the preserve to engage partners in science, education, and resource protection, an addition of five FTE staff to the current staff would be requested.

Commercial Visitor Services. In addition to continuing to authorize appropriate commercial visitor services determined to be necessary and appropriate as discussed in alternative 1, commercial service providers would be required to adopt sustainable operations.

Partnerships. The National Park Service recognizes the challenges associated with management of cross-boundary resource issues and recognizes the importance of encouraging partnerships to address and resolve these challenges.

Outreach efforts would be expanded to enhance the NPS presence in outlying communities, increase involvement with civic organizations and activities (e.g., adopt-a-trail programs), and partner with volunteer groups to carry out restoration projects and other activities. The National Park Service would work with oil and gas operators and the forestry industry to develop an acceptable range of best management practices and incentives that promote environmentally friendly industry operations. Issues regarding protection of soundscapes and lightscape would also be addressed from a regional perspective in partnership with other agencies and communities.

The preserve staff would conduct educational outreach and would partner with area schools and universities, the Alabama-Coushatta Tribe of Texas, and others to impart information that would support and expand public understanding, interpretation, and protection of Big Thicket's cultural resources and heritage.

Environmental Leadership. The National Park Service would demonstrate leadership in environmentally responsible facility design and construction and would build to the highest achievable LEED standards, striving for Platinum certification. The National Park Service would also pursue climate-friendly designation. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would be implemented, including recycling and green purchasing. Preserve operation and facilities would be managed under an ISO 14001-certified environmental management system. The preserve staff would seek inclusion and recognition for leadership efforts in environmental management through programs such as the EPA National Environmental Performance Track Program and the Texas Commission on Environmental Quality (TCEQ) Clean Texas Program.

Facilities

Facilities would be minimal. New facilities would be operationally sustainable and built to the highest achievable LEED standards, striving for Platinum certification. To minimize impacts to preserve resources, proposed facilities would be developed outside the preserve boundaries to the extent possible. The types of development that would be appropriate in the preserve include facilities that support resource protection or visitor recreational and ecotourism activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events), picnic and day use areas, and trails. All facilities would feature designs and fixtures to minimize impacts to night skies and soundscapes. Additional district ranger stations (staffed with law enforcement and interpretation rangers) would be established as necessary. These stations would likely be outside the preserve boundary. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.

The preserve staff would continue to maintain the existing headquarters and visitor center complex on FM 420. In addition, the preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues.

In addition to maintaining the existing headquarters and visitor center complex on FM 420, a new visitor contact facility shared with various partner agencies and organizations could be established. This facility would replace the USGSA-leased visitor contact station reestablished in the Beaumont area. The facility would allow the National Park Service to contact and orient visitors coming primarily from the south and to better direct them to the various preserve units without requiring them to travel many miles north to the visitor center.

As in alternative 1, the preserve staff would continue to maintain the fire management facility in Woodville, which could include a ranger station. Similarly the National Park Service would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory.

Boat Ramps and Launches. Boat ramps and launches would be designed and located for minimal impact to resources. A small floating dock that adjusts to varying water levels would be built on the Neches River in the Canyonlands unit to provide access to hiking trails. In this alternative, formal agreements could be sought with existing partner who have ramps that straddle the preserve boundary. Additional facilities and opportunities with partners such as Lamar University would be sought out and encouraged.

Roads, Trails, and Public Access. In addition to continuing to maintain existing paved roads, unpaved roads, trails, and uses as in alternative 1, the preserve staff would also maintain new trails proposed under this

alternative. Existing roadbeds from abandoned roads would be used as possible to minimize resource impacts. Existing trailheads, parking areas, and associated facilities would be assessed to ensure they effectively address resource protection and visitor objectives.

Water Trails. Designated water trails would be maintained. However, not all obstacles would be cleared and users would be required to portage under some conditions, such as fallen trees.

Camping. In addition to continuing to manage current primitive backcountry dispersed camping as discussed in alternative 1, the National Park Service would also expand management to 20 new backcountry sites along land and water trails (e.g., Lower Cypress area of the Beaumont unit and the Turkey Creek unit).

Housing and Related Facilities. In addition to existing employee housing, the Seale House could be converted to a ranger station with seasonal housing as described in alternative 1. Under this alternative the preserve staff could seek to provide employee housing for seasonal employees outside the preserve through agreements, partnerships, and contracts, to the extent possible. If it is not possible to obtain housing outside the preserve, sustainable improvements could be made to current housing in the preserve.

IMPLEMENTATION PRIORITIES

When developing the alternatives, the general management planning team considered actions that would be consistent with the intent of the alternative and would, when implemented, help preserve management to address the planning issues identified. Recognizing that there are fiscal and operational constraints that would affect implementation of the general management plan, the team organized the proposed actions into three categories: essential, desirable, and not strictly necessary. Those actions identified

as essential to the successful implementation of the general management plan could be required to preserve fundamental resources and experiences, and would likely require federal funding. Actions identified as desirable for the successful implementation of the plan would be important but may be accomplished with nonfederal funds or may be accomplished many years into the future. A third category identified actions that, while consistent with the general management plan, were determined to be not strictly necessary to the successful implementation of the alternative. While the implementation of these actions support the goals of this alternative they are not necessary in order to achieve the desired resource management and visitor use and experience conditions.

When identifying the appropriate category for a proposed action, the general management planning team considered if the proposed action addressed an important need identified in the general management plan (e.g., provided visitor opportunities not currently present, addressed important operational issues). Actions that could potentially be implemented through partnerships with other entities or through the use of volunteers were also identified. As previously noted, only actions considered essential and desirable have been included in the cost estimate for the alternative and analyzed in chapter 4.

In association with alternative 2, there were a number of actions considered by the general management planning team and discussed with the public that were consistent with the concept of this alternative, but these have not been included in the general management plan because they fall into the third category. If resources to complete these actions were to become available, these actions could be implemented because they are consistent with the concept of this alternative and would not require an amendment to the general management plan. However, before implementation could occur, appropriate planning and compliance would need to be completed as described under the

Environmental Policy Act and National Historic Preservation Act.

Consistent with the preserve's goal of offering low-impact recreation and a variety of recreational activities, a new multiuse back-country trail in the Little Pine Island-Pine Island Bayou corridor unit (Pinewood Trail) could be established. A new trailhead and parking area for this trail off Thompson Road and Woodway Boulevard could be constructed. A new frontcountry trail (the Lake Bayou Trail) could be developed in the Beaumont unit consisting of a raised boardwalk loop through cypress-tupelo swamp and connecting to a boat dock in the Lower Cypress area of the Beaumont unit. Additionally, Voth Mill Trail could be improved.

The preserve staff could explore the possibility of developing a minimal-facility campground that would provide vault toilets, tent camping sites, and interpretive facilities (such as waysides, small amphitheater, or campfire ring to facilitate interpretive talks). Such development could occur near the visitor center or in the Oxbow area of the Beaumont unit. Additional land acquisitions could be considered for camping opportunities. Further, camping platforms could be developed in the Lower Cypress area of the Beaumont unit.

The access point to the upper Neches River at Timber Slough could be improved by grading the existing road, adding culverts, adding rock or caliche, and improving parking. A small boat ramp could be built to accommodate small boat trailers (e.g., John boats, fishing boats).

Additionally, consistent with the National Park Service's dedication to protect the environment and practice sustainable development, the preserve staff could undertake basinwide restoration activities to restore the natural hydrology of wetlands, bayous, river floodplains, and estuaries.

ESTIMATED COSTS AND STAFFING

Cost estimates for this alternative are identified in tables 7, 8, and 9. These estimates, in 2010 dollars, are only intended to indicate a very general relative comparison of costs among the alternatives; they are not to be used for budgeting purposes.

Identification of these costs does not guarantee future NPS funding. Project funding may not come all at once; it would likely take many years to secure and may be partially obtained through partners, donations, or other non-NPS federal sources. Although the National Park Service hopes to secure this funding, the preserve may not receive enough funding to achieve all desired conditions within the time frame of this management plan (the next 15–20 years).

Costs have been broken down into two categories: annual operating costs and one-time costs. Annual costs include the costs associated with ongoing maintenance, utilities, staffing, supplies and materials, and any leasing costs. One-time costs include projects such as construction of new buildings, trail building, native species restoration, and structure rehabilitation.

Annual Costs

Implementation of this alternative is estimated to require \$3.022 million in annual costs in 2010 dollars, a 14% increase over alternative 1. These costs include additional staff salaries and benefits, as well as facility operating costs. The staffing costs include an additional five FTE staff above currently funded staffing levels (24.5 FTE). Staffing levels would likely increase over time as the proposed actions are implemented as opposed to all at once. Seasonal and student employees as well as volunteers supplement the preserve staff and would continue to support the preserve as needed.

To fully implement, this alternative would require additional staff primarily to support protection of visitors and resources while

allowing for additional access into the preserve and some increase in programming. Maintenance of new trails, picnic areas, boat ramps, and parking areas as well as coordination with volunteer groups also would require staff.

The staffing needs have been prioritized and the following positions would allow the National Park Service to begin implementing some aspects of the general management plan:

- two maintenance positions
- one resource management position
- one interpretive position
- one law enforcement position

Some actions could not be initiated until there is appropriate personnel to maintain and implement all the actions proposed in this alternative. Preserve managers would explore opportunities to work with partners, volunteers, and other federal agencies to leverage resources to effectively and efficiently manage the preserve. Additional staff or agreements would be necessary to fully implement this alternative.

One-time Costs

It is estimated that this alternative would require one-time costs of \$7.678 million in 2010 dollars. These costs would primarily be due to the necessary safety and maintenance improvements to the headquarters and visitor center complex on FM 420, new boat ramps, multiuse trails, and interpretive panels, and kiosks. In addition, the preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues. A new visitor contact facility shared with various partner agencies and organizations could be established.

The one-time costs are also shown in the following table as those that are essential and those that are desirable for alternative 2. The

costs have been categorized accordingly. (See table 8 and 9.)

Deferred Maintenance

Deferred maintenance refers to maintenance activities for assets in the preserve that were not preformed when scheduled. Assets include infrastructure such as buildings and trails, as well as docks and wayside exhibits. The preserve staff has identified approximately \$2.6 million of deferred maintenance related to assets in the preserve. This figure is representative of when the assessment was made and is not necessarily indicative of

future deferred maintenance needs. When the assessment was conducted, the majority of the deferred maintenance costs in the preserve related to new lands that have been recently added to the preserve and have not been fenced. Under this alternative, the preserve would address this and other deferred maintenance activities. In particular the preserve would address deferred maintenance related to drainage in the headquarters parking lot. The preserve staff would continue to address deferred maintenance of preserve assets as expeditiously as possible.

TABLE 7. SUMMARY OF COSTS FOR ALTERNATIVE 2

ANNUAL OPERATING COSTS	
Annual Operating Costs ¹	\$2,653,000
Increased Staffing	369,368
Staffing (additional full-time equivalent)	29.5 (+5)
Total Annual Operating Costs	\$3,022,368
ONE-TIME CAPITAL COSTS	
Facility (Construction):	
Visitor Infrastructure and Experience <ul style="list-style-type: none"> • Magnolia Trail and Loblolly Loop² • Palmetto Trail • Yellow Bluff Ferry Trail and Blue Hole Trail • Accessible hunting trail • Oxbow Trail • Pine Island Bayou Trail² • Fern Hollow Trail • Savannah Loop Trail² • Village Creek Trail • New campground and designated backcountry campsites along land and water trails² • Boat ramps • Primitive canoe trails 	
Subtotal	\$5,051,000
Resource Management and Visitor Safety <ul style="list-style-type: none"> • Additional oil and gas mitigation measures • Expanded fire management activities • Improved and expanded nonnative species management • Additional endangered and threatened species monitoring and habitat restoration 	
Subtotal	\$ 345,000
Operational Improvements <ul style="list-style-type: none"> • Headquarters areas of headquarters and visitor center complex on FM 420² • Visitor use areas of headquarters and visitor center complex on FM 420 • LEED construction standards • Housing assessment 	
Subtotal	\$2,330,000
Total One-time Capital Costs ³	\$7,726,000
Deferred Maintenance ⁴	\$2,686,000

¹ 2010 funding level.

² These projects are desirable, but lower priority; while important to the full implementation of the alternative, they may be accomplished with nonfederal funds or many years in the future.

³ Total includes costs for both essential and desirable projects.

⁴ Deferred maintenance is primarily a result of the need to fence additional lands added to the preserve boundary.

TABLE 8: ESSENTIAL ONE-TIME CAPITAL COSTS FOR ALTERNATIVE 2

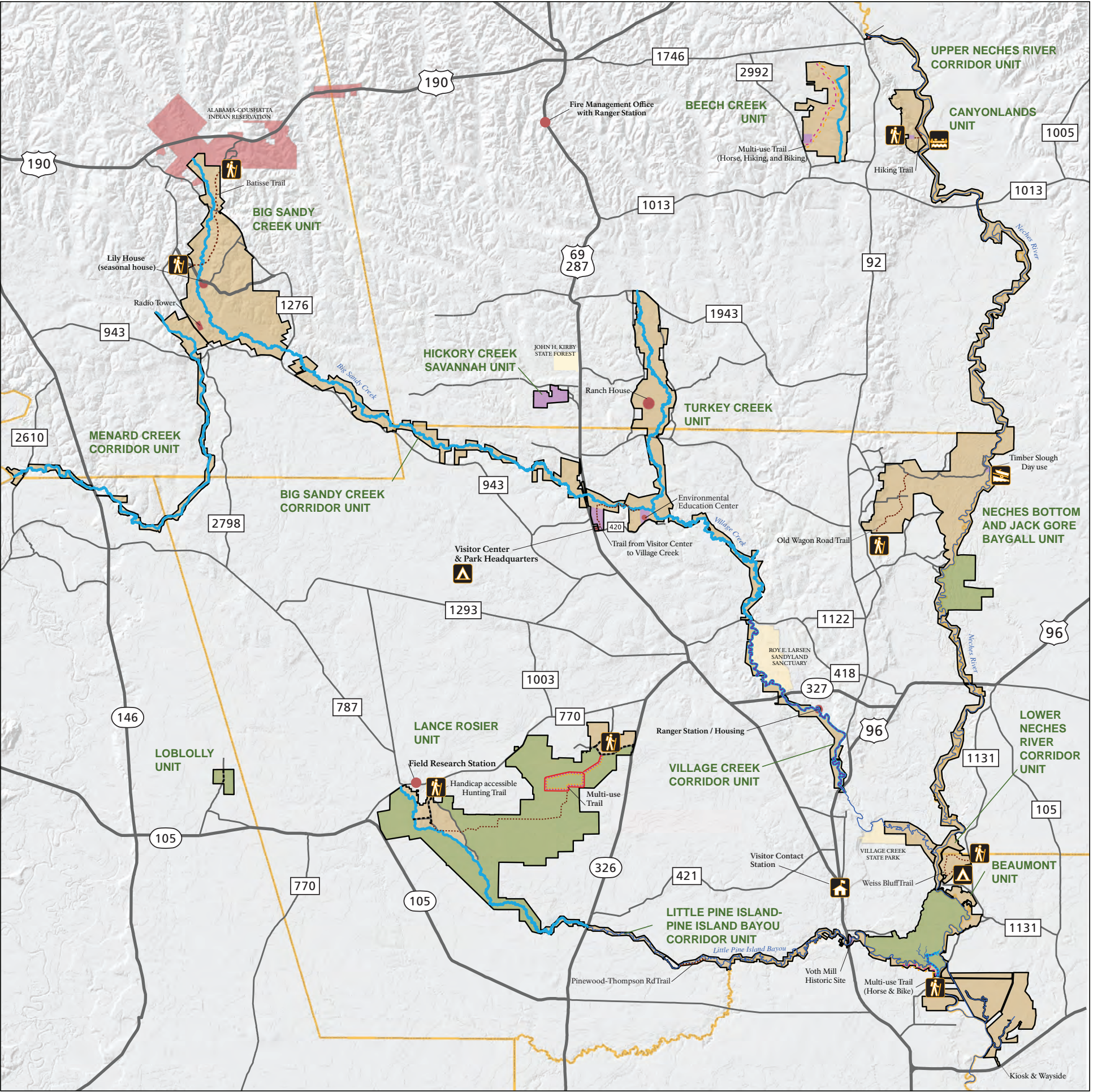
	Visitor Infrastructure and Experience	Resource Management and Visitor Safety	Operational Improvements	Total
Trails and Access	\$2,967,000			\$2,967,000
Resource Management		\$ 345,000		345,000
Visitor Center Area and Housing			\$ 321,000	321,000
Total One-time Capital Costs	\$2,967,000	\$ 345,000	\$ 321,000	\$3,633,000

Note: Essential projects are required to preserve fundamental resource and experiences and would likely require federal funding.

TABLE 9: DESIRABLE ONE-TIME CAPITAL COSTS FOR ALTERNATIVE 2

	Visitor Infrastructure and Experience	Resource Management and Visitor Safety	Operational Improvements	Total
Trails and Access	\$2,084,000			\$2,084,000
Resource Management		0		0
Headquarters Area			\$2,012,000	\$2,012,000
Total One-time Capital Costs	\$2,084,000	0	\$2,012,000	\$4,096,000

Note: Desirable projects are important to full implementation of the alternative but may be accomplished with nonfederal funds or many years in the future.



Big Thicket National Preserve

Alternative 2:
Partnerships and Collaborations

Proposed Features

Trailhead

Boat Ramp

Floating Dock

Potential Campground

Visitor Contact Station

New or Improved Road

Multi-use Trail (Admin. Road, Bike, and Horse)

Hiking Trail

Water Trail

Proposed Zones

Developed or Administrative

Frontcountry

Backcountry

Primitive

Mixed-use Waterway

Nonmotorized Waterway

Existing Features

County

Indian Reservation

Other Conservation Areas (non NPS)

Major Road

Minor Road

Note: For existing features, see Alternative 1.

North

0 2.5 5 10

Kilometers

0 2.5 5 10

Miles

Big Thicket National Preserve

ALTERNATIVE 3: LEADERSHIP IN BIODIVERSITY AND SUSTAINABILITY

CONCEPT

Alternative 3 would emphasize natural resource preservation and research while providing self-reliant recreational opportunities (figure 5). This alternative would provide the highest emphasis on protection, restoration, and maintenance of native biodiversity in the preserve. Restoration and active management would restore native vegetation communities, species assemblages, and ecological functions. The preserve staff would engage communities in neighborhood partnership programs and citizen science activities with the goals of increasing volunteerism and developing local stakeholder interest in the preserve and its natural resources. Preserve operations would feature strong environmental protection and sustainable development and practices. To increase the visibility of the NPS-managed lands and water to the public, the National Park Service would increase patrols and improve signs.

NATURAL RESOURCES MANAGEMENT

Management of natural resources would be focused on protection, restoration, and maintenance of native biodiversity in the preserve. To develop and support the information needs for resources management, a strong emphasis would be placed on scientific study, research, and data management. Priorities for these efforts would include the role and function of biological corridors for the maintenance of native species populations and the response, resilience, and recovery of plant and animal communities to natural and anthropogenic disturbances, including impacts of climate change, changes in hydrology and land use, and invasive species. Active management would focus on achieving lasting restoration

of native vegetation communities, species assemblages, and ecological functions.

Biodiversity and Science

In addition to the biological inventory and monitoring programs described in alternative 1, the National Park Service would focus research efforts on the inventory and understanding of the full scope of the biodiversity of the Big Thicket, including the interactions of compositional (e.g., species and communities), structural (e.g., spatial and temporal patterns), and functional (e.g., ecological processes) elements. In connection with these objectives, the preserve staff would develop a state-of-the-art geographic information system (GIS) to effectively manage resource and biological information.

As in alternative 2, the National Park Service would expand upon adaptive management practices and efforts to meet agency goals for sustainability, energy conservation, and greenhouse gas emissions. Under this alternative, the preserve staff would increase efforts to understand the impacts of climate change on preserve resources and enhance the resiliency of habitats to the effects of climate change. This would be accomplished by undertaking landscape-scale restoration activities.

The National Park Service would coordinate, when appropriate, with neighboring land management agencies, local universities, and nongovernmental organizations to complete research necessary to develop a regional approach to ecosystem management in the face of climate change. Potential partners could include NPS inventory and monitoring network, USDI climate science centers, landscape conservation cooperatives, and local partners.

The preserve staff could partner with local schools to develop educational programs concerning climate change.

Nonnative Species

The National Park Service would continue its current management of the invasive and nonnative species that pose the greatest threats through integrated pest management in cooperation with NPS exotic plant management teams as described in alternative 1. In addition, the preserve staff would comprehensively prioritize management of nonnative vegetation, targeting species and areas where populations pose the greatest threat to preserve resources, and where control efforts have the greatest likelihood of achieving lasting success. Management actions may be conducted at larger, landscape scales and may be conducted jointly with partners and adjacent landowners where necessary, in order to achieve efficient results. Prioritized treatment would be integrated into revegetation, restoration, and fire management activities, and could include increased involvement of the Gulf Coast exotic plant management team. The preserve staff would develop and implement effective control techniques to limit the damages caused by nonnative animal species, including feral hogs, nutria, and others.

Endangered and Threatened Species and Species of Concern

As in alternative 2, the preserve staff would expand activities related to monitoring and recovery of all endangered and threatened species and species of management concern that occur in the preserve. In addition, recognizing the important role that protected lands serve in providing habitat for the region's rare species, the preserve staff would research the ecology, restore habitat, and undertake reintroduction actions where practical.

Water

Under this alternative, the National Park Service would continue the actions described for alternative 2 including working with partners to protect watersheds from source and nonpoint source pollutants, maintaining natural fluvial processes, and practicing good watershed management. The preserve staff would also pursue improved watershed health through community outreach and educational programs.

Partnerships would focus on working directly with communities to educate residents about the importance of maintaining the flow of water through the preserve and the region. The preserve staff would research, define, and protect the environmental flow regime to sustain aquatic species, river and stream ecology, estuaries, and floodplain vegetation. The National Park Service would work with the state agencies, water authorities, and planning commissions to protect water quality and freshwater environmental flows. In collaboration with the U.S. Army Corps of Engineers and the Lower Neches Valley Authority, the National Park Service would seek management agreements for the Neches River to maintain optimal flows and flood pulses necessary to benefit the health of ecological systems and control the spread of nonnative species.

Oil and Gas Management

As in alternative 2, the preserve staff would expand upon the implementation of measures to minimize the impacts of oil and gas operations and protect preserve resources and values. In addition, under this alternative, the National Park Service would work in coordination with the Texas Railroad Commission, the Federal Energy Regulatory Commission, and other jurisdictional agencies to develop a mitigation and management program for within-boundary surface operations.

Under this alternative, the National Park Service would work with oil and gas operators and industries, and undertake initiatives to

mitigate and protect natural soundscapes and reduce light pollution adversely impacting the lightscapes.

Fire Management

The National Park Service would continue management practices described in alternative 1 by using a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities in order to allow fire to function in its natural ecological role, restore ecosystem balance, and manage hazardous fuels in the urban interface.

CULTURAL RESOURCES MANAGEMENT

As in alternative 1, the National Park Service would continue efforts to protect, preserve, and stabilize cultural resources as staffing and funding priorities allow.

As in alternative 1, cultural resources studies would continue to be carried out as necessary with available staffing and funding, and resulting information would be incorporated in cultural resource management databases. The preserve staff would continue to consult with NPS regional staff, the Texas SHPO, the Alabama-Coushatta THPO, and other concerned parties to ensure protection of cultural resources.

VISITOR USE AND EXPERIENCE

This alternative would emphasize low-impact, self-reliant recreational experiences. Opportunities to learn through discovery and citizen science would be provided. There would be a minimal increase in ranger-led activities.

Visitor Opportunities

The traditional range of visitor use activities would continue under this alternative,

although the National Park Service would promote low-impact activities that best support the protection of preserve resources. These activities include boating, canoeing, kayaking, birding, and hiking. A variety of additional visitor use and interpretive activities and programs would be provided, including self-guiding activities, interpretive wayside exhibits, displays, and demonstrations. Working through partnerships, the preserve staff would create opportunities for visitor learning and participation in scientific research, restoration projects, and citizen science activities. Sustainability would be showcased for the public and the preserve staff would provide related interpretive programs and workshops.

Houseboats. Houseboats would not be allowed in the preserve.

Motorized Boats. Motorized boats would be allowed in the Neches River (including Johns Lake, Lake Bayou, Ten-Mile Creek, and associated canals), and Pine Island Bayou from the end of Carpenter Road (in Beaumont) to the confluence with the Neches River (including Cook's Lake). In this alternative, all of Village Creek upstream from the confluence with the Neches River, Cook's Lake to Scatterman Lake loop, and Johns Lake to Franklin Lake waters would be nonmotorized only. The portion of Johns Lake from the boat launch to the Neches River would be mixed use. Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized) at no-wake speeds.

Off-road Vehicles or Personal Watercraft. As in alternative 1, both off-road vehicle and personal watercraft use would remain prohibited.

Horses. Opportunities for horseback riding would be expanded, including the development of a new multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop).

Bicycling. Consistent with law and policy, mountain bikes would be allowed only on designated routes within the preserve. These routes would include new areas identified as appropriate and a new multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop). The development of bike route connections from public transit to the preserve would be encouraged.

Hunting, Fishing, and Trapping. As in alternative 1, the National Park Service would continue to permit hunting, fishing, and trapping where currently authorized in the preserve. Other areas would continue to be closed to hunting and trapping for reasons of public safety, administration, resource protection and management, or public use and enjoyment.

Roads and Trails. Currently, the preserve maintains about 45 miles of designated trails within five units of the preserve; the majority, over 75%, of the designated trails are in only two of the 15 units. Four of the preserve's nonwater corridor units do not have any trails; one of which is a new unit and another the largest unit in the preserve (Lance Rosier unit). The current designated trails in the preserve are greatly geographically dispersed and the nearby large metropolitan centers, such as Houston and Beaumont and their surrounding regions, offer relatively few places to hike. Trail development in this alternative would offer more abundant and appropriately located hiking opportunities.

Trail development would focus on those opportunities that support traditional, low-impact recreational activities, as well as those that promote connections to the preserve from alternative means of transportation (e.g., bicycles, public transportation).

Land Trails. Additional hiking trails would be developed where appropriate (e.g., Big Sandy Creek and Canyonlands units) and abandoned roadbeds would be assessed for reuse as trails (e.g., Lance Rosier unit). Trails would include backcountry hiking trails,

frontcountry trails, and some partnership efforts such as establishing a new trail along Little Pine Island Bayou with the Pinewood community. Trailheads would be connected with existing public and community bike trails where possible.

New backcountry trails would be developed in the following units:

- **Beech Creek Unit:** Magnolia Trail and Loblolly Loop (multiuse for horse use, bicycles, and hikers)
- **Canyonlands Unit:** Fern Hollow Trail
- **Lance Rosier Unit:** Fire Tower Trail (converted from a road)
- **Turkey Creek Unit:** hiking trails from the visitor center to Village Creek (Village Creek Trail)

New trailheads with visitor parking would be constructed for Fern Hollow Trail off CR 4415 and Fire Tower Trail or Hunter parking off Little Rock Road. Minor improvements to existing parking facilities would be made at new trailheads to the visitor center—Village Creek Trail, Magnolia Trail, and Loblolly Loop (multiuse)—and to provide adequate and safe parking for paddle trails.

Water Trails. Designated paddle trails for canoes and kayaks (nonmotorized water recreation) would be provided. Paddle trails would feature soft put-ins, signs, and minimal to no instream improvement (e.g., selected removal or trimming of snags). The visitor experience would be largely primitive and would create the need for short portages or ducking under bank-to-bank snags. Primitive canoe trails would be established for paddlers in the following units:

- **Village Creek Corridor Unit:** Village Creek Paddle Trail; FM 418 to Highway 96
- **Beaumont Unit:** Cook's Lake to Scatterman Lake

- **Neches Bottom and Jack Gore Baygall Unit:** Johns Lake to Franklin Lake

Existing and new designated paddle trails would be regularly maintained.

Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized). The portion of Johns Lake from the boat launch to the Neches River would be mixed use.

Camping. As in alternative 1, backcountry camping would continue to be allowed, consistent with existing rules and regulations. Based on resource conditions, the National Park Service may restrict camping in some areas.

Interpretation and Education

Visitors would be encouraged to learn through discovery by way of opportunities to take part in scientific research and resource management projects. Efforts would also be increased to enhance community outreach and educational initiatives. The preserve staff would expand citizen science programs that encourage the public to take part in scientific research and resource management projects. Biodiversity discovery opportunities would be offered through Thicket of Diversity All Taxa Biological Inventory workshops and field activities that partner citizen scientists with taxonomists. The National Park Service would expand opportunities for visitors and volunteers to participate in resource management projects including nonnative plant management, wildlife counts, cleanup days, and water quality monitoring. Sustainability would be showcased for the public and the preserve staff would provide related interpretive programs and workshops. Interpretive programs would also focus on the UNESCO Man and the Biosphere Programme, Globally Important Bird Area designation, and other efforts related to sustainability and biodiversity.

Interpretation. A variety of additional visitor use and interpretive activities and programs would be provided including self-guiding opportunities, interpretive wayside exhibits, displays, and demonstrations. Working through partnerships, the preserve staff would create opportunities for visitor learning and participation in scientific research, restoration projects, and citizen science. The preserve staff would enhance partnerships with local agencies and communities, nonprofit organizations, area universities and schools, and scout groups for river cleanups, weed pulling, citizen science activities such as bird counts and All Taxa Biological Inventory workshops, and regional watershed management and monitoring (e.g., WaterWatch programs). The preserve staff would highlight its significance as an American Bird Conservancy Important Bird Area (IBA) through increased bird-focused activities with partners. The preserve staff would highlight its international significance and inclusion in the UNESCO Man and the Biosphere Programme with special events and through building connections to other biosphere reserves around the world. Sustainability would be showcased for the public and the preserve staff would provide related interpretive programs and workshops.

Education. As described in alternative 2, increased relevancy would be achieved by expansion of curriculum-based presentations connecting the educational objectives of the group with the meanings and significance(s) inherent in the preserve's resources. By making the Big Thicket relevant, education programs would foster lifelong learning and encourage stewardship of natural and cultural resources. Education programs would be interdisciplinary, and tied to or connected with curriculum requirements, the national education standards, and presidential goals for education and fitness.

The preserve staff would strive to expand education programs to all schools in the region. New technologies would be incorporated where appropriate. Increased staffing and facilities would meet the growing

demand and preserve goals. Partnerships would be encouraged to provide facilities and support.

Curriculum-based programs would promote the preserve as a learning laboratory to develop greater public awareness, understanding, appreciation and commitment to the preservation and restoration of Big Thicket National Preserve and the larger environment on which it depends. Education programming would integrate research and interpretive programs into the broader educational goals of communities and schools through partnership approaches.

In partnership with local schools, the preserve staff would take an active role in curriculum development and resource protection activities, including Teacher-Ranger-Teacher programs, and honor student community service activities.

In addition to these actions taken in alternative 2, in coordination with Lamar University in Beaumont, the preserve could establish an outdoor educational center along the Neches River.

OPERATIONS AND FACILITIES

Operations

Staffing. To fully implement this alternative and to build the capability of the National Park Service to address science, data management, and resource protection proposals, an additional five FTE staff would be requested.

Commercial Visitor Services. As in alternative 2, commercial visitor service providers would be required to adopt sustainable operations.

Partnerships. Under this alternative, the National Park Service would expand outreach and partnership efforts with local communities, schools, universities,

developers, civic organizations and federal, state, and county agencies. The goal of these partnerships would be to strengthen understanding and protection for preserve resources.

The National Park Service would strengthen its partnerships with other agencies and organizations having similar mission objectives for resource protection, science, and stewardship (e.g., Thicket of Diversity All Taxa Biological Inventory, area universities and schools, and scout groups). The National Park Service would strengthen its partnerships with other federal agencies (e.g., U.S. Geological Survey [USGS], U.S. Fish and Wildlife Service, U.S. Forest Service) and the state for resource stewardship training and scientific research, and work collaboratively with The Nature Conservancy and other partners for longleaf pine restoration, Texas trailing phlox recovery, and other restoration projects.

Expansion of partnership projects with the Gulf Coast Inventory and Monitoring Program (i.e., vital signs monitoring), the “Thicket of Diversity” All Taxa Biological Inventory, universities, and other agencies (e.g., USDI climate science centers and landscape conservation cooperatives) would help the preserve to become a center of learning and practical management application of biodiversity information.

The National Park Service would increase patrols, improve signs, and engage communities in neighborhood partnership programs with the goals of increasing volunteerism and developing local stakeholder interest in the preserve. The preserve staff would enhance partnerships with local agencies and communities for river cleanups, removal of invasive plants, and citizen science activities including regional watershed management and monitoring (e.g., WaterWatch programs). In partnership with neighboring communities, the preserve staff would undertake initiatives to protect natural soundscapes and reduce light pollution.

Environmental Leadership

As in alternative 2, the National Park Service would demonstrate leadership in environmentally responsible facility design and construction and build to the highest achievable LEED standards, striving for Platinum certification. The preserve would pursue climate-friendly options, alternative energy sources, and other energy conservation measures.

Under this alternative, opportunities to support alternative transportation within and to the preserve would be evaluated and implemented where feasible (e.g., support of bicycle lanes from nearby towns and cities, and connections to public transportation in Beaumont). The feasibility of installing electric car charging stations for the public and administrative use at the visitor center and headquarters would be evaluated.

Facilities

Facilities would be minimal, sustainably built and operated, and built to the highest achievable LEED standards, striving for Platinum certification. The National Park Service would site new occupied facility development outside the preserve boundaries. The types of development that would be appropriate in the preserve include facilities that support resource protection and visitor recreational or ecotourism activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events), picnic and day use areas, and trails. All facilities would be designed with fixtures to minimize impacts to lightscapes and soundscapes. Existing facilities in areas of prior development in the preserve could be retrofitted, redesigned, or rebuilt as necessary for administrative purposes. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.

As in alternative 1, the National Park Service would continue to maintain the existing

headquarters and visitor center complex on FM 420. The preserve staff would also undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues. A visitor contact facility would be reestablished in Beaumont.

An educational multiuse facility near Beaumont, in partnership with Lamar University, would be considered. This facility would be located outside the preserve. It would be owned by Lamar University and would serve as an environment education outreach facility with laboratories, classrooms, and office space for environmental education personnel. It would provide a base of operations for educational and interpretative boat tours provided by NPS staff. This partnership would be limited to NPS staffing costs associated with educational programs. NPS participation would not require an increase in NPS operational funding.

As in alternative 1, the fire management facility in Woodville, which could include a ranger station, would be maintained. The National Park Service would also continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Other field research stations could be constructed as necessary in the preserve for environmental monitoring and data collection. Off-site research stations could also be developed in partnership with research organizations.

Boat Ramps and Launches. The National Park Service would add an improved boat ramp for small motorized boats along the Neches River at Johns Lake. If feasible, a boat ramp and dock would be built in association with a shared facility with Lamar University in Beaumont.

Roads, Trails, and Public Access. Some roads in the preserve would be removed and the habitat restored while the use of other

roads may change. For example, portions of Zig Zag Road in the Neches Bottom and Jack Gore Baygall unit, and other oil and gas roads and abandoned spur roads would be removed and Ranch House Road in the Turkey Creek unit would be for administrative use only. Fire Tower Road in the Lance Rosier unit would be reclaimed as a hiking trail. No new roads would be built except for minor improvements necessary to access trailheads and boat ramps. Existing and new trails would be designed to link to trails beyond the preserve boundary where possible. Existing roadbeds from abandoned roads would be used as possible to minimize resource impacts.

Trailheads, parking areas, and associated facilities could be reduced or limited in certain areas, especially near sensitive resources such as habitat for endangered and threatened species or archeological sites. Some improvements or closures may be made to unofficial day use areas in order to protect resources from damage.

Water Trails. Primitive water trails would be designated with limited improvements (e.g., removal of some snags).

Camping. As in alternative 1, the National Park Service would continue to manage current primitive backcountry camping opportunities. To protect resources, the campsites in the backcountry could be designated and administered under a permit system.

Housing and Related Facilities. Housing would be provided as feasible outside the preserve for seasonal employees and volunteers through partnerships, agreements, and contracts. The Lily Bunkhouse would be designated for possible demolition and the Ranch House would be designated for administrative reuse. As in alternative 1, the field research station and Brammer House would continue to accommodate researchers.

ESTIMATED COSTS AND STAFFING

Cost estimates for this alternative are identified in table 10. These cost estimates, in 2010 dollars, are only intended to indicate a very general relative comparison of costs among the alternatives; they are not to be used for budgeting purposes.

Identification of these costs does not guarantee future NPS funding. Project funding may not come all at once; it would likely take many years to secure and may be partially obtained through partners, donations, or other non-NPS federal sources. Although the National Park Service hopes to secure this funding, the preserve may not receive enough funding to achieve all desired conditions within the time frame of this management plan (the next 15–20 years).

Costs have been broken down into two categories: annual operating costs and one-time costs. Annual costs include the costs associated with ongoing maintenance, utilities, staffing, supplies and materials, and any leasing costs. One-time costs include projects such as construction of new buildings, trail building, native species restoration, and structure rehabilitation.

Annual Costs

Implementation of this alternative is estimated to result in \$3.022 million in annual costs in 2010 dollars, a 14% increase over alternative 1. These costs include additional staff salaries and benefits, as well as facility maintenance. The staffing costs include an additional five FTE staff above currently authorized staffing levels (24.5 FTE). Staffing levels would likely increase over time as the proposed actions are implemented as opposed to all at once. Seasonal and student employees, as well as volunteers, also supplement the preserve staff and would continue to support the preserve as needed.

To fully implement, this alternative would require additional staff to support greater visitor access to the preserve units, to protect

visitors and resources, and to provide new programs. Maintenance of new trails, picnic areas, boat ramps, and parking areas as well as coordination with volunteer groups also would require staff. The staffing needs have been prioritized and the following positions would allow the National Park Service to begin implementing some aspects of the general management plan:

- two maintenance positions
- one resource management position
- one interpretive position
- one law enforcement position

Some actions cannot be initiated until there is appropriate personnel to maintain and implement all the actions proposed in this alternative. Preserve managers would explore opportunities to work with partners, volunteers, and other federal agencies to leverage resources to effectively and efficiently manage the preserve. Additional staff or agreements would be necessary to fully implement this alternative.

One-time Costs

It is estimated that this alternative would result in one-time costs of \$13.178 million in 2010 dollars. These costs would be primarily

due to the necessary safety and maintenance improvements to the headquarters and visitor center complex on FM 420, a multiuse facility in Beaumont, new field sampling stations, boat ramps, multiuse trails, and interpretive panels and kiosks.

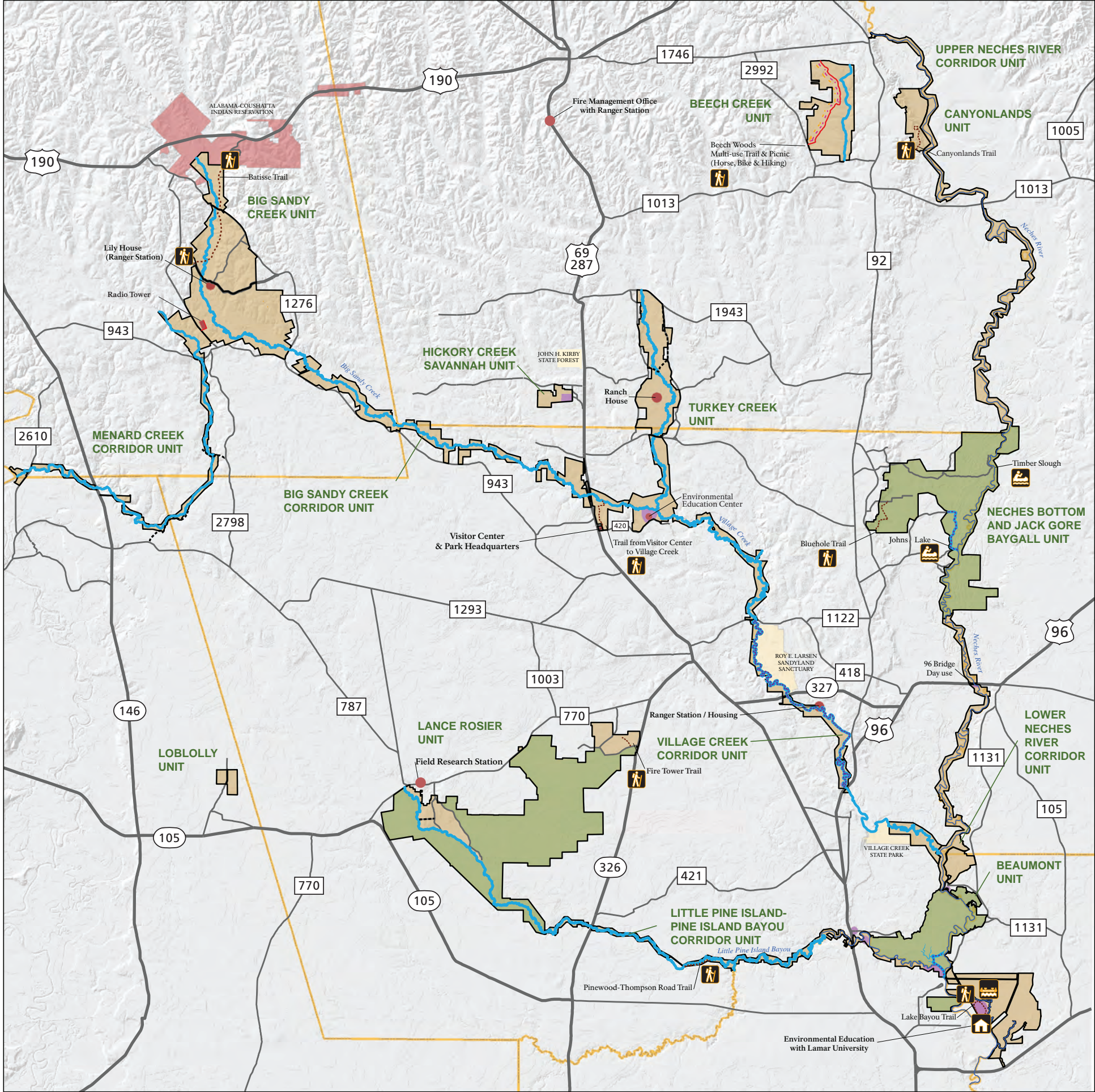
Deferred Maintenance

Deferred maintenance refers to maintenance activities for assets in the preserve that were not preformed when scheduled. Assets include infrastructure such as buildings and trails, as well as docks and wayside exhibits. The preserve staff has identified approximately \$2.6 million of deferred maintenance related to assets in the preserve. This figure is representative of when the assessment was made and is not necessarily indicative of future deferred maintenance needs. When the assessment was conducted, the majority of the deferred maintenance costs in the preserve related to new lands that have been recently added to the preserve and have not been fenced. Under this alternative, the preserve would address this and other deferred maintenance activities. In particular, the preserve would address deferred maintenance related to drainage in the headquarters parking lot. The preserve staff would continue to address deferred maintenance of preserve assets as expeditiously as possible.

TABLE 10. SUMMARY OF COSTS FOR ALTERNATIVE 3

ANNUAL OPERATING COSTS	
Annual Operating Costs ¹	\$2,653,000
Increased Staffing	369,368
Staffing (additional full-time equivalent)	29.5 (+5)
Total Annual Operating Costs	\$3,022,368
ONE-TIME CAPITAL COSTS	
Facility (Construction):	
Visitor Infrastructure and Experience <ul style="list-style-type: none"> • Magnolia Trail and Loblolly Loop • Blue Hole Trail • Hunter Parking Trail • Pine Island Bayou Trail • Fern Hollow Trail • Village Creek Trail • Boat ramps • Primitive canoe trails • Incorporation of expanded educational curriculum and new technologies 	
Subtotal	\$9,000,000
Resource Management and Visitor Safety <ul style="list-style-type: none"> • Additional native vegetation restoration • Expanded partnership projects • Development of comprehensive GIS system for resource management • Expanded resource inventory and biodiversity research • Increased water flow regime management measures through research and partnerships • Increased efforts to understand climate change effects and enhance resiliency of habitats • Additional oil and gas mitigation measures • Expanded fire management activities • Improved and expanded nonnative species management • Additional threatened and endangered species monitoring and habitat restoration • Increased NPS presence in visitor use conflict areas and regulation enforcement 	
Subtotal	\$ 865,000
ONE-TIME CAPITAL COSTS	
Operational Improvements <ul style="list-style-type: none"> • Headquarters areas of headquarters and visitor center complex on FM 420 • Visitor use areas of headquarters and visitor center complex on FM 420 • Housing assessment • Multiuse facility with Lamar University • LEED construction standards • Soundscape and lightscape mitigation through facility design, retrofit, redesign, or rebuild • Lily Bunkhouse demolition 	
Subtotal	\$ 3,313,000
Total One-time Capital Costs	\$13,178,000
Deferred Maintenance ²	\$ 2,686,000

¹ 2010 funding level.² Deferred maintenance is primarily a result of the need to fence additional lands added to the preserve boundary.



Big Thicket National Preserve
Alternative 3:
Leadership in Biodiversity
and Sustainability

Proposed Features

- Trailhead
- Canoe Access
- Floating Dock
- Visitor Contact and Multi-Use Facility with Lamar University
- Administrative Road
- New or Improved Road
- Water Trail
- Hiking Trail
- Hike & Bike Trail
- Multi-use Trail (Admin. Road, Bike & Horse)

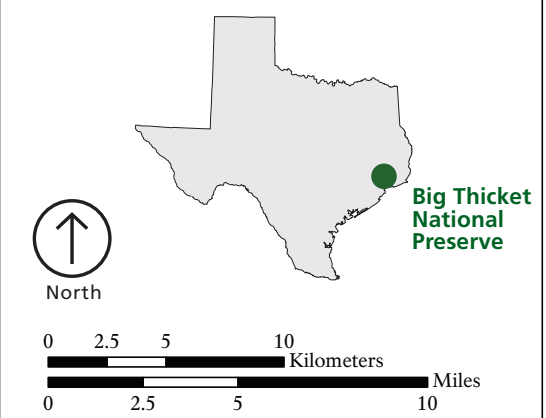
Proposed Zones

- Developed or Administrative
- Frontcountry
- Backcountry
- Primitive
- Mixed-use Waterway
- Nonmotorized Waterway

Existing Features

- County
- Indian Reservation
- Other Conservation Areas (non NPS)
- Major Road
- Minor Road

Note: For existing features, see Alternative 1.



ALTERNATIVE 4: CONNECTING PEOPLE TO THE PRESERVE

CONCEPT

The purpose of this alternative is to increase the relevancy of the preserve and the National Park Service to the people in the communities of southeast Texas and to visitors from all over the world. People would be encouraged to connect to and support the preserve through exploration of its natural and historical resources and enjoyment of its recreational opportunities. Management of this alternative would emphasize personal connections to the preserve through family and cultural history, recreational opportunities, and personal experiences. Opportunities to visit the preserve using technology would be considered.

This alternative recognizes that the cultural history of the preserve is also a history of the surrounding communities and the region. This history includes the history of American Indians and early settlers through today's inhabitants. Cultural resources would be preserved, rehabilitated, and restored as appropriate. Where possible, cultural resources would become a greater part of the visitor experience.

Visitors would continue to have the opportunity to enjoy a range of recreational activities consistent with the purpose of the preserve. There would be improved access in some areas (e.g., Neches Bottom and Jack Gore Baygall, Lance Rosier, and Canyonlands units) as well as enhanced recreational and interpretive opportunities. Resource management efforts would support and maintain the biodiversity of the preserve, appropriate visitor experiences, as well as a landscape that reflects the historic native ecosystems. Preserve operations would feature strong environmental protection and sustainable development and practices (figure 6).

NATURAL RESOURCES MANAGEMENT

As in alternative 1, preserve lands would continue to be administered to assure their natural and ecological integrity in perpetuity. Management of natural resources would emphasize the mitigation of impacts from oil and gas operations and other preserve uses, management of nonnative plants and animals, biological inventory, and restoration of fire-adapted communities.

Additionally, management of natural resource would allow for appropriate visitor services that would connect visitors to the natural resources and build support for conservation.

Biodiversity and Science

As in alternative 1, the preserve staff would continue to work with partners to complete biological inventories, implement vital signs monitoring, and promote scientific research on the biodiversity of the preserve. Additionally, the National Park Service would work closely with UNESCO Man and the Biosphere Programme, which aims to improve the relationship of people with their environment. Because the preserve is a biosphere reserve, the preserve staff would strive to demonstrate the conservation of biodiversity with sustainable use and development. The staff would engage partners and community leaders to develop avenues for knowledge sharing, research and monitoring, education and training, and participatory decision making.

As in alternative 2, the preserve staff would continue to adaptively manage resources by utilizing the best available scientific information, conduct research on susceptible species as resources allow, and work to meet agency goals for sustainability,

energy conservation, and greenhouse gas emissions. Further efforts would be undertaken to increase understanding of the impacts of climate change on preserve resources and to enhance the resiliency of habitats to the effects of climate change. The National Park Service would undertake landscape-scale restoration activities prioritized to promote connectivity and to mitigate, as best as possible, habitat fragmentation. Restoration activities would be designed to contribute to the resilience of the landscape.

Under this alternative, the National Park Service would coordinate, when appropriate, with neighboring land management agencies, local universities, and nongovernmental organizations to complete research necessary to develop a regional approach to ecosystem management in the face of climate change and to conduct regionwide scientific studies to address the resiliency of local habitats to climate change. The preserve staff would also partner with local schools to develop educational programs about sustainability, energy conservation, and greenhouse gas emission reduction, and how climate change may impact the region as a whole.

Nonnative Species

As in alternative 3, the preserve staff would continue its current management of the invasive and nonnative species that pose the greatest threats through integrated pest management in cooperation with NPS exotic plant management teams. The preserve staff would comprehensively prioritize management of nonnative vegetation, targeting species and areas where populations pose the greatest threat to preserve resources, and where control efforts have the greatest likelihood of achieving lasting success. Management actions may be conducted at larger, landscape scales, and be conducted jointly with partners and adjacent landowners where necessary in order to achieve efficient results. Prioritized treatment would be

integrated into revegetation, restoration, and fire management activities, and could include increased involvement of the Gulf Coast exotic plant management team. The preserve staff would develop and implement effective control techniques to limit the damages caused by nonnative animal species, including feral hogs, nutria, and others.

Endangered and Threatened Species and Species of Concern

The National Park Service would continue the actions described in alternative 2, including the expansion of activities related to monitoring and recovery of all endangered and threatened species and species of concern that occur in the preserve. In recognition of the important role that protected lands serve in providing habitat for the region's rare species, the preserve staff would research the ecology, restore habitat, and undertake reintroduction actions where practicable for endangered and threatened species and species of management concern.

Water

As in alternative 1, the National Park Service would continue to strive to ensure that there is adequate flow of clean water to optimize the ecological support of aquatic and terrestrial systems, manage for natural processes in rivers and wetlands, and manage for instream structural diversity. The preserve staff would continue to work with partners, researchers, and agencies on inventory monitoring projects to improve water quality; to implement high pulse flows; and to reduce trash and pollutants. The preserve staff would work toward the definition of environmental flow requirements for aquatic species and floodplain vegetation communities.

Oil and Gas Management

As in alternative 1, the National Park Service would continue to implement measures to

minimize the impacts of oil and gas operations, and manage oil and gas operations based on preserve legislation, law, and servicewide regulations.

Fire Management

The National Park Service would continue management practices described in alternative 1 by using a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities in order to allow fire to function in its natural ecological role, restore ecosystem balance, and manage hazardous fuels in the urban interface.

CULTURAL RESOURCES MANAGEMENT

As in alternative 1, the National Park Service would continue efforts to protect, preserve, and stabilize cultural resources as staffing and funding priorities allow. Appropriate cultural resources studies, investigations and historical research would be undertaken. In this alternative, as in alternative 2, the preserve staff would actively preserve, stabilize, and rehabilitate selected historic structures (e.g., Staley Cabin) and cultural landscapes. Archeological sites and ethnographic resources would also be protected and preserved. Evaluative testing of selected archeological sites would be carried out to assist determinations of national register eligibility.

Additionally, in this alternative, visitors would have greater opportunities to access and visit selected cultural sites determined to have little potential to be adversely impacted by visitor use. Public visitation to sensitive sites would be limited and controlled, perhaps permitted only as a part of ranger-led interpretive programs. As in alternative 1, cultural resources studies would continue to be carried out as necessary with available staffing and funding, and resulting information would be incorporated in cultural resource

management databases. In addition to these actions, the preserve would promote more extensive research to document the area's history and cultural resources, through partnerships with the Texas SHPO, the Alabama-Coushatta THPO, and historic preservation groups.

VISITOR USE AND EXPERIENCE

This alternative emphasizes visitor experiences that encourage a personal connection to the preserve. Opportunities to experience cultural resources would increase and a range of recreational opportunities would be provided to accommodate visitors with a range of skills and abilities. There would be an emphasis on ranger-led activities.

Visitor Opportunities

Under this alternative, the preserve staff would be managed to provide a greater array of visitor experiences including new uses as well as different management approaches to areas of the preserve. Traditional uses (boating, canoeing, kayaking, fishing, hunting, trapping, hiking, bird-watching, nature observation, and backcountry camping) would continue and would be managed to minimize impacts on resources.

Some new uses could be allowed to encourage visitors to get into and experience the preserve. For example, GPS-based recreational activities, such as virtual caches or canoe trails could be developed. An auto tour route of the preserve would be developed along with trailheads and hiking trails to link the various units. The trails and auto tour route would include self-guiding interpretive information presented in brochures or on wayside exhibits. The preserve staff would sponsor workshops to highlight the biological, historical, and cultural resources in the preserve, with subject matter experts invited to present topics of interest.

Houseboats. It is the intent of this alternative to have all houseboats (generically speaking—a boat that is designed and equipped for use as a dwelling) to comply with laws and regulations including proof of registration, sanitation, camping as articulated in the Superintendent's Compendium, and unattended property regulations. The majority of houseboats found within the waters of the preserve are not commercially produced and most are not registered as vessels. Additionally, these houseboats are lashed to trees on a permanent basis, which causes damage to preserve resources.

Visitors would have the opportunity to use houseboats in the preserve subject to existing regulations and policies. Houseboats would be required to comply with laws and regulations including proof of registration, sanitation, camping, as articulated in the Superintendent's Compendium, and unattended property regulations. Those left unattended for more than 24 hours would be impounded and removed. The National Park Service would work closely with the Texas Commission on Environmental Quality, Texas Parks and Wildlife, the U.S. Coast Guard, and local authorities to ensure boating, water quality, and other regulations are consistently enforced to enhance visitor experience and resource protection.

Motorized Boats. Motorized boats would be allowed in all navigable waters except where prohibited for conflicting uses (e.g., paddling trails in designated portions of Village Creek, Menard Creek, Cook's Lake to Scatterman Lake loop, Johns Lake to Franklin Lake waters, and designated portions of the lower Beaumont unit). The portion of Johns Lake from the boat launch to the Neches River would be mixed use. Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized zones) at no-wake speeds.

Off-road Vehicles or Personal Watercraft. As in alternative 1, off-road

vehicles and personal watercraft use would remain prohibited.

Horses. Horses would be allowed only on designated routes within the preserve. New areas would be developed in the Oxbow area of the Beaumont unit, the Beech Creek unit to the Magnolia Trail and Loblolly Loop, and the Lance Rosier unit. Old roadways could be evaluated for use as part of a trail or trail link as appropriate.

Bicycling. Consistent with law and policy, mountain bikes would be allowed only on designated routes within the preserve. New areas would be developed in the Oxbow area of the Beaumont unit, the Beech Creek unit to the Magnolia Trail and Loblolly Loop, and the Lance Rosier unit. Old roadways could be evaluated for use as part of a trail or trail link as appropriate.

Hunting, Fishing, and Trapping. As in alternative 1, the National Park Service would continue to permit hunting, fishing, and trapping where currently authorized. Other locations would continue to be closed to hunting and trapping for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment.

Roads and Trails. Currently, the preserve maintains about 45 miles of designated trails within five units of the preserve; the majority, over 75%, of the designated trails are in only two of the 15 units. Four of the preserve's nonwater corridor units do not have any trails; one of which is a new unit and another the largest unit in the preserve (Lance Rosier unit). The current designated trails in the preserve are greatly geographically dispersed and the nearby large metropolitan centers, such as Houston and Beaumont and their surrounding regions, offer relatively few places to hike. Trail development in this alternative would offer more abundant and appropriately located hiking opportunities.

Roads and trails could be developed to allow new or improved visitor access into units including undeveloped areas (e.g., roads into Canyonlands and Lance Rosier units, new roads to access points along the Neches River, trails within the Lance Rosier unit).

Land Trails—Trails could include self-guiding nature trails that provide an introduction to inaccessible areas of the preserve such as Fern Hollow. Other trails could be developed to link resources that highlight the history of habitation in and around the Big Thicket, thus providing greater relevancy to the visitor. Examples could include American Indian trails and traces, trails to the Hooks Bear Camp, or trails to the Slovakian stove-makers camp in the Lance Rosier unit. In the Neches Bottom and Jack Gore Baygall unit, trails to the Blue Hole and along the old Yellow Bluff Ferry Trail could be considered. In the Canyonlands unit, a new trail would be established that would optimize layout, minimize boardwalks, and link to a floating dock on the Neches River.

To increase relevancy with nearby communities, the preserve staff would engage the NPS Rivers, Trails, and Conservation Assistance Program to collaborate with partners to develop regional trails that link with the preserve. Possibilities include trail connections with Village Creek State Park; connections between Kountze and the visitor center trails, development of water trails with Beaumont, and development of a regional trail with Houston Wilderness.

New frontcountry trails would be developed in the following units:

- **Canyonlands Unit:** Fern Hollow Trail, crossing some backcountry areas, would link to a floating dock on the Neches River
- **Turkey Creek Unit:** trail from the visitor center to Village Creek (Village Creek Trail) with trail

connections to the Turkey Creek Trail

- **Lower Neches River Corridor Unit:** multiuse horse, bicycle, and hiking trail in the Oxbow area of the Beaumont unit.

New backcountry trails would be developed in the following units:

- **Beech Creek Unit:** Magnolia Trail and Loblolly Loop (multiuse for horses, bicycles, and hikers)
- **Big Sandy Creek Unit:** Alabama Trace Trail
- **Neches Bottom and Jack Gore Baygall Unit:** Yellow Bluff Ferry Trail
- **Lance Rosier Unit:** 14 mile-long “east-west” multiuse horse, bicycling, and hiking trail using abandoned roadbeds where possible; the trail includes some backcountry

In this alternative, the National Park Service would consider developing new access points, including into the Lance Rosier unit away from existing oil and gas operations, in order to provide visitor access and enhance the visitor experience.

New trailheads with visitor parking would be constructed for the Fern Hollow Trail off CR 4415, the Yellow Bluff Ferry Trail off Highway 92, the Fire Tower Trail or Hunter parking off Little Rock Road, and the west side of the Lance Rosier unit. Minor improvements to existing parking facilities would be made at new trailheads to the Village Creek Trail, Magnolia Trail, and Loblolly Loop (multiuse), and to provide adequate and safe parking for paddle trails. *Water Trails*—Water trails with appropriate navigational markers would be developed to help visitors navigate to day use areas and other destinations. Trails would be developed and maintained in waterways to guide visitors to resources that can be

reached by canoes and kayaks (e.g., Cook's Lake to Scatterman Lake loop). Water trails would be suited for a wide range of paddling expertise and would receive a moderate to high level of maintenance to minimize portages. Nonmotorized water trails would be provided for paddlers in the following units:

- **Village Creek Corridor Unit:** Village Creek Paddle Trail above FM 418
- **Beaumont Unit:** Cook's Lake to Scatterman Lake
- **Neches Bottom and Jack Gore Baygall Unit:** Johns Lake to Franklin Lake
- **Menard Creek Corridor Unit:** Highway 146 to the confluence of the Trinity River

Existing and new water trails would be regularly maintained.

The portion of Johns Lake from the boat launch to the Neches River would be mixed use. Trolling motors would be allowed in all waters of the preserve (motorized, nonmotorized, and mixed use).

Camping. As in alternative 1, backcountry primitive camping would continue. Designated backcountry campsites could be developed along land and water trails (e.g., lower cypress area of the Beaumont unit).

Interpretation and Education

Significant new and expanded interpretive and educational programming would respond to increasing visitation, ecotourism, and engage new audiences. National and global initiatives, such as Climate Change and Going Green, would be incorporated into personal and nonpersonal interpretive media. Partnerships with designator affiliations (i.e., UNESCO Biosphere Reserve and Globally Important Bird Area) would be expanded, using their framework

to address global relevancy. Some recreational activities would be managed to provide an interpretive component to ensure minimum impact on preserve resources. Opportunities to participate in ranger-led interpretive programs (on and off the water) would be expanded.

Interpretation. As in alternative 2, a wide variety of additional visitor use and interpretive activities and programs would be provided. New technologies may be utilized to extend the range of low-impact visitor activities. The preserve staff would interpret historic structures, archeological sites, and cultural landscapes, and the rehabilitated Staley Cabin.

Additionally, under this alternative the preserve staff would focus on partnerships that can help the National Park Service tell the history of southeast Texas. Potential partners include Southeast Texas Energy Museum, Spindletop Museum, Heritage Village, and Kirby Hill House; these entities are already telling aspects of the story.

Education. As in alternative 2, the preserve staff would strive for increased relevancy by the expansion of curriculum-based presentations connecting the educational objectives of the group with the meanings and significance(s) inherent in the preserve's resources. Education programs would be interdisciplinary, and tied to or connected with curriculum requirements, the national education standards, and presidential goals for education and fitness.

The preserve staff would strive to expand education programs to all schools in the region. New technologies would be incorporated where appropriate. Increased staffing and facilities would meet the growing demand and preserve goals. Partnerships would be encouraged to provide facilities and support.

Curriculum-based programs would promote the preserve as a learning laboratory to develop greater public awareness,

understanding, appreciation and commitment to the preservation and restoration of Big Thicket National Preserve and the larger environment on which it depends. Education programming would integrate research and interpretive programs into the broader educational goals of communities and schools through partnership approaches.

In partnership with local schools, the preserve staff would take an active role in curriculum development and resource protection activities, including Teacher-Ranger-Teacher programs, and honor student community service activities.

OPERATIONS AND FACILITIES

Operations

Staffing. In addition to current staff, an additional five FTE staff would be requested to fully implement this alternative and to build the capacity of the preserve staff to increase the relevancy of the preserve through cultural and natural resource protection, education programs, and use of new technology.

Commercial Visitor Services. As in alternative 1, commercial visitor services could be authorized if determined necessary and appropriate; in this alternative, commercial visitor services (such as guides and tours) would be encouraged to provide greater access and visitor opportunities.

Partnerships. Focus would be on partnerships that help link the preserve to other local and regional resources, such as engaging the NPS Rivers, Trails and Conservation Assistance Program with communities to develop regional partnerships to conserve rivers, preserve open space, and develop trails and greenways. Partnerships could include development of recreation opportunities, resource management activities, or operations functions (i.e., law enforcement,

fire management). Partnerships would also continue with those organizations associated with the preserve's international designations, including the UNESCO Man and the Biosphere Programme and the Globally Important Bird Area Program.

The National Park Service would increase patrols, improve signs, and engage communities in neighborhood partnership programs with the goals of increasing volunteerism and developing local stakeholder interest in areas of the preserve. Outreach efforts would be expanded to enhance the NPS presence in outlying communities, increase involvement with civic organizations and activities (e.g., ecotourism, adopt a trail programs), and partner with volunteer groups to implement restoration projects and other activities.

As in alternative 2, the preserve staff would conduct educational outreach and partner with area schools and universities, the Alabama-Coushatta Tribe of Texas, and others to impart information that would support and expand public understanding, interpretation, and protection of Big Thicket's cultural resources and heritage.

Environmental Leadership. As in alternative 2, the National Park Service would demonstrate leadership in environmentally responsible facility design and construction, and build to the highest achievable LEED standards, striving for Platinum certification. The preserve staff would also pursue "climate-friendly" designation, utilize alternative energy sources, and implement other energy conservation measures.

Facilities

Under this alternative, more dispersed facilities designed to enhance visitor experience would be developed, using partnerships where appropriate. These could include interpretive waysides, picnic areas, trails and roads, visitor contact stations, boat launches, and water-based

trails. The preserve staff would transition operations and facilities to climate friendly technology over time, exhibiting leadership in sustainability through reducing the carbon footprint of preserve operations; encouraging recycling for visitors; and expanding current preserve recycling operations, biomass use, and green purchasing.

Facilities would be minimal, sustainably built and operated, and built to the highest achievable LEED standards, striving for Platinum certification. As facilities and equipment are replaced or renovated, designs and selections would minimize impacts to night skies and soundscapes. Preserve staff would evaluate visitor use patterns and add, reroute or remove access points or facilities as necessary. The National Park Service would site new roads and facilities to increase visitor access. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.

To increase the visibility of the National Park Service and staff interactions with gateway communities, district ranger stations would be established as necessary. In some instances, visitor contact stations would be jointly located with existing facilities, possibly in Beaumont, Woodville, Saratoga, and Silsbee (Seale House). The headquarters building and visitor center would remain at the current site. The preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues. A visitor contact facility would be reestablished in Beaumont.

As in alternative 2, in addition to maintaining the existing headquarters and visitor center complex on FM 420, a new visitor contact facility could be established near Beaumont. Management of the facility could be shared among various partner agencies and organizations. The facility would allow

the National Park Service to contact and orient visitors coming primarily from the south and to better direct them to the various preserve units without them having to travel many miles north to the visitor center.

An educational multiuse facility, in partnership with Lamar University, near Beaumont would be considered. This facility would be located outside the preserve. It would be owned by Lamar University and would serve as an environment education outreach facility with laboratories, classroom, and office space for environmental education personnel. It will provide a base of operations for educational and interpretative boat tours provided by NPS staff. This partnership would be limited to NPS staffing costs associated with educational programs. NPS participation would not require an increase in NPS operational funding.

As in alternative 1, the National Park Service would continue to maintain the fire management facility in Woodville, which could include a ranger station. The preserve staff would also continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory.

Boat Ramps and Launches. Boat ramps, launches, and docks would be designed and located for improved visitor access and to minimize maintenance. Unauthorized boat launches within the preserve boundary would be removed.

Roads, Trails, and Public Access. Roads and trails could be developed to allow new or improved visitor access into undeveloped areas along with new trailhead and visitor parking.

Camping. Current backcountry camping opportunities would remain and could be expanded (e.g., lower cypress area of the Beaumont unit and the Turkey Creek unit).

Housing and Related Facilities. In addition to maintaining current preserve employee housing and researcher accommodations as described in alternative 1, in this alternative the National Park Service would maintain sufficient government housing to accommodate seasonal employee and volunteer needs.

ESTIMATED COSTS AND STAFFING

Cost estimates for this alternative are identified in table 11. These cost estimates, in 2010 dollars, are only intended to indicate a very general relative comparison of costs among the alternatives; they are not to be used for budgeting purposes.

Identification of these costs does not guarantee future NPS funding. Project funding may not come all at once; it would likely take many years to secure and may be partially obtained through partners, donations, or other non-NPS federal sources. Although the National Park Service hopes to secure this funding, the preserve may not receive enough funding to achieve all desired conditions within the time frame of this management plan (the next 15–20 years).

Costs have been broken down into two categories: annual operating costs and one-time costs. Annual costs include the costs associated with ongoing maintenance, utilities, staffing, supplies and materials, and any leasing costs. One-time costs include projects such as new building construction, trail building, native species restoration, and structure rehabilitation.

Annual Costs

Implementation of this alternative is estimated to result in \$3.022 million in annual costs in 2010 dollars, a 14% increase over alternative 1. These costs include additional staff salaries and benefits, as well as facility maintenance. The staffing costs include an additional five FTE staff above

currently authorized staffing levels (24.5 FTE). Staffing levels would likely increase over time as the proposed actions are implemented. Seasonal and student employees, as well as volunteers, also supplement the preserve staff and would continue to support the preserve activities as needed.

To fully implement, this alternative would require additional staff to support greater visitor access to the preserve units, to protect visitors and resources, and to provide new programs. Maintenance of new trails, picnic areas, boat ramps, and parking areas, as well as coordination with volunteer groups also would require staff. The staffing needs have been prioritized and the following positions would allow the National Park Service to begin implementing some aspects of the general management plan:

- two maintenance positions
- one resource management position
- one interpretive position
- one law enforcement position

Some actions cannot be initiated until there is appropriate personnel to maintain and implement all the actions proposed in this alternative. Preserve managers would explore opportunities to work with partners, volunteers, and other federal agencies to leverage resources to effectively and efficiently manage the preserve. Additional staff or agreements would be necessary to fully implement this alternative.

One-time Costs

It is estimated that this alternative would result in one-time costs of \$30.686 million in 2010 dollars. These costs would be primarily due to the necessary safety and maintenance improvements to the headquarters and visitor center complex on FM 420, a multiuse facility in Beaumont, visitor contact stations, district ranger stations, new boat ramps, multiuse trails, roads, picnic areas,

water-based trails, and interpretive panels and kiosks.

Deferred Maintenance

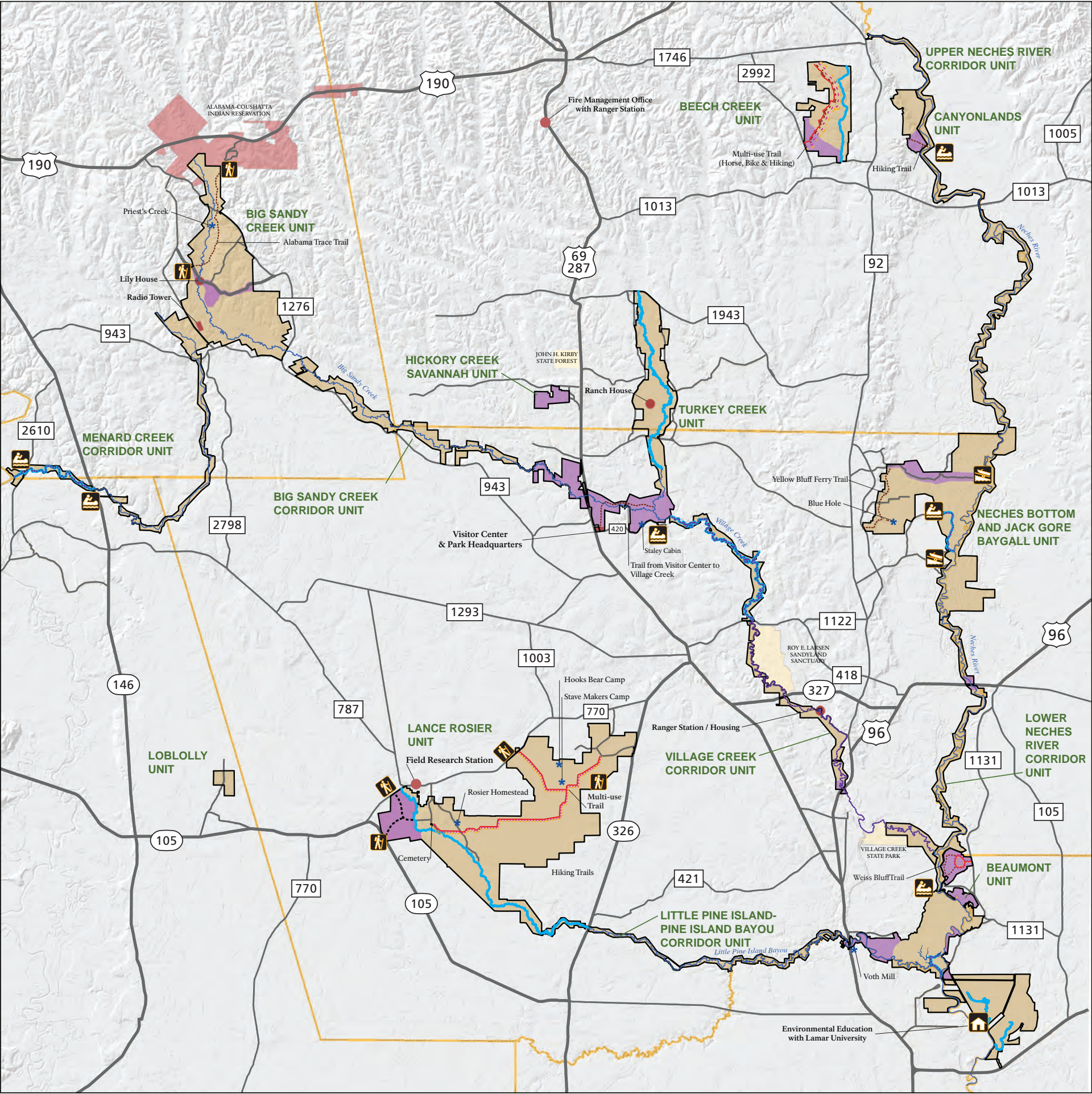
Deferred maintenance refers to maintenance activities for assets in the preserve that were not performed when scheduled. Assets include infrastructure such as buildings and trails, as well as docks and wayside exhibits. The preserve staff has identified approximately \$2.6 million of deferred maintenance related to assets in the preserve. This figure is representative of when the assessment was made and is not

necessarily indicative of future deferred maintenance needs. When the assessment was conducted, the majority of the deferred maintenance costs in the preserve related to new lands that has been recently added to the preserve and have not been fenced. Under this alternative, the preserve would address this and other deferred maintenance activities. In particular, the preserve would address deferred maintenance related to drainage in the headquarters parking lot. The preserve staff will continue to address deferred maintenance of preserve assets as expeditiously as possible.

TABLE 11. SUMMARY OF COSTS FOR ALTERNATIVE 4

ANNUAL OPERATING COSTS	
Annual Operating Costs ¹	\$2,653,000
Increased Staffing	369,368
Staffing (additional full-time equivalent)	29.5 (+5)
Total Annual Operating Costs	\$3,022,368
ONE-TIME CAPITAL COSTS	
Facility (Construction):	
Visitor Infrastructure and Experience <ul style="list-style-type: none"> • Magnolia Trail and Loblolly Loop • Yellow Bluff Ferry Trail and Blue Hole Trail • Palmetto Trail • Oxbow Trail • Fern Hollow Trail • Village Creek Trail • Savannah Loop Trail • Boat ramps • Primitive canoe trails • Incorporation of expanded educational curriculum and new technologies • New campground and designated backcountry campsites along land and water trails² • Development and implementation of auto tours 	
Subtotal	\$27,101,000
Resource Management and Visitor Safety	
<ul style="list-style-type: none"> • Increased climate change partnership and education • Improved and expanded nonnative species management • Additional cultural resource protection and restoration • Expanded research efforts for the area's history and cultural resources • Increased NPS presence in visitor use conflict areas and regulation enforcement 	
Subtotal	\$ 850,000
Operational Improvements	
<ul style="list-style-type: none"> • Headquarters areas of headquarters and visitor center complex on FM 420 • Visitor use areas of headquarters and visitor center complex on FM 420 • LEED construction standards • Housing and field research facilities • Multiuse facility with Lamar University 	
Subtotal	\$ 2,735,000
Total One-time Capital Costs	\$30,686,000
Deferred Maintenance ²	\$ 2,686,000

¹ 2010 funding level.² Deferred maintenance is primarily a result of the need to fence additional lands added to the preserve boundary.



Big Thicket National Preserve

Alternative 4: Increase Relevancy of the Preserve

Proposed Features

- Trailhead
- Canoe Access
- Boat Ramp
- Visitor Contact and Multi-Use Facility with Lamar University
- Points of Interest
- Administrative Road
- New or Improved Road
- Water Trail
- Hiking Trail
- Multi-use Trail (Admin. Road, Bike & Horse)

Proposed Zones

- Developed or Administrative
- Frontcountry
- Backcountry
- Mixed-use Waterway
- Nonmotorized Waterway

Existing Features

- County
- Indian Reservation
- Other Conservation Areas (non NPS)
- Major Road
- Minor Road

Note: For existing features, see Alternative 1.

Big Thicket National Preserve

North

0 2.5 5 10 Kilometers
0 2.5 5 10 Miles

MITIGATIVE MEASURES COMMON TO ALL ACTION ALTERNATIVES

Congress charged the National Park Service with managing the lands under its stewardship “in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (NPS Organic Act, 16 USC 1). As a result, the National Park Service routinely evaluates and implements mitigation whenever conditions occur that could adversely affect the sustainability of national park system resources.

To ensure that implementation of the action alternatives protects unimpaired natural and cultural resources and the quality of the visitor experience, a consistent set of mitigating measures would be applied to actions proposed in this general management plan. The National Park Service would prepare appropriate environmental review (i.e., those required by the National Environmental Policy Act, the National Historic Preservation Act, and other relevant legislation) for these future actions. As part of the environmental review, the National Park Service would avoid, minimize, and mitigate adverse impacts when practicable. The implementation of a compliance-monitoring program could be considered to stay within the parameters of NEPA and NHPA compliance documents, USACE section 404 permits, and other requirements. The compliance-monitoring program would oversee these mitigative measures and would include reporting protocols.

The following mitigative measures and best management practices could be applied to avoid or minimize potential impacts from implementation of the alternatives. These measures would apply under all action alternatives.

CULTURAL RESOURCES

The National Park Service would preserve and protect, to the greatest extent possible, resources that reflect human occupation of Big Thicket National Preserve. Specific mitigating measures include the following:

- Preserve staff would continue to develop inventories for and oversee research regarding archeological, historic, and ethnographic resources to better understand and manage the resources, including cultural landscapes. The preserve staff would conduct any needed archeological or other resource specific surveys, NHRP evaluations, and identify recommended treatments. The results of these efforts would be incorporated into comprehensive preservewide planning and resource assessments, as well as site-specific planning, mitigation, and environmental analysis.
- Museum collections would be acquired, accessioned and cataloged, preserved, protected, and made available for access and use according to NPS standards and guidelines.
- Known archeological sites would be routinely monitored to assess and document the effects of natural processes and human activities on the resources. Archeological resources would be left undisturbed and preserved in a stable condition to prevent degradation and loss of research values unless intervention could be justified based on compelling research, interpretation, site protection, or park development needs. Recovered archeological materials and associated records would be treated in accordance with

NPS *Management Policies* 2006, NPS *Museum Handbook*, and 36 CFR Part 79.

- As appropriate, archeological surveys or monitoring would precede any ground disturbance. Significant archeological resources would be avoided to the greatest extent possible during construction. If such resources could not be avoided, an appropriate mitigation strategy (e.g., the excavation, recordation, and mapping of cultural remains prior to disturbance to ensure that important archeological data is recovered and documented) would be developed in consultation with the Texas SHPO and, as necessary, associated American Indian tribes.
- If, during construction, previously unknown archeological resources were discovered, all work in the immediate vicinity of the discovery would be halted until the resources could be identified and documented. If the resources could not be preserved in situ, an appropriate mitigation strategy would be developed. In the unlikely event that human remains, funerary objects, sacred objects, or objects of cultural patrimony are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act (25 USC 3001) of 1990 would be followed. If non-Indian human remains were discovered, standard reporting procedures to notify the proper authorities would be followed, as would all applicable federal, state, and local laws.
- All projects with the potential for ground disturbance would undergo site-specific planning and compliance procedures. For archeological resources, construction projects and designed facilities would be in previously disturbed or existing developed areas. Adverse impacts to

archeological resources would be avoided to the extent possible in accordance with the *Secretary of the Interior's Standards for Archeology and Historic Preservation*.

- To minimize visual and auditory intrusions on cultural resources from modern development, the National Park Service would use screening or sensitive designs that would be compatible with historic resources and cultural landscapes and not intrude on ethnographic resources. If adverse impacts could not be avoided, impacts would be mitigated through a consultation process with all interested parties.
- Continue ongoing consultations with culturally associated American Indian tribes. Protect sensitive traditional use areas to the extent feasible by avoiding or mitigating impacts on ethnographic resources and continuing to provide access to traditional use and spiritual areas. Mitigation could include identification of and assistance in accessing alternative resource gathering areas and screening new development from traditional use areas.
- Encourage visitors through the preserve's interpretive programs to respect and leave undisturbed any inadvertently encountered archeological resources as well as to respect and leave undisturbed any offerings placed by American Indians.

NATURAL RESOURCES

Air Quality

- Implement a dust abatement program for construction projects. Standard dust abatement measures could include the following elements: water or otherwise stabilize soils, cover haul

trucks, employ speed limits on unpaved roads, minimize vegetation clearing, and revegetate after construction.

Nonnative Species

- Implement an invasive weed control program. Standard measures could include the following elements: ensure construction-related equipment arrives on-site free of mud or seed-bearing material, certify all seeds and straw material as weed-free, identify areas of invasive weeds preconstruction, treat invasive weeds or weed topsoil before construction (e.g., topsoil segregation, storage, herbicide treatment), and revegetate with appropriate native species.

Soils

- Build any proposed facilities on soils suitable for development. Minimize soil erosion by limiting the time that soil is left exposed and by applying other erosion control measures, such as erosion matting, silt fencing, and sedimentation basins in construction areas to reduce erosion, surface scouring, and discharge to water bodies. Once work is completed, revegetate construction areas with native plants in a timely manner.

Endangered and Threatened Species and Species of Concern

Mitigation actions would occur during normal preserve operations as well as before, during, and after construction to minimize immediate and long-term impacts on rare, threatened, and endangered species. These actions would vary by specific project and area of the preserve affected. Additional mitigation measures would be added depending on the specific action and location. Many of the measures listed above for vegetation and wildlife would also benefit

rare, threatened, and endangered species by helping to preserve habitat. Mitigation actions specific to rare, threatened, and endangered species would include the following:

- Conduct surveys for rare, threatened, and endangered species as warranted.
- Locate and design facilities and actions to avoid adverse effects on rare, threatened, and endangered species. If avoidance is infeasible, minimize and compensate for adverse effects on rare, threatened, and endangered species as appropriate and in consultation with the appropriate resource agencies. Conduct work outside of critical periods for the specific species.
- Develop and implement restoration or monitoring plans as warranted. Plans should include methods for implementation, performance standards, monitoring criteria, and adaptive management techniques.
- Implement measures to reduce adverse effects of nonnative plants and wildlife on rare, threatened, and endangered species.

Vegetation

- Monitor areas used by visitors (e.g., trails) for signs of native vegetation disturbance. Use public education, revegetation of disturbed areas with native plants, erosion control measures, and barriers to control potential impacts on plants from trail erosion or social trailing.
- Develop revegetation plans for the disturbed area and require the use of native species. Revegetation plans should specify seed or plant source, seed or plant mixes, soil preparation, and other details as needed. Salvage vegetation should be used to the extent possible.

Wildlife

- Implement visitor education programs, restrictions on visitor activities, and park ranger patrols as necessary to reduce impacts to wildlife.
- Implement a natural resource protection program. Standard measures would include construction scheduling, biological monitoring, erosion and sediment control, the use of fencing or other means to protect sensitive resources adjacent to construction, the removal of all food-related items or rubbish, topsoil salvage, and revegetation. This could include specific construction monitoring by resource specialists as well as treatment and reporting procedures.

Natural Soundscapes

- Implement standard noise abatement measures during construction. Standard noise abatement measures could include the following elements: a schedule that minimizes impacts on adjacent noise-sensitive uses, the use of the best available noise control techniques wherever feasible.
- Implement standard noise abatement measures during preserve operations using measures such as those listed above.
- Site and design facilities to minimize the intrusive frequencies, magnitudes, and durations of human-caused sound.
- Schedule interpretive programs around the times when noisy activities occur.
- Use quiet technology equipment wherever feasible.
- Use hydraulically or electrically powered impact tools when feasible.

- Place stationary noise sources as far from sensitive uses as possible.
- The idling of motors (power tools, equipment, and vehicles) would be minimized when not in use.

Scenic Resources

- Where appropriate, use facilities such as boardwalks and fences to route people away from sensitive natural and cultural resources, while still permitting access to important viewpoints.
- Design, site, and construct facilities to avoid or minimize adverse effects on natural and cultural resources and visual intrusion into the natural or cultural landscape.
- Provide vegetative screening, where appropriate.

SUSTAINABILITY AND AESTHETICS

- Projects would avoid or minimize adverse impacts on natural and cultural resources.
- Development projects (e.g., buildings, facilities, utilities, roads, bridges, trails, etc.) or reconstruction projects (e.g., road reconstruction, building rehabilitation, utility upgrade, etc.) would be designed to work in harmony with the surroundings to the greatest extent possible.
- Projects would reduce, minimize, or eliminate air and water nonpoint-source pollution.
- Projects would take into account the expected effects of climate change on preserve resources and would incorporate this information into project planning, design, and construction.
- Projects would be sustainable whenever practicable, by recycling and reusing materials, by minimizing

materials, by minimizing energy consumption during the project, and by minimizing energy consumption

throughout the lifespan of the project.

FUTURE STUDIES AND IMPLEMENTATION PLANS NEEDED

After completion and approval of a general management plan for Big Thicket National Preserve, other more detailed studies and plans would be needed before specific actions are implemented. As required, additional environmental compliance (adherence to the National Environmental Policy Act, the National Historic Preservation Act, and other relevant laws and policies) and public involvement would be conducted. Preserve staff would undertake a comprehensive assessment of future planning and study needs. Plans and studies would be prioritized and coordinated to address the preserve's most pressing needs with consideration of critical resource protection requirements, funding availability, and other management priorities. Additional studies could include but would not be limited to the following:

- Wild and scenic river study—this study would be conducted for the waterways within the preserve to determine whether they are eligible and suitable for wild and scenic river designation and inclusion into the Wild and Scenic Rivers System. An eligibility assessment has already been conducted and determined that seven of the eight segments analyzed were eligible. Determination of suitability is the next step in this process.
- The Neches River and several tributaries within the preserve are listed in the National Rivers Inventory, which requires the National Park Service to address eligibility and suitability for inclusion in the wild and scenic rivers system as part of land planning activities, or in a related planning effort. A study covering eligibility, classification, and outstandingly remarkable values of the Neches River and tributaries within the preserve (i.e., downstream of B.A. Steinhagen Lake) would be completed by the National Park Service and would be incorporated in this general management plan effort. Suitability would be addressed in a future study separate from this GMP effort.
- Trail management plan—the preserve staff would perform visitor demand modeling to assist in the development of a trail management plan that would include land and water-based trails. This plan would help with the determination of placement and management of trails within the preserve.
- Cultural resource management plans—a wide array of possible plans and studies may be undertaken by NPS staff to enhance understanding and treatment of the preserve's historic properties and cultural resources. Among these are archeological resource overviews, historic structure reports, historic resource studies, cultural landscape inventories and reports, ethnographic overviews and assessments, cultural affiliation studies, oral histories, and museum collections management reports.
- Resource stewardship strategy—resource stewardship strategies serves as a bridge between the qualitative statements of desired conditions for resources and resource condition-dependent visitor experiences established in the park's general management plan and the measureable goals and implementation actions determined through park strategic planning. This analytical document focuses on identifying and tracking indicators of desired resource conditions, recommends

comprehensive strategies to achieve and maintain desired conditions over time, and assesses and updates these comprehensive strategies periodically based on new information and the results of completed activities. A resource stewardship strategy provides an approach for investing both human and fiscal resources in resource stewardship. It also reports accountability toward progress in attaining and maintaining desired resource conditions. Comprehensive

strategies in a resource stewardship strategy for Big Thicket National Preserve would likely include further necessary planning efforts such as a hunting management plan, integrated pest management plan, and water corridor or comprehensive river management plan, depending on whether the Neches River and tributaries are determined eligible and suitable for wild and scenic river designation.

ENVIRONMENTALLY PREFERABLE ALTERNATIVE

As defined in CEQ “Forty Most Asked Questions,” (Q6a) the environmentally preferable alternative is defined as “. . . the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources.” It should be noted that there is no requirement that the environmentally preferred alternative and the NPS preferred alternative be the same.

In analyzing the impacts to natural and cultural resources, as described in chapter 4, none of the alternatives would result in more than moderate adverse impacts—most adverse impacts would be negligible to minor in intensity. Indeed, most of the preserve’s natural resources would not be affected by the action alternatives. Compared to alternative 1, alternatives 2, 3, and 4 would have similar adverse impacts on resources in the preserve. Some localized minor impacts could occur as a result of the limited construction projects and the maintenance of facilities in the action alternatives. However, all the action alternatives would better protect the preserve’s

natural resources through increased monitoring, increased volunteer and outreach efforts (which would increase visitors’ awareness of the preserve’s natural resources), increased native vegetation restoration efforts, better designation of existing trails, increased cooperation with neighbors and development of partnerships, and the application of user capacity indicators and standards. Alternatives 2 and 4 would also better protect the preserve’s cultural resources through increased monitoring of archeological resources, historic structures and cultural landscapes, and increased outreach and education efforts, which in turn would increase visitor awareness and community stewardship of these resources.

Although the beneficial and adverse impacts of the three action alternatives are similar, alternative 3 has the least amount of road, trail, and visitor infrastructure development (e.g., boat ramps and launches) and the greatest focus on protection of biodiversity and natural resources within the preserve. For this reason, alternative 3 is the environmentally preferable alternative.

ALTERNATIVES AND ACTIONS CONSIDERED BUT DISMISSED FROM DETAILED EVALUATION

In developing alternatives for this general management plan, a number of actions were considered by the GMP planning team that were eliminated from further detailed evaluation because they did not meet the stated objectives of the general management plan to a large degree, could not be implemented for technical or logistical reasons, were not consistent with the purpose or significance of the preserve, or were outside the scope of this GMP planning effort. The actions and the reasons why they were dismissed are described below.

1. The use of existing oil and gas rights-of-way for possible public use trail corridors was considered. Continuing use of these rights-of-way by private companies raised concerns for public safety and the potential for companies to incur liability if they allowed public access. It was also determined that the visitor experience through the open clearings along the rights-of-way would not provide compelling visual or scenic interest.
2. The concept of a “canopy walk” was considered in previous planning efforts and a number of commenters suggested the construction of a canopy walk during scoping for this general management plan. A canopy walk would provide visitors with an opportunity to experience the forest canopy while also giving a broader perspective on the landscape. This action was dismissed from further consideration because of the likely footprint associated with such a structure, concerns about public safety, impacts to natural and cultural resources, and the costs of construction and maintenance.

Given the preserve’s proximity to the Gulf Coast and to ensure visitor safety, such a tall structure would need to be designed for very high wind loads (approximately 110 to 130 mile per hour [mph]) to withstand hurricanes. Such a structure or structures would also require a significant foundation to prevent overturning in high winds. This would create a structure or structures with significant visual and natural resource impacts to soils, vegetation, and wildlife during construction and after. There is also the potential for disturbance of unknown archeological sites. In addition, such a structure or structures would likely be cost prohibitive given the above and below ground construction requirements and maintenance costs.

3. The use of personal watercraft on waters of the preserve and off-road vehicles was proposed by some members of the public as recreational experiences they would like to see allowed in the preserve. The NPS staff continues to view these devices as inappropriate to the customary range of visitor experiences allowable in the preserve and detrimental to resource protection objectives.
4. Some commenters suggested that the National Park Service acquire a portion of or all of the nonfederal mineral rights in the preserve. These suggestions were dismissed from further consideration in the general management plan because these issues have already been considered as part of the *Big Thicket National Preserve Oil and Gas Management Plan* (NPS 2006). As the conditions

have not changed, these actions were dismissed from further analysis in the alternatives for the general management plan.

As noted in the preserve's enabling legislation (PL 93-439 2[a]) "The Secretary [of the Interior] shall, immediately after the publication of the boundaries of the preserve, commence negotiations for the acquisition of the lands located therein, "Provided, that he shall not acquire the mineral estate in any property or existing easements for public utilities, pipelines or railroads without the consent of the owner unless, in his judgment, he first determines that such property or estate is subject to, or threatened with, uses which are, or would be, detrimental to the purposes and objectives of this Act."

Because the National Park Service currently has the authority to acquire the nonfederal mineral rights on a case-by-case basis, if it determines that an oil and gas operation poses a significant threat to preserve resources and values and the operation cannot be modified to ensure the protection of preserve resources and values, it is not necessary to consider acquisition of nonfederal mineral rights as a separate action within the general management plan.

Further, as part of the *Big Thicket National Preserve Oil and Gas Management Plan*, an analysis was completed of the impacts of acquiring all nonfederal mineral rights in the preserve. It was determined that acquisition would protect preserve resources and values and avoid conflicts with visitor use, enjoyment, and human health and safety, but would create conflicts with private property rights. It would also not meet the objective of permitting reasonable access for exploration and development of nonfederal oil and gas resources. NPS regulations in 36 CFR Part 9B governing nonfederal oil and gas operations in park units provide reasonable controls on nonfederal oil and gas exploration, production, and transportation to assure park resource and visitor protection. As described above, the National Park Service has the authority to purchase the nonfederal mineral rights on a case-by-case basis. It would be unnecessary and cost prohibitive to purchase all of the mineral rights throughout the preserve; therefore, this alternative was eliminated from further detailed analysis.

Tables 12 and 13 are a summary of the alternatives and key impacts of implementing the alternatives.

TABLE 12. SUMMARY OF ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
Resources Management				
Concept	Under this alternative, the current management approach for the preserve would continue into the future. The management direction would be in accordance with the 1980 general management plan, previous NPS practices and approved actions, and all applicable laws, regulations, and policies. Lands acquired after the 1980 general management plan (including the Big Sandy Creek corridor unit, Village Creek corridor unit, and Canyonlands unit) would be managed in a manner compatible with existing units. New or expanded uses would not be anticipated. Because currently there are no management zones designated for alternative 1, the management zones described earlier in this chapter have not been applied to this alternative.	<p>This alternative concept endorses a broad ecosystem perspective for protection of substantial portions of historic Big Thicket. This alternative acknowledges the challenges associated with cross-boundary resource management issues and recognizes the importance of fostering partnerships to address and resolve resource problems. The National Park Service would actively engage in regional planning and policy efforts that benefit resource protection, offer compatible visitor use, and address other issues, both within and outside the preserve boundaries.</p> <p>The National Park Service would emphasize the status of Big Thicket National Preserve as a globally important biological protection area. Initiatives that advance the long-term protection of natural resources of the preserve would receive primary focus of management attention and funding. Preserve staff would continue to protect and preserve significant cultural resources consistent with law and policy. Appropriate visitor opportunities would be expanded. To achieve these objectives, preserve staff would expand existing partnerships and seek new partnership agreements with outside public and private organizations having similar objectives for resource protection, law enforcement, public education, interpretation, and other operational requirements. Preserve operations would incorporate strong environmental protection and sustainable development practices.</p>	Alternative 3 would emphasize natural resource preservation and research while providing self-reliant recreational opportunities. This alternative would provide the highest emphasis on protection, restoration, and maintenance of native biodiversity in the preserve. Restoration and active management would restore resilient native vegetation communities, species assemblages, and ecological functions. To increase the visibility of the NPS-managed lands and water to the public, the National Park Service would increase patrols and improve signs. The preserve staff would engage communities in neighborhood partnership programs and citizen science activities with the goals of increasing volunteerism and developing local stakeholder interest in the preserve and its natural resources. Preserve operations would feature strong environmental protection and sustainable development and practices.	<p>The purpose of this alternative is to increase the relevancy of the preserve and the National Park Service to the people in the communities of southeast Texas and to visitors from all over the world. Nature, history, and recreational opportunities would encourage people to connect to and support the preserve mission. Management of this alternative would emphasize personal connections to the preserve through family and cultural history, recreational opportunities, and personal experiences. Opportunities to visit the preserve using technology would be considered.</p> <p>This alternative recognizes that the cultural history of the preserve is also a history of the surrounding communities and the region. This history includes the history of American Indians and early settlers through today’s inhabitants. Cultural resources would be preserved, rehabilitated, restored, or reconstructed as appropriate. Where possible, cultural resources would become a greater part of the visitor experience.</p> <p>Visitors would continue to have the opportunity to enjoy a range of recreational activities consistent with the purpose of the preserve. There would be improved access in some areas (e.g., Jack Gore Baygall, Lance Rosier, and Canyonlands units) as well as enhanced recreational and interpretive opportunities. Resource management efforts would support and maintain the biodiversity of the preserve, appropriate visitor experiences, as well as a landscape that reflects the historic native ecosystems. preserve operations would feature strong environmental protection and sustainable development and practices.</p>
Natural Resources Management Concept	<p>Lands would continue to be administered to assure their natural and ecological integrity in perpetuity.</p> <p>Management of natural resources would continue to emphasize the mitigation of impacts from oil and gas operations and other preserve uses, management of nonnative plants and animals, biological inventory, and restoration of fire-adapted communities.</p>	<p>Preserve staff would undertake comprehensive restoration activities to maintain ecological integrity of the preserve in a largely unfragmented condition.</p> <p>The National Park Service would increase its coordination efforts with neighboring land management agencies, researchers, volunteers, and nongovernmental organizations to achieve natural resource management goals.</p> <p>Outside the boundary, preserve staff would strive to enhance natural resources management through active participation in regional planning, educational programs, and partnerships.</p>	<p>To develop and support the information needs for resources management, a strong emphasis would be placed on scientific study, research, and data management.</p> <p>Priorities for these efforts would include the role and function of biological corridors for the maintenance of native species populations and the response, resilience, and recovery of plant and animal communities to natural and anthropogenic disturbances, including impacts of climate change, changes in hydrology and land use, and invasive species.</p> <p>Active management would focus on achieving lasting restoration of native vegetation communities, species assemblages, and ecological functions.</p>	<p>Same as alternative 1 plus.</p> <p>The National Park Service would include appropriate visitor services that would connect visitors to natural resources and build support for conservation.</p>
Biodiversity and Science	The National Park Service staff would continue to work with partners such as Gulf Coast Cooperative Ecosystems Study Unit and Gulf Coast Inventory and Monitoring Program to complete biological inventories and research species susceptibility to climate change.	<p>Same as alternative 1 plus.</p> <p>Alternative 2 would emphasize an ecosystem approach to resource management that emphasizes evaluation of landscape-scale restoration of methods, habitat fragmentation, invasive species control, fire management strategies, and</p>	<p>Same as alternatives 1 and 2 plus.</p> <p>Under this alternative, the National Park Service would focus research efforts on the inventory and understanding of the full scope of the biodiversity of Big Thicket, including interactions of elements.</p>	<p>Same as alternatives 1 and 2 plus.</p> <p>The National Park Service would work closely with UNESCO Man and the Biosphere Programme.</p> <p>Because Big Thicket National Preserve is a biosphere reserve, the National Park Service would strive to demonstrate</p>

TABLE 12. SUMMARY OF ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
	Staff would continue to meet agency goals for sustainability, energy conservation, and greenhouse gas emission reduction, and to adaptively manage resources using the best available scientific information on climate change.	<p>species interactions within ecological communities.</p> <p>Scientifically based best management practices would be used to adaptively manage resources and better understand the effects of climate change on ecological communities. Management practices would be prioritized to promote ecological connectivity and mitigate habitat fragmentation caused by the separation of park units and regional land use practices and development.</p> <p>The National Park Service would coordinate with neighboring land management agencies, local universities, and nongovernmental organizations to develop regional approaches to ecosystem management and to assess the impacts of climate change by establishing baseline data and identifying at-risk species. The National Park Service would also partner with local schools to develop educational programs about sustainability, energy conservation, and greenhouse gas emission reduction, and how climate change may affect the region as a whole.</p>	As part of this effort a comprehensive geographic information system would be developed to effectively manage resource and biological information.	conservation of biodiversity with sustainable use and development. As part of the effort, the staff would engage partners and community leaders to develop avenues for knowledge sharing, research and monitoring, education and training, and participatory decision making.
Nonnative Species	<p>The National Park Service would continue current management of invasive and nonnative species, focusing on those that pose the greatest resource threats.</p> <p>Management actions would mainly be conducted and coordinated with NPS exotic plant management teams and be targeted on limited populations and areas that can be feasibly controlled. A variety of integrated pest management principles would be used including mechanical and chemical methods of nonnative plant control.</p> <p>Cooperative control efforts with volunteers and neighboring agencies would continue on a limited basis, including educational and prevention-oriented activities.</p> <p>Planning for management of nonnative feral hogs and other animal species would continue.</p>	<p>Same as alternative 1 plus.</p> <p>Staff would partner with neighboring agencies, volunteers, and nongovernmental organizations to combat nonnative invasive species on a regional scale, employing educational partnerships and cross-boundary control efforts would increase.</p> <p>Integrated pest management principles would be used to increase the number of acres treated for nonnative species.</p> <p>Monitoring activities would be improved and expanded and could include increased involvement of the NPS exotic plant management team.</p> <p>Staff would develop and implement effective control techniques to limit the damage caused by nonnative animal species.</p>	<p>Same as alternative 1 plus.</p> <p>Staff would comprehensively prioritize management of nonnative vegetation, targeting species and areas where populations pose the greatest threat to preserve resources, and where control efforts have the greatest likelihood of achieving lasting success.</p> <p>Management actions may be conducted at larger, landscape-scales and may be conducted jointly with partners and adjacent landowners in order to achieve efficient results.</p> <p>Prioritized treatment would be integrated into other resource management activities.</p> <p>Staff would develop and implement effective control techniques to limit the damage caused by nonnative animal species.</p>	Same as alternative 3.
Endangered and Threatened Species and Species of Concern	Preserve staff would continue to focus on monitoring and recovery of Texas trailing phlox, restoration of habitat for fire-adapted species of concern, and participation in the East Texas Black Bear Task Force.	<p>Same as alternative 1 plus.</p> <p>The National Park Service would expand activities related to monitoring and recovery of all endangered and threatened species and species of concern that occur in the preserve.</p> <p>The National Park Service would research the ecology, restore habitat, and undertake reintroduction actions, where practical, for endangered and threatened species and species of concern.</p>	Same as alternative 2.	Same as alternative 2.
Water	<p>The National Park Service would strive to ensure there is adequate flow of clean water to optimize ecological support of aquatic and terrestrial systems.</p> <p>Staff would continue to manage natural processes in rivers and wetland systems.</p> <p>Staff would continue to conduct water quality monitoring at</p>	<p>Same as alternative 1 plus.</p> <p>Preserve staff would work with partners to protect watersheds from source and nonsource pollutants, maintain natural fluvial processes, and practice good watershed management.</p> <p>Preserve staff would pursue improved watershed health</p>	Same as alternative 2.	Same as alternative 1.

TABLE 12. SUMMARY OF ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
	<p>selected preserve sites through the Gulf Coast Inventory and Monitoring Program.</p> <p>Staff would continue to work with partners, researchers, and agencies to inventory and monitor aquatic organisms.</p> <p>Staff would continue to work toward defining environmental flow requirements for aquatic species and floodplain vegetation communities, and they would work with neighboring agencies and partners to improve water quality, implement high pulse flows, and reduce trash and pollutants.</p>	<p>through community outreach and educational programs.</p> <p>Partnerships would focus on working directly with communities to educate residents about the importance of maintaining the flow of water through the preserve and region.</p> <p>Staff would research, define, and protect the environmental flow regime to sustain aquatic species, river and stream ecology, estuaries, and floodplain vegetation.</p> <p>The National Park Service would work with state offices, water authorities, and planning commissions to protect water quality and freshwater environmental flows.</p> <p>In collaboration with the U.S. Army Corps of Engineers and the Lower Neches Valley Authority, the National Park Service would seek management agreements for the Neches River to maintain optimal flows necessary to benefit the health of ecological systems and control the spread of nonnative species.</p>		
Oil and Gas Management	<p>As specified in the enabling legislation, the National Park Service would continue to regulate gas exploration oil and gas extraction.</p> <p>Preserve staff would continue to manage oil and gas operations under the servicewide regulations governing the exercise of nonfederal oil and gas rights in park units at 36 CFR Part 9, Subpart B and the <i>Big Thicket National Preserve Oil and Gas Management Plan</i>.</p> <p>The National Park Service would seek to minimize the impacts of oil and gas operations; voluntary mitigation from operations with surface locations outside the preserve would be encouraged.</p> <p>Abandoned oil and gas sites, abandoned pipeline, and road rights-of-way would be reclaimed where appropriate and feasible.</p>	<p>Same as alternative 1 plus.</p> <p>The National Park Service would coordinate with the Texas Railroad Commission, the Federal Energy Regulatory Commission, and other jurisdictional agencies to develop a mitigation and management program for within-boundary surface operations that would represent additional actions over and above regulatory requirements.</p> <p>The National Park Service would implement a variety of measures to improve the protection of preserve resources and values from impacts of oil and gas operations.</p>	<p>Same as alternative 2 plus.</p> <p>The National Park Service would work with oil and gas operators and industries to implement initiatives to mitigate and protect natural soundscapes and reduce light pollution adversely impacting the nightscape.</p>	<p>Same as alternative 1.</p>
Fire Management	<p>Preserve staff would continue to use a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities in order to allow fire to function in its natural ecological role, to restore ecosystem balance, and to manage hazardous fuels in the urban interface.</p> <p>Fire management activities would include hazardous fuel reduction and restoration, especially of longleaf pine habitat.</p> <p>Preserve staff would continue to work cooperatively with the Texas Forest Service, counties, and other partners on mutual support for response to wildfires, prescribed fire management, fire prevention and preparedness, and restoration as appropriate.</p>	<p>Same as alternative 1 plus.</p> <p>The National Park Service would continue management practices described in alternative 1 by using a combination of prescribed fire and mechanical and chemical treatments to manage vegetation in fire-adapted vegetation communities to allow fire to function in its natural ecological role, restore ecosystem balance, and manage hazardous fuels in the urban interface.</p>	<p>Same as alternative 1.</p>	<p>Same as alternative 1.</p>

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Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
Cultural Resource Management Concept	<p>The National Park Service would continue efforts to protect, preserve, and stabilize cultural resources as staffing and funding priorities allow.</p> <p>Appropriate cultural resources studies and investigations would be undertaken with available staffing and funding.</p> <p>Preserve staff would continue to carry out surveys of areas proposed for construction or ground disturbance (e.g., oil and gas operations) to identify and document cultural resources within areas of potential effect that may be eligible for the National Register of Historic Places.</p> <p>The anticipated effects on these resources would continue to be assessed in consultation with the state historic preservation office, associated tribes, and other concerned parties. Adverse impacts on significant resources would be avoided or adequately mitigated.</p> <p>Studies and investigations would be carried out as necessary with available staffing and funding, including surveys conducted with contracted services to fulfill project compliance requirements. Information compiled and synthesized from these investigations would be incorporated in cultural resource management databases.</p> <p>Staff would continue to consult with NPS regional staff, Texas SHPO, Alabama-Coushatta THPO, and other concerned parties to ensure potential cultural resources in areas of proposed activities are identified, documented, and protected.</p> <p>Existing cultural and education partnerships would continue.</p>	<p>Same as alternative 1 plus</p> <p>Based on appropriate treatment recommendations and guidance documentation, the National Park Service would actively preserve, stabilize, and rehabilitate selected historic structures and cultural landscapes.</p> <p>Staley Cabin and its associated cultural landscape would be rehabilitated to reflect its 1920 period of significance.</p> <p>Archeological and ethnographic resources would be protected and preserved. Expanded research on cultural resources and history of Big Thicket would be conducted.</p> <p>Partnership assistance would be sought from NPS regional staff, Texas SHPO, Alabama-Coushatta THPO, and other historic preservation groups to carry out cultural resource surveys and documentation, assessment, and monitoring of resources.</p>	<p>Same as alternative 1.</p>	<p>As in alternative 2, preserve staff would actively preserve, stabilize, and rehabilitate selected historic structures and cultural landscapes. Archeological sites and ethnographic resources would be protected and preserved.</p> <p>Visitors would have greater opportunities to access and visit selected cultural sites determined to have little potential to be adversely impacted by visitor use. Public visitation to sensitive sites would be limited and controlled.</p> <p>As in alternative 1, the National Park Service would promote more extensive research to document the area’s history and cultural resources, through partnerships with Texas SHPO, Alabama-Coushatta THPO, and historic preservation groups.</p>
Visitor Use and Experience				
Concept	<p>Visitors would continue to have opportunities to enjoy a wide range of land- and water-based recreational activities consistent with the purpose of the preserve. The traditional range of visitor use activities would continue with few substantial changes anticipated. Visitors would continue to receive information from NPS staff primarily in the headquarters and visitor center area, and could expect to encounter NPS presence in areas with high visitor use. NPS staff would continue to inform visitors of the preserve boundaries and regulations, and emphasize water safety measures.</p>	<p>This alternative would emphasize low impact recreation and a variety of recreational opportunities ranging from self-guiding to ranger-led experiences.</p> <p>Connections to outside partners or programs providing experiences not permitted in the preserve would also be encouraged.</p>	<p>The traditional range of visitor use activities would continue; the National Park Service would promote low-impact activities that best support the protection of preserve resources.</p> <p>A variety of additional visitor use and interpretive activities and programs would be provided.</p> <p>Working through partnerships, preserve staff would create opportunities for visitor learning and participation in scientific research, restoration projects, and citizen science activities.</p>	<p>This alternative would emphasize visitor experience that encourages a personal connection to the preserve. Opportunities to experience cultural resources would increase and a range of recreational opportunities would be provided. There would be an emphasis on ranger-led activities.</p> <p>Some new uses could be allowed to encourage visitors to get into and experience the preserve. An auto tour route of the preserve could be developed along with trailheads and hiking trails linking to various units.</p> <p>Staff would sponsor workshops to highlight biological, historical, and cultural resources in the preserve.</p>
Visitor Opportunities				
Houseboats	<p>The management of houseboats would be prioritized as resources allow, ensuring compliance with local, state, and federal laws.</p>	<p>Houseboats would be required to comply with laws and regulations including proof of registration, sanitation, camping as set forth in Superintendent’s Compendium, and unattended property regulations.</p> <p>The National Park Service would work closely with the Texas</p>	<p>Houseboats would not be allowed in the preserve.</p>	<p>Same as alternative 2.</p>

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Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
		Commission on Environmental Quality, Texas Parks and Wildlife, United States Coast Guard, and local authorities to ensure boating, water quality, and other regulations are consistently enforced to enhance visitor experience and resource protection.		
Motorized Boats	Preserve staff would continue to limit and control use of motorized boats. Existing boat ramps and launch facilities would remain; no new facilities would be anticipated.	<p>Motorized boats would be allowed in the Neches River (including Johns Lake, Tater Patch Lake, Lower Cypress area of the Beaumont unit, Lake Bayou, associated canals) and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook’s Lake and Scatterman Lake.</p> <p>In this alternative, Village Creek from the confluence with the Neches River upstream to the Highway 96 bridge would allow both motorized and nonmotorized uses. Village Creek upstream from the Highway 96 bridge would be nonmotorized only.</p> <p>Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized). In nonmotorized zones, trolling motors would be allowed at no-wake speeds.</p>	<p>Motorized boats would be allowed in the Neches River (including Johns Lake, Lake Bayou, Ten-Mile Creek, and associated canals), and Pine Island Bayou from the end of Carpenter Road (in Beaumont) to the confluence with the Neches River (including Cook’s Lake). In this alternative, all of Village Creek upstream from the confluence with the Neches River, Cook’s Lake to Scatterman Lake loop, and Johns Lake to Franklin Lake waters would be nonmotorized only. The portion of Johns Lake from the boat launch to the Neches River would be mixed use.</p> <p>Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized zones). In nonmotorized zones, trolling motors would be allowed at no-wake speeds.</p>	<p>Motorized boats would be allowed in all navigable waters except where prohibited for conflicting uses. The portion of Johns Lake from the boat launch to Neches River would be mixed use.</p> <p>Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized). In nonmotorized zones, trolling motors would be allowed at no-wake speeds.</p>
Off-road Vehicles and Personal Watercraft	ORV and PWC use would continue to be prohibited.	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.
Horses	Existing horseback riding opportunities within the preserve would remain. New opportunities would not be considered.	Opportunities for horseback riding would be expanded to include a multiuse trail in the Beech Creek unit, Oxbow area of the Beaumont unit, and northeastern portion of the Lance Rosier unit. Connections to other trails outside the preserve would be encouraged with partner agencies.	Opportunities for horseback riding would be expanded, including the development of a new multiuse trail in the Beech Creek unit.	Same as alternative 2.
Bicycling	Existing bicycling opportunities within the preserve would remain. Bicycling would continue to be restricted to designated routes within the preserve. New opportunities would not be considered.	Opportunities for biking would be expanded to include a multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop); another new trail for bicycling and hiking along Pine Island Bayou could be developed in cooperation with the City of Beaumont. Connections to other trails outside the preserve would be encouraged with partner agencies.	Mountain bikes would be allowed only on designated routes within the preserve; these routes would include new areas identified as appropriate and a new multiuse trail in the Beech Creek unit (Magnolia Trail and Loblolly Loop). Development of bicycle route connections from public transit to preserve would be encouraged.	Same as alternative 2.
Hunting, Fishing, and Trapping	The preserve staff would continue to permit hunting, fishing, and trapping where currently authorized, including over 47,000 acres in portions of the Beaumont, Beech Creek, Big Sandy Creek, Jack Gore Baygall and Neches Bottom, and Lance Rosier units. Other locations would continue to be closed to hunting and trapping for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment.	Same as alternative 1.	Same as alternative 1.	Same as alternative 1.
Roads and Trails	<p>No substantial changes to roads and trails would occur. This would include those lands recently added to the preserve.</p> <p>Paved roads and unpaved roads would remain as they are currently.</p> <p>The preserve staff would continue to maintain existing trails and uses.</p>	<p>Trail development would focus on those that link areas of the preserve to existing trails inside and outside the preserve, as well as to other entities such as the city of Beaumont. An accessible hunting trail would be provided for use only by wheelchairs and other power-driven mobility devices consistent with NPS policy.</p> <p>Land Trails. Additional hiking trails would be developed where</p>	<p>Trail development would focus on those opportunities that support traditional, low-impact recreational activities, as well as those that promote connections to the preserve from alternative means of transportation (bicycles, public transportation).</p> <p>Land Trails. Additional hiking trails would be developed where appropriate and abandoned roadbeds would be</p>	<p>Roads and trails could be developed to allow for new or improved visitor access into units including undeveloped areas.</p> <p>Land Trails. Trails could include self-guiding nature trails that provide an introduction to inaccessible areas of the preserve such as Fern Hollow. Other trails could be developed to link resources that highlight the history of habitation in and</p>

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	Water trails—there are three existing minimally maintained water trails in the preserve.	<p>appropriate, and abandoned roadbeds would be assessed for reuse as trails. The preserve staff would work with GPS-based recreation groups to ensure activities do not impact resources.</p> <p>A new frontcountry trail would be developed in the Turkey Creek unit from the visitor center to Village Creek, with trail connections to the Turkey Creek Trail.</p> <p>New primitive trails in the Lance Rosier unit would include an “East – West” hiking trail and a multiuse loop trail in the northeast section of the unit for horseback riding, biking, and hiking.</p> <p>New trailheads with visitor parking would be constructed for the Fern Hollow Trail off of County Road 4415, the Old Wagon Road Trail, off Highway 92, and the Canal-Saltwater Barrier Trail (in partnership with the Lower Neches River Authority).</p> <p>Minor improvements to existing parking facilities would be made at new trailheads for the Village Creek Trail, the Magnolia Trail, and Loblolly Loop, as well as to provide adequate and safe parking for paddle trails.</p> <p>Water Trails. Designated water trails would be provided and a sign plan developed to help visitors navigate to day use areas and other destinations. Existing and newly designated water trails would be regularly maintained.</p>	<p>assessed for reuse as trails. Trails would include establishing a new trail along Little Pine Island Bayou, in partnership with the Pinewood community. Trailheads would be connected with existing public and community bike trails where possible.</p> <p>New trailheads with visitor parking would be constructed for Fern Hollow Trail and Fire Tower Trail. Minor improvements to existing parking facilities would be made at new trailheads to the visitor center – Village Creek Trail, Magnolia Trail, and Loblolly Loop (multiuse).</p> <p>Water Trails. Designated paddle trails would be provided, offering soft put-ins, signs, and minimal to no instream. The visitor experience would be largely primitive and would the need for short portages or ducking under bank-to-bank snags. Existing and newly designated water trails would be regularly maintained.</p> <p>Trolling motors would be allowed in all waters of the preserve. The portion of Johns Lake from the boat launch to the Neches River would be mixed use.</p>	<p>around the Big Thicket.</p> <p>To increase relevancy with nearby communities, the preserve staff would engage the NPS Rivers, Trails and Conservation Assistance Program to collaborate with partners to develop regional trails that link with the preserve.</p> <p>The National Park Service would consider developing new road and access points in order to provide visitor access and enhance the visitor experience.</p> <p>New trailheads with visitor parking would be constructed. Minor Improvements to existing parking facilities would be made at new trailheads and to provide adequate and safe parking for paddle trails.</p> <p>Water Trails. Trails would be developed and maintained in waterways to guide visitors to resources that can be reached by canoe or kayak. Water trails would be suited for a wide range of paddling expertise and would receive a moderate to high level of maintenance. Existing and newly designated water trails would be regularly maintained.</p> <p>The portion of Johns Lake from the boat launch to the Neches River would be mixed use. Trolling motors would be allowed in all waters of the preserve (mixed use and nonmotorized zones).</p>
Camping	Backcountry camping would continue to be allowed consistent with existing rules and regulations.	<p>Same as alternative 1 plus.</p> <p>Twenty dispersed backcountry sites would be developed along land and water trails.</p>	<p>Same as alternative 1 plus.</p> <p>Further restrictions on camping locations could be made based on resource impacts or environmental protection.</p>	Same as alternative 2.
Interpretation and Education	The preserve staff would continue to offer interpretive and educational activities and programs that are consistent with the purpose of the preserve. New or expanded activities would not be anticipated. Educational programs to encourage effective collaboration with educators, address preserve interpretive themes and meet the audience’s curriculum objectives would continue. Programs would be offered based on available staffing.	<p>Same as alternative 1 plus</p> <p>Efforts would be increased to enhance community outreach and educational initiatives. Recreational activities would be managed to provide an interpretive component to ensure minimum impact on preserve resources.</p>	<p>Visitors would be encouraged to learn through discovery and have opportunities to take part in scientific research and resource management projects.</p> <p>Efforts would also be increased to enhance community outreach and educational initiatives. The preserve staff would expand citizen science programs that encourage the public to take part in scientific research and resource management projects. Biodiversity discovery opportunities would be offered.</p> <p>The National Park Service would expand opportunities for visitors and volunteers to participate in resource management projects.</p> <p>Sustainability would be showcased for the public and the preserve staff would provide related interpretive programs and workshops. Interpretive programs would also focus on the UNESCO Man and the Biosphere Programme, Globally Important Bird Area designation, and other efforts related to sustainability and biodiversity.</p>	<p>Significant new and expanded interpretive and educational programming would respond to increasing visitation, ecotourism, and engage new audiences. National and global initiatives would be incorporated into personal and nonpersonal interpretive media. Partnerships with designator affiliations would be expanded, using their framework to address global relevancy.</p> <p>Some recreational activities would be managed to provide an interpretive component to ensure minimum impact on preserve resources.</p> <p>Opportunities to participate in ranger-led interpretive programs would be expanded.</p>

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Interpretation	See above.	<p>A wide variety of additional visitor uses and interpretive activities and programs would be provided, including self-guiding or ranger-led tours and interpretive wayside exhibits, displays, and demonstrations. New technologies may be used to extend the range of low impact visitor activities. The National Park Service would interpret historic structures, archeological sites, cultural landscapes, and other cultural resources.</p> <p>Living history programs could be used to enhance visitor understanding.</p> <p>Visitors would have greater opportunities to understand and appreciate the relevancy of the preserve’s history, stories, and associated cultural resources.</p>	<p>A variety of additional visitor use and interpretive activities and programs would be provided including self-guiding opportunities, interpretive wayside exhibits, displays, and demonstrations. Working through partnerships, the preserve staff would create opportunities for visitor learning and participation in scientific research, restoration projects, and citizen science. The preserve staff would enhance partnerships for river cleanups, weed pulling, citizen science activities such as bird counts and All Taxa Biological Inventory workshops, and regional watershed management and monitoring. The staff would highlight the preserve’s significance as an American Bird Conservancy Important Bird Area through increased bird-focused activities with partners. The preserve staff would highlight its international significance and inclusion in the UNESCO Man and the Biosphere Programme with events and building connections to other biosphere reserves around the world. Sustainability would be showcased.</p>	<p>Same as alternative 2, plus.</p> <p>The preserve staff would focus on partnerships that can with groups that can help the National Park Service tell the history of southeast Texas.</p>
Education	See above.	<p>Making the preserve more relevant to community members and visitors would be achieved by the expansion of curriculum-based presentations. Education programs would be interdisciplinary, and tied to or connected with curriculum requirements, the national education standards, and presidential goals for education and fitness.</p> <p>The National Park Service would strive to expand education programs to all schools in the region. New technologies would be incorporated where appropriate. Increased staffing and facilities would meet the growing demand and preserve goals. Partnerships would be encouraged to provide facilities and support.</p> <p>Curriculum-based programs would promote the preserve as a learning laboratory. Education programming would integrate research and interpretive programs into the broader educational goals of communities and schools through partnership approaches.</p> <p>In partnership with local schools, the preserve staff would take an active role in curriculum development and resource protection activities such Teacher to Ranger to Teacher programs, and honor student community service activities.</p> <p>The preserve staff would also partner with local schools and communities to expand environmental education initiatives.</p>	<p>Same as alternative 2 plus.</p> <p>In coordination with Lamar University in Beaumont, the preserve staff could establish an outdoor educational center along the Neches River.</p>	<p>Same as alternative 2.</p>
Operations and Facilities				
Staffing	The National Park Service would continue to operate the preserve within the approved ceiling of 38.8 FTE and related positions.	To fully implement this alternative, an addition of 11 FTE staff to the current staff would be requested.	An additional 12.5 FTE staff would be requested to fully implement this alternative.	In addition to current staff, an additional 14 FTE staff would be requested to fully implement this alternative.

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Commercial Visitor Services	Commercial visitor services could be authorized if these uses are determined necessary and appropriate.	Same as alternative 1 plus. Commercial service providers would be required to adopt sustainable operations.	Same as alternative 2.	Same as alternative 1 plus. Commercial visitor services providers would be encouraged to provide greater access and visitor opportunities.
Partnerships	Cooperative management agreements and efforts would be maintained to enhance preserve operations and expand common goals and interests related to administration, interpretation, natural resource management and protection, and maintenance.	Outreach efforts would be expanded to enhance the NPS presence in outlying communities, increase involvement with civic organizations and activities, and partner with volunteer groups to carry out restoration projects and other activities. The National Park Service would work with oil and gas operators and the forestry industry to develop an acceptable range of best management practices and incentives that promote environmentally friendly industry operations. Issues regarding protection of soundscapes and the night sky would also be addressed in a regional perspective in partnership with other agencies and communities. The preserve staff would conduct educational outreach and would partner with area schools and universities, the Alabama – Coushatta Tribe of Texas, and others to impart information that would support and expand public understanding, interpretation, and protection of Big Thicket’s cultural resources and heritage.	Under this alternative, the National Park Service would expand outreach and partnership efforts with local groups to strengthen understanding and protection for preserve resources. The preserve staff would strengthen its partnerships with other agencies and organizations having similar mission objectives for resource protection. The National Park Service would strengthen its partnerships with other federal agencies and state agencies for resource stewardship training and scientific research, and would work collaboratively with partners for longleaf pine restoration, Texas trailing phlox recovery, and other restoration projects. Expansion of partnership projects with the Gulf Coast Inventory and Monitoring Program would help the preserve to become a center of learning and practical management application of biodiversity information.	Focus would be on partnerships that help link the preserve to other local and regional resources to conserve rivers, preserve open space, and develop trails and greenways. Partnerships could include development of recreation opportunities, resource management activities, or operations functions. Partnerships would also continue with those organizations associated with the preserve’s international designations. Outreach efforts would be expanded to enhance the NPS presence in outlying communities, increase involvement with civic organizations and activities, and partner with volunteer groups to carry out restoration projects and other activities. As in alternative 2, the preserve staff would conduct educational outreach and partner with area schools and universities, the Alabama- Coushatta Tribe, and others to impart information that would support and expand public understanding, interpretation, and protection of Big Thicket’s cultural resources and heritage.
Environmental Leadership	The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction, and would incorporate LEED construction standards. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would continue, including recycling of office materials and green purchasing.	The National Park Service would demonstrate leadership in environmentally responsible facility design and construction and would build to the highest achievable LEED standards. The National Park Service would also pursue climate-friendly designation. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would be implemented, including recycling and green purchasing. Preserve operation and facilities would be managed under an ISO 14001 certified environmental management system. The preserve staff would seek inclusion and recognition for leadership efforts in environmental management through programs such as the EPA National Environmental Performance Track Program and the TCEQ Clean Texas Program.	Same as alternative 2 plus. Opportunities to support alternative transportation within and to the preserve would be evaluated and implemented where feasible. The feasibility of installing electric car charging stations for the public and administrative use at the visitor center and headquarters would be evaluated.	The National Park Service would demonstrate leadership in environmentally responsible facility design and construction, and build to the highest achievable LEED standards. The preserve staff would also pursue “climate-friendly” designation, use alternative energy sources, and implement other energy conservation measures.
Facilities	The National Park Service would continue to limit new construction within the preserve for public use and administrative facilities. As facilities and equipment are replaced or renovated, designs and selections would, as feasible, minimize impacts to the night sky and soundscapes. The preserve boundary would be marked or improved as necessary to reduce boundary incursions and other illegal activities. To increase the visibility of National Park Service staff and their interactions with gateway communities, district ranger stations could be maintained or established inside or outside the preserve. In some instances, visitor contact stations would be jointly located with existing facilities, possibly in Beaumont,	New facilities would be operationally sustainable and built to the highest achievable LEED standards. Proposed facilities would be developed outside the preserve boundaries to the extent possible. Other appropriate facility development would be constructed in the preserve to assist with resource protection or visitor recreational activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events, picnic and day use areas, trails, and facilities to support ecotourism activities).All facilities would feature designs and fixtures to minimize impacts to night skies and soundscapes. Additional district ranger stations (staffed with law enforcement and interpretation rangers) would be established as necessary.	Facilities would be minimal, sustainably built and operated, and built to the highest achievable LEED standards. The National Park Service would site new occupied facility development outside the preserve boundaries. Appropriate facility development inside the preserve would assist visitor recreational activities. All facilities would be designed with fixtures to minimize impacts to night skies and soundscapes. Existing facilities in areas of prior development in the preserve could be retrofitted, redesigned, or rebuilt as necessary for administrative purposes. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.	Under this alternative, more dispersed facilities designed to enhance the visitor experience would be developed, using partnerships where appropriate. These could include interpretive waysides, picnic areas, trails and roads, visitor contact stations, boat launches and water-based trails. The preserve staff would transition operations and facilities to “climate friendly” technology over time. Facilities would be minimal, sustainably built and operated, and built to the highest achievable LEED standards. Designs and selections would minimize impacts to night skies and soundscapes. Preserve staff would evaluate visitor use patterns and add, reroute or remove access points or facilities as necessary. The National Park Service would site new roads

TABLE 12. SUMMARY OF ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
	<p>Woodville, Saratoga, and Silsbee (Seale House).</p> <p>The headquarters or visitor center complex on FM 420 would remain at the current location. In addition, the preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues.</p> <p>The National Park Service would reestablish a visitor contact station in the Beaumont area using a GSA lease. The preserve staff would continue to maintain the fire management facility in Woodville.</p>	<p>These stations would likely be outside the preserve boundary. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.</p> <p>The preserve staff would continue to maintain the existing headquarters or visitor center complex on FM 420. In addition, the preserve staff would undertake groundwork in the parking lot of the visitor center to improve visitor safety and around the headquarters complex to address maintenance and drainage issues.</p> <p>A new visitor contact facility shared with various partner agencies and organizations could be established. This facility would replace the USGSA-leased visitor contact station reestablished in the Beaumont area.</p> <p>As in alternative 1, the preserve staff would continue to maintain the fire management facility in Woodville, which could include a ranger station. Similarly the National Park Service would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory.</p>	<p>As in alternative 1, a multiuse facility in partnership with Lamar University in Beaumont would be considered.</p> <p>As in alternative 1, the fire management facility in Woodville would be maintained. The National Park Service would also continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Other field research stations could be constructed for environmental monitoring and data collection. Off-site research stations could also be developed in partnership with research organizations.</p>	<p>and facilities to increase visitor access. To reduce boundary incursions and other illegal activity, the boundary would be marked or improved as necessary.</p> <p>District ranger stations would be established as necessary. In some instances, visitor contact stations would be jointly located with existing facilities. The headquarters building and visitor center would remain at the current location.</p> <p>As in alternative 2, in addition to maintaining the existing headquarters or visitor center complex on FM 420, a new visitor contact facility could be established near Beaumont. Management of the facility could be shared among various partner agencies and organizations. The National Park Service would also consider a partnership with Lamar University or other suitable partner to develop a multiuse facility in in or near Beaumont.</p> <p>As in alternative 1, the National Park Service would continue to maintain the fire management facility in Woodville. The preserve staff would also continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory.</p>
Boat Ramps and Launches	<p>Existing boat ramp and launch facilities would be maintained and new public facilities would not be anticipated. The cooperative maintenance of existing public boat ramps would continue on the Neches River, Village Creek Highway 96, and Pine Island Bayou Highway 69/96/287.</p>	<p>New Boat ramps and launches would be designed and located for minimal impact to resources. A small floating dock that adjusts to varying water levels would be built on the Neches River in the Canyonlands unit to provide access to hiking trails. The National Park Service would seek formal agreements for existing partner ramps that straddle the preserve boundary. Additional facilities and opportunities with partners such as Lamar University would be sought out and encouraged.</p>	<p>The National Park Service would add an improved boat ramp for small motorized boats along the Neches River at Johns Lake. If feasible, a boat ramp and dock would be built in association with a shared facility with Lamar University in Beaumont.</p>	<p>Boat ramps, launches, and docks would be designed and located for improved visitor access and to minimize maintenance. Unauthorized boat launches within the preserver boundary would be removed.</p>
Roads, Trails and Public Access	<p>The National Park Service would continue to maintain existing paved roads and unpaved roads and existing trails and uses. Existing trailheads, parking areas, and associated facilities would remain in their current general locations at existing trails, boat ramps, and other day use areas.</p> <p>New roads and trails in newly acquired lands would not be anticipated. Existing facilities for public access would remain and substantial new access would not be anticipated.</p>	<p>Same as alternative 1 plus.</p> <p>Preserve staff would maintain new trails permitted under this alternative. Existing trailheads, parking areas, and associated facilities would be assessed to ensure they effectively address resource protection and visitor objectives.</p> <p>Water Trails: Designated water trails would be maintained. However, not all obstacles would be cleared and users would be required to portage under some conditions, such as fallen trees.</p>	<p>Some roads in the preserve would be removed and the habitat restored while the use of other roads may change. Fire Tower Road in the Lance Rosier unit would be reclaimed to a hiking trail.</p> <p>No new roads would be built except for minor improvements necessary to access trailheads and boat ramps. Existing and new trails would be designed to link to trails beyond the preserve boundary where possible. Existing roadbeds from abandoned roads would be used as possible to minimize resource impacts.</p> <p>Trailheads, parking areas, and associated facilities could be reduced or limited in certain areas, especially near sensitive resources such as habitat for endangered and threatened species or archeological sites. Some improvements or closures may be made to unofficial day use areas in order to protect resources from damage.</p> <p>Water Trails: Primitive water trails would be designated with limited improvements (e.g., removal of some snags).</p>	<p>Roads and trails could be developed to allow for new or improved visitor access into undeveloped areas along with new trailhead and visitor parking. For safety reasons, minor improvements would also be made to the parking lot at the visitor center.</p>

TABLE 12. SUMMARY OF ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
Camping	The preserve staff would continue to manage current backcountry camping opportunities consistent with existing rules and regulations.	In addition to continuing to manage current primitive backcountry camping as discussed in alternative 1, the National Park Service would also expand management to 20 new backcountry sites along land and water trails (e.g., Lower Cypress area of the Beaumont unit and the Turkey Creek unit).	As in alternative 1, the National Park Service would continue to manage current primitive backcountry camping opportunities. To protect resources, the campsites in the backcountry could be designated and administered under a permit system.	Current backcountry camping opportunities would remain and could be expanded (e.g., Lower Cypress area of the Beaumont unit and the Turkey Creek unit).
Housing and Related Facilities	Current preserve employee housing includes the Lily Bunkhouse and Ranch House. Future housing could include the Lily Estate House and the Seale House. The Seale House could be converted to a ranger station with seasonal housing. The field research station and Brammer House would continue to accommodate preserve researchers.	<p>In addition to continuing to manage current preserve employee housing, the Seale House could be converted to a ranger station with seasonal housing as described in alternative 1.</p> <p>The preserve staff would seek to provide employee housing for seasonal employees outside the preserve through agreements, partnerships, and contracts, to the extent possible. If not possible, sustainable improvements would be made to current housing in the preserve.</p>	<p>Housing would be provided as feasible outside the preserve for seasonal employees and volunteers through partnerships, agreements and contracts.</p> <p>The Lily Bunkhouse would be designated for possible demolition and the Ranch House would be designated for administrative reuse. As in alternative 1, the field research station and Brammer house would continue to accommodate researchers.</p>	In addition to maintaining current preserve employee housing and researcher accommodations as described in alternative 1, the National Park Service would maintain sufficient government housing to accommodate seasonal employee and volunteer needs.

TABLE 13. SUMMARY OF KEY IMPACTS OF IMPLEMENTING ALTERNATIVES

	Alternative 1 (No Action)	Alternative 2 (Preferred)	Alternative 3	Alternative 4
NATURAL RESOURCES				
Soils	Some soils would be eroded or lost, and soil properties would be altered due to visitor use in localized areas associated with visitor use and development. These adverse impacts would likely be long term and negligible to minor in extent.	Some minor to moderate, long-term, adverse impacts to soils would occur due to increased visitor use, the development of new facilities, and new motorboating activities in localized areas.	Some soils would be eroded and lost, and soil properties would be altered due to increased visitor use, and facility development. This would result in long-term, minor to moderate adverse impacts to soils.	Some soils would be eroded and lost, and soil properties would be altered due to increased visitor use, the development of new facilities, and new motorboating activities in localized areas. These adverse impacts would likely be long-term, and minor to moderate in extent.
Water Quality	There would continue to be negligible to minor, long-term, adverse impacts to the preserve’s water quality in localized areas, primarily due to visitor activities (e.g., contact recreation activities, improper disposal of human waste in areas without sanitation facilities, and discharges from motorboats).	There would continue to be negligible to minor, long-term, adverse impacts to the preserve’s water quality in localized areas, primarily due to visitor activities and sedimentation.	There would be minor, long-term, adverse impacts to water quality in localized areas, primarily due to visitor activities. Overall, there would be a long-term, moderate, beneficial impact on water quality from the prohibition of houseboats.	There would be minor, long-term, adverse impacts to-water quality in localized areas, primarily due to visitor activities and sedimentation.
Vegetation	Long-term, negligible to minor, adverse impacts on native vegetation, primarily due to continued visitor use.	There would be some beneficial effects on the preserve’s native vegetation due to new fire management activities. But overall, the alternative would result in and long-term, minor, adverse impacts on native vegetation, primarily due to visitor use and development of new facilities.	There would be beneficial effects on the preserve’s native vegetation due to new fire management activities. But overall, the alternative would result in long-term, negligible to minor, adverse impacts on native vegetation, primarily due to visitor use and development of new facilities.	This alternative would result in long-term, minor, adverse impacts on native vegetation, primarily due to visitor use and development of new facilities.
Wetlands	Alternative 1 would continue to result in long-term, negligible to minor, adverse impacts on wetlands, due to visitor use, and some minimal facility development.	Alternative 2 would result in long-term, negligible to minor, adverse impacts on the preserve’s wetlands, due to visitor use and some minimal facility development.	Alternative 3 would result in short- and long-term, negligible to minor, adverse impacts on wetlands, due to visitor use and some minimal facility development.	Alternative 4 would result in short- and long-term, negligible to minor, adverse impacts on wetlands, due to visitor use and some minimal facility development.
Fish and Wildlife	Alternative 1 would likely result in a long-term, moderate to major, adverse cumulative impact on wildlife populations in or near the preserve.	Most wildlife in the preserve would not change as a result of the actions in this alternative. Long-term, negligible to minor, adverse impacts would occur to wildlife in localized areas due to visitor use and the construction of a few new facilities.	Most wildlife in the preserve would not change as a result of the actions in this alternative. Long-term, negligible to minor, adverse impacts would occur to wildlife in localized areas due to visitor use and the construction of a few new facilities.	Most wildlife in the preserve would not change as a result of the actions in this alternative. Long-term, negligible to minor, adverse impacts would occur to wildlife in localized areas due to visitor use and the construction of a few new facilities in the preserve.
Endangered and Threatened Species and Species of Concern	No new major developments or actions would occur under alternative 1 that would have the potential to affect the Texas trailing phlox, Navasota ladies’-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague’s pipit, Louisiana pine snake, and the Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Thus, alternative 1 would be expected to have no effect on the listed species.	Most of the developments or actions that would occur under alternative 2 would not have the potential to affect the Texas trailing phlox, Navasota ladies’-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague’s pipit, Louisiana pine snake, and the Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Overall, alternative 2 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to new fire management actions. Alternative 2 would have a short-term, negligible, adverse impact on the other state- and federal- listed species. This would equate to a “may affect but not likely to adversely affect” determination for the red-cockaded woodpecker and Texas trailing phlox, and a “no effect” determination on the other listed species.	Most of the developments or actions that would occur under alternative 3 would not have the potential to affect the Texas trailing phlox, Navasota ladies’-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague’s pipit, Louisiana pine snake, and the Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Overall, alternative 3 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to new fire management actions, and it would have a short-term, negligible, adverse impact on the other state- and federal-listed species. This would equate to a “may affect but not likely to adversely affect” determination for the red-cockaded woodpecker and Texas trailing phlox, and a “no effect” determination on the other listed species.	Most of the developments or actions that would occur under alternative 4 would not have the potential to affect the Texas trailing phlox, Navasota ladies’-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague’s pipit, Louisiana pine snake, and the Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Overall, alternative 4 would have a long-term, negligible, adverse impact on the state- and federal-listed species. This would equate to a “no effect” determination on the listed species.

TABLE 13. SUMMARY OF KEY IMPACTS OF IMPLEMENTING ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
CULTURAL RESOURCES				
Archeological Resources	Long-term or permanent, localized, negligible to minor adverse impacts on the preserve’s prehistoric and historic archeological resources would occur from ongoing visitor use and other factors.	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s prehistoric and historic archeological resources could be expected from ongoing visitor use, proposed NPS development and management actions, and other factors.	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s prehistoric and historic archeological resources would occur from ongoing visitor use, proposed NPS development and management actions and other factors.	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s prehistoric and historic archeological resources would occur from ongoing visitor use, proposed NPS development and management actions, and other factors.
Historic Structures, Sites, and Cultural Landscapes	Long-term, localized, minor to moderate adverse, and minor to moderate beneficial impacts on historic buildings, structures and cultural landscape features would occur from ongoing visitor use, routine preserve operations, preservation undertakings and other factors.	Long-term, localized, minor adverse and minor to moderate beneficial impacts on historic buildings, structures and cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings and other factors.	Long-term, localized, minor adverse and minor to moderate beneficial impacts on historic buildings, structures and cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings and other factors.	Long-term, localized, minor adverse, and minor to moderate beneficial impacts on historic buildings, structures and cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings and other factors.
Ethnographic Resources	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s ethnographic resources would occur from ongoing visitor use, routine preserve operations and other factors.	Long-term or permanent , localized, minor adverse and beneficial impacts on the preserve’s ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities and other factors.	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities and other factors.	Long-term or permanent, localized, minor adverse and beneficial impacts on the preserve’s ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities and other factors.
VISITOR USE AND EXPERIENCE				
Visitor Opportunities	<p>Under alternative 1, there would continue to be long-term, adverse, negligible to minor impacts on visitor experience because road-based recreation, access to cultural resources, and access to water in the preserve would continue to be limited. For visitors who cannot camp in the preserve and those who experience crowding unexpectedly, there would be a long-term, adverse, and minor impact to their experience.</p> <p>Trail-based recreation would continue to be limited. Recreational opportunities on water trails would continue to have minimal wayfinding signs and be subject to conflicts between users. These impacts would be long term, adverse, and minor to moderate. The impacts to visitors who are disturbed by motorboats or displaced during hunting season would be long term, adverse and minor or moderate.</p> <p>Opportunities to hunt, fish, and trap in the preserve would not change, resulting in a long-term adverse negligible impact to visitors who would like to pursue these activities in the preserve. For visitors hiking and sharing a trail with mountain bikes and horses, the impact would be long term, adverse, and negligible. For visitors experiencing crowding in developed areas, the impacts on their experience would be long term, adverse, and negligible.</p> <p>The impacts to visitors because personal watercraft and off-road vehicles would not be allowed in the</p>	<p>Alternative 2 would be expected to have a long-term, minor to moderate, beneficial effect on road-based visitor experience for those visitors seeking road-based opportunities. There could be a long-term, minor, adverse impact on the road-based visitor experience for those visitors who would prefer to limit the amount of traffic and resource impacts that could result if auto tours were implemented.</p> <p>Because of the development of new land and water trails and the expansions of services in this alternative, there would be long-term, minor to moderate, adverse impacts visitor experience for those visitors who would prefer to limit the amount of use and resource impacts that could result if new trails were developed and uses were expanded.</p> <p>Alternative 2 would be expected to have a long-term, negligible to minor, beneficial effect on visitor access and orientation due to providing new accessible hunting access.</p> <p>Alternative 2 would be expected to have a long-term, minor to moderate, beneficial effect on trail-based, water-based, and other recreation; on visitor access and orientation; and on crowding, and solitude.</p>	<p>Alternative 3 would be expected to have a long-term, negligible to minor, adverse impact on road-based visitor experiences, as well as on visitor access and orientation because this alternative does not implement auto tours for visitors seeking road-based opportunities, does not provide access to cultural resources, does not provide new roads, and does not provide additional hunting access.</p> <p>There could be a long-term, minor to moderate, adverse impact on the trail- and water-based recreation, as well as on other visitor experiences under alternative 3 due to the development of new trails and expanded uses, the establishment of motorized and nonmotorized use zones, and the prohibition of houseboats because some visitors do not want to see these changes.</p> <p>There could be a long-term, negligible to minor, beneficial impact on the road-based, other land-based and water-based opportunities under alternative 3 due to the lack of auto tours; the development of more backcountry campsites; the increase in hunting, fishing, and trapping opportunities; the possibility of allowing some commercial visitor services; the installation of additional field sampling stations for researchers and partners; the addition of further cultural resource studies and surveys; the establishment of</p>	<p>There could be a long-term, minor to moderate, adverse impact on the road- and water-based visitor experience under alternative 4 due to implementation of auto tours and development of new roads and trails, the establishment of motorized and nonmotorized use zones, enforcement of houseboat regulations or the continued presence of houseboats, and expanded uses. There would also be no changes to current uses such as backcountry primitive camping and hunting, fishing, and trapping.</p> <p>There could also be a long-term, negligible to minor, adverse impact on visitor access and orientation under alternative 4 due to the development of new roads and the lack of additional hunting access.</p> <p>Alternative 4 would be expected to have a long-term, minor to moderate, beneficial effect on road-, trail-, and water-based experiences, as well as on other visitor experiences and on visitor access and orientation. This beneficial effect would be due to the implementation of auto tours; the development of new roads, land trails and signed water trails; designated nonmotorized areas for paddlers and motorized areas for other boaters; and the enforcement of houseboat regulations. Beneficial effects would also be due to the possibility of allowing some commercial visitor services; more extensive historical and cultural resource research; greater visitor access to cultural resources; the establishment of a new visitor contact station and multiuse facility in Beaumont; and a new sign plan to help visitor navigation and orientation.</p>

TABLE 13. SUMMARY OF KEY IMPACTS OF IMPLEMENTING ALTERNATIVES

Alternative 1 (No Action)		Alternative 2 (Preferred)	Alternative 3	Alternative 4
	<p>preserve would be long-term, adverse, and negligible because these uses are not currently allowed in the preserve.</p> <p>The continued availability of visitor services including necessary and appropriate commercial visitor services would result in long-term, beneficial, and minor to moderate impacts. Continued opportunities for solitude in the preserve would result in a long-term, beneficial, and negligible impact.</p> <p>The impacts of management of houseboats in the preserve would be long term, beneficial, and negligible for visitors who are able to comply with the requirements. For visitors unable to comply with the requirements, the impacts on their experience would be short term, adverse, and minor to moderate if changes can be made to the houseboat so that it is in compliance. For visitors unable to modify their houseboat to meet the requirements, the impact would be long-term, adverse, and moderate to major.</p>		<p>a visitor contact station and multiuse facility in Beaumont; the development of new hiking trails to increase community and preserve connectivity; development of a new sign plan to help visitor navigation and orientation; and improved water access and trails.</p> <p>Alternative 3 would be expected to have a long-term, minor to moderate, beneficial effect on trail- and water-based visitor opportunities, as well as on crowding and solitude due to the development of new trails and expanded uses, designated and signed water trails and waterways that would minimize visitor conflicts, designated nonmotorized areas for paddlers, designated motorized areas for other boaters, and the prohibition of houseboats.</p>	
Interpretation and Education	<p>Alternative 1 would be expected to have a long-term, negligible to minor, adverse impact on visitor education and interpretation, because there would be no changes in interpretive activities, education programs, partnerships, or outreach, and there would be no development of new trails for educational and interpretive purposes. There could be long-term, minor to moderate beneficial impacts on future interpretive activities based on the results of cultural resource studies. Therefore, the impacts of alternative 1 would be long-term, negligible to minor, and both beneficial and adverse.</p>	<p>Alternative 2 would be expected to have a long-term, minor to moderate, beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and outreach efforts, and new interpretive opportunities provided on current trails.</p>	<p>Alternative 3 would be expected to have a long-term, minor to moderate, and beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and outreach efforts, and new interpretive opportunities provided on existing trails.</p>	<p>Alternative 4 would be expected to have a long-term, minor to moderate, and beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and outreach efforts, and new interpretive opportunities provided on new and current trails.</p>
SOCIOECONOMICS				
	<p>Under alternative 1, impacts on the local socioeconomic environment would be beneficial, long-term and minor to moderate.</p>	<p>Under alternative 2, impacts on the local socioeconomic environment would be beneficial, long-term and minor to moderate.</p>	<p>Under alternative 3, impacts on the local socioeconomic environment would be beneficial, long-term and minor to moderate.</p>	<p>Under alternative 4, impacts on the local socioeconomic environment would be beneficial, long-term and minor to moderate.</p>
OPERATIONS AND FACILITIES				
	<p>Short-term and long-term, localized minor to moderate adverse and beneficial impacts on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use activities, and other factors.</p> <p>Adverse impacts are associated primarily with the challenges faced by preserve staff (limited by present funding and staffing levels) to continue to provide adequate resource protection, facility maintenance, limited new improvements, and visitor services. Beneficial impacts to preserve operational efficiencies and outreach would result from a variety of measures</p>	<p>Short-term and long-term, localized, minor to moderate adverse and beneficial impact on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors.</p> <p>Adverse impacts are associated primarily with the added expenses resulting from new construction and ongoing facility maintenance. Beneficial impacts to preserve operational efficiencies and outreach would result from a variety of measures such as the establishment of district ranger stations and visitor contact facility near Beaumont. Beneficial impacts</p>	<p>Short-term and long-term, localized, minor to moderate adverse and beneficial impact on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors.</p> <p>Adverse impacts are associated primarily with the added expenses resulting from limited new construction and ongoing facility maintenance. Beneficial impacts to preserve operational efficiencies and outreach would result from a variety of measures such as the establishment of district ranger stations and visitor contact facility</p>	<p>Short-term and long-term, localized, minor to moderate adverse and beneficial impact on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors.</p> <p>Adverse impacts are associated primarily with the added expenses resulting from limited new construction and ongoing facility maintenance. Beneficial impacts to preserve operational efficiencies and outreach would result from a variety of measures such as the establishment of district ranger stations and visitor contact facility near Beaumont. Beneficial impacts would also result from improved boundary marking, provision of seasonal housing for preserve staff, ongoing use of the expanded field research station near Saratoga, adoption of energy savings measures and demonstrated leadership in</p>

TABLE 13. SUMMARY OF KEY IMPACTS OF IMPLEMENTING ALTERNATIVES

	Alternative 1 (No Action)	Alternative 2 (Preferred)	Alternative 3	Alternative 4
	such as the establishment of district ranger stations and visitor contact facility near Beaumont. Beneficial impacts would also result from improved boundary marking, provision of seasonal housing for preserve staff, adoption of energy savings measures, and ongoing partnerships and collaboration with research programs, local and county law enforcement agencies, and others.	would also result from improved boundary marking, provision of seasonal housing for preserve staff, ongoing use of the expanded field research station near Saratoga, adoption of energy savings measures and demonstrated leadership in sustainable design and construction, and enhanced partnerships and collaboration with research and education institutions, civic organizations, industries, local and county law enforcement agencies, and others.	near Beaumont. Beneficial impacts would also result from improved boundary marking, provision of seasonal housing for preserve staff, ongoing use of the expanded field research station near Saratoga, adoption of energy savings measures and demonstrated leadership in sustainable design and construction, and enhanced partnerships and collaboration with research and education institutions, civic organizations, industries, local and county law enforcement agencies, and others.	sustainable design and construction, and enhanced partnerships and collaboration with research and education institutions, civic organizations, industries, local and county law enforcement agencies, and others.

CONSISTENCY OF THE ALTERNATIVES WITH THE NATIONAL ENVIRONMENTAL POLICY ACT

The National Environmental Policy Act requires an analysis of how each alternative meets or achieves the purposes of the act, as stated in section 101(b). Each alternative analyzed in a NEPA document must be assessed as to how it meets the followings purposes:

1. fulfill the responsibilities of each generation as trustee of the environment for succeeding generations
2. assure for all Americans safe, healthful, productive, and aesthetically and culturally pleasing surroundings
3. attain the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences
4. preserve important historic, cultural, and natural aspects of our national heritage, and maintain, wherever possible, an environment which supports diversity, and variety of individual choices
5. achieve a balance between population and resource use, which would permit high standards of living and a wide sharing of life's amenities
6. enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources

The Council on Environmental Quality has promulgated regulations for federal agency implementation of the National Environmental Policy Act (40 CFR Parts 1500–1508). Section 1500.2 states that federal agencies shall, to the fullest extent possible,

interpret and administer the policies, regulations, and public laws of the United States in accordance with the policies set forth in the act (sections 101(b) and 102(1)); therefore, other acts and NPS *Management Policies 2006* are references as applicable in the following discussion.

Criterion 1. Fulfill the Responsibilities of Each Generation as Trustee of the Environment for Succeeding Generations

All alternatives considered in this general management plan or environmental impact statement, including alternative 1, must comply with NPS laws and policies (e.g., the Organic Act of 1916, NPS *Management Policies 2006*) that require the agency to manage park units by such means and in such a manner “that will leave them unimpaired for the enjoyment of future generations.” Each alternative meets this criterion, although the “action alternatives” (alternatives 2, 3, and 4) provide enhanced stewardship and trusteeship of the preserve’s resources in comparison with alternative 1. Alternative 1 also does not lend comprehensive management direction and protection for the new preserve units (i.e., Big Sandy Creek corridor unit, Village Creek corridor unit, and the Canyonlands unit).

Criterion 2. Assure for All American Safe, Healthful, Productive, and Aesthetically and Culturally Pleasing Surroundings

Under all alternatives, the National Park Service would strive to provide for safe, healthful, productive, and aesthetically and culturally pleasing surroundings. In comparison with alternative 1, the ability of

the preserve to achieve this objective would be enhanced under alternatives 2, 3, and 4 by emphasizing environmental protection and sustainable development in preserve operations, increasing NPS law enforcement and resource protection presence throughout the preserve, and expanding visitor use opportunities (e.g., land and water trails and opportunities to visit cultural resource sites).

Criterion 3. Attain the Widest Range of Beneficial Uses of the Environment without Degradation, Risk of Health or Safety, or Other Undesirable and Unintended Consequences

All the action alternatives promote a wide range of beneficial uses of the environment, allowing visitors an appropriate range of self-guiding and ranger-led experiences (e.g., hiking, bird-watching, boating, canoeing) without degradation of natural and cultural resources, or otherwise incurring undesirable and unintended consequences. Among the alternatives, alternative 3 provides the greatest emphasis on natural resources preservation, restoration, and other actions to sustain native biodiversity and ecological functions. The traditional range of visitor use activities would be retained under all alternatives, and low-impact and self-reliant activities would be promoted to minimize environmental impacts.

Criterion 4. Preserve Important Historic, Cultural, and Natural Aspects of Our National Heritage and Maintain, Wherever Possible, an Environment that Supports Diversity and Variety of Individual Choice

Among the action alternatives, alternative 4 strongly emphasizes the relevancy and connections of the preserve to regional communities and other visitors, and

therefore best addresses criterion 4 with regard to preserving and providing visitor access to important historic, cultural, and natural aspects of our national heritage. Although environmental protection measures are important considerations of alternative 4, this aspect of preserve management and operations is not emphasized to as great an extent as under alternatives 2 and 3.

Criterion 5. Achieve a Balance Between Population and Resource Use that Will Permit High Standards of Living and a Wide Sharing of Life's Amenities

Although all three action alternatives would provide enhanced opportunities for visitors to access and experience the preserve's diverse units, alternative 2 best achieves a balance between providing a high level of protection of natural and cultural resources while also providing a wide range of neutral and beneficial uses of the environment. Offering an increased range of appropriate visitor uses, activities, and interpretive programs, alternative 2 emphasizes a broad partnership approach for integrating resource protection with visitor use in a fashion that best supports national environmental policy goals.

Criterion 6. Enhance the Quality of Renewable Resources and Approach the Maximum Attainable Recycling of Depletable Resources

In accordance with NPS *Management Policies 2006*, all the action alternatives incorporate measures to ensure that preserve operations are conducted in an environmentally responsible and sustainable manner. The preserve staff would demonstrate environmental leadership in facility designs and operation.



Chapter 3 THE AFFECTED ENVIRONMENT



INTRODUCTION

This chapter describes the existing environment of Big Thicket National Preserve. The focus is on the preserve resources, visitor use and experience, socioeconomic environment, and preserve operations and facilities that could be affected by implementation of the alternatives. These topics were selected based on federal laws and regulations, executive orders, NPS expertise, and concerns expressed by other agencies or members of the public during scoping for this management plan. The conditions described in this chapter establish the baseline for the evaluation of environmental consequences that is provided in chapter 4. The size of the preserve has increased by about 22% since it was established. These new lands have been added throughout the preserve; most of these new lands adjoin existing units and share similar characteristics. The National Park Service has general background information about the resources in the new lands. This information, together with the more detailed information about other preserve units, is

sufficient to support the programmatic guidelines in this general management plan and the supporting analysis. Prior to implementation of the actions proposed in *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement*, analysis consistent with the National Environmental Policy Act, the National Historic Preservation Act, and others would be completed.

The CEQ guidelines (1978) for implementing the National Environmental Policy Act require that the description of the affected environment must focus on those resources that might be affected by implementation of the alternatives. To enhance reader understanding, the first section in this chapter gives a broad overview of the preserve and its regional context. The following sections provide more detailed descriptions of the existing conditions of the preserve resources that could be affected by implementing one or more of the alternatives that were described in chapter 2.

NATURAL RESOURCES

OVERVIEW

The Big Thicket National Preserve lies within the Flatwoods and Lower Coastal Plain geographic areas of southeast Texas. The topography is nearly level in the southern part to gently rolling in the northern part of the preserve. Slopes in the Flatwoods area (Beaumont and Lance Rosier units) are generally less than 1%. Slopes in the Lower Coastal Plain area (Neches Bottom and Jack Gore Baygall, Turkey Creek, Big Sandy Creek, and Beech Creek units) are generally 1.0%–3.0%, and range from 0.5%–12.0%.

Elevation generally rises to the north and west from 5 feet (above mean sea level) in the Beaumont unit to 365 feet at the northern tip of the Big Sandy Creek unit and 215 feet at the northern edge of the Beech Creek unit. Although the units of the preserve vary widely in topography, soils, and size, most are situated along water corridors or in upland settings, or a combination of both.

The preserve is on the western edge of the humid subtropical climatic region. This region is characterized by long, warm to hot humid summers and fairly short, mild winters. Onshore winds from the Gulf of Mexico provide maritime influence during the spring, summer, and fall. Arctic, Rocky Mountain, and Pacific storms occur frequently in the winter months and result in depressed temperatures; however, warming periods usually occur between fronts. Subzero temperatures are rare with typically less than a dozen freezing nights per year.

Precipitation is reasonably well distributed throughout the year, ranging from 47 to 71 inches, with an annual average around 60 inches. Thunderstorms occur about 60 days each year, and while sustained rainfall and flooding often take place in the winter and spring, the most intense events are associated

with tropical storms and hurricanes in the summer and fall (NPS 1996).

CLIMATE CHANGE AND ITS INFLUENCE ON PRESERVE ENVIRONMENT

Climate change refers to any significant changes in average climatic conditions (such as mean temperature, precipitation, or wind) or variability (such as seasonality and storm frequency) lasting for an extended period (decades or longer). Recent reports by the U.S. Climate Change Science Program, the National Academy of Sciences, and the United Nations Intergovernmental Panel on Climate Change provide clear evidence that climate change is occurring and is likely to accelerate in the coming decades. While climate change is a global phenomenon, it manifests differently depending on regional and local factors.

Some of these changes are already occurring. Many effects of climate change are being experienced globally, but there are also regionally and locally specific impacts. Big Thicket National Preserve is an uncommon unit of the national park system in that it is influenced by regional climatic impacts typical of both the Gulf Coast region and the eastern woodlands and forests. In southeast Texas, it is possible that there would be hotter summer temperatures, fewer winter freezes, warmer water temperatures, fewer and more intense rainfall events, earlier and increased annual runoff, rises in sea level, and stronger tropical storms and storm surges (NPS 2010c). Specific impacts on Big Thicket National Preserve could include saltwater intrusion into freshwater environments, advancing shorelines interfering with preserve ecosystems, and changes in the composition of flora and fauna. These dynamic changes are expected to have effects

on the natural resources and visitor use patterns in the preserve. However, climate change is not an impact topic for the purposes of the National Environmental Policy Act. While not a topic of analysis in the document, it is noted that climate change is likely to affect visitor experience of the preserve in a variety of ways, including:

- The preserve may experience a longer summer season; however, summer use in much of the preserve could decrease due to increasing high temperatures in mid-summer.
- There may be an increase in frequency and intensity of severe storms, which may accentuate both winter and summer floods.
- There may be an increase in water demands combined with a decrease in supply, which may result in water shortages.
- There may be a decrease in streamflows and an increase in water removal; competition from nonnative species would likely lead to changes to the preserve's riparian areas.
- There may be changes in bird populations, which in turn would affect bird-watching activities.

Climate change may have potential impacts on cultural resources, as well. For example, increasing frequency and intensity of severe storms and floods may pose threats to the preserve's historic structures, as well as administrative and visitor facilities. The potential for an increase in wildland fires also poses an increased risk to the cultural resources of the preserve.

SOILS

Deshotels (1978) described 46 soils (mapping units) in the preserve. Soils in the preserve developed during the Pleistocene (1.8 million to 10,000 years ago) and Holocene (10,000

years ago to present day). Soils formed in floodplains range from loamy to clayey, and occur on old oxbows to moderately well-drained natural levees adjacent to stream channels. Upland soils are generally loamy to sandy in texture and are found on a wide variety of landscapes. Immediately above the floodplains are sandy point bar deposits and low, mounded terraces.

For purposes of describing the hydrologic characteristics of the soil and evaluating the potential impacts of trail or road development and use, soils have been combined into four major classes based on their infiltration or runoff potential or hydrologic group. Hydrologic group refers to a group of soils having similar runoff potential under similar storm and cover conditions. Secondary characteristics of the soils that are described in the following section, but are not directly attributable to the hydrologic group, include water storage capacity, water table, and flooding frequency. Hydrologic soil classes are based on the soil hydrologic groups as assigned by the Natural Resources Conservation Service (formerly Soil Conservation Service). These are summarized in table 14.

The soils within the preserve are characteristic of those developed under a mild climate, with abundant rainfall, in a mixed conifer-deciduous forest. Two broad categories of soils are found: a highly leached, acidic, sandy to loamy textured soil with a lower less-permeable zone of clay accumulation; and a more clayey textured, less permeable soil that is subject to either high water tables or periods of extensive flooding. The latter soils shrink and swell with changes in seasonal moisture. In general, the sandier soils tend to occur in uplands, and clayey textured soils are found in swales, lowlands, floodplains, and wetlands. The sandier textured soils typically belong to hydrologic soil classes "A" and "B" and the more clayey textured soils to classes "C" and "D" (see table 14).

TABLE 14. CHARACTERISTICS OF SOIL CLASS

Hydrologic Soil Class ¹	"A" Soils	"B" Soils	"C" Soils	"D" Soils
Composition	Thick, well to excessively drained, moderately coarse textured (sands, loamy sands, and sandy loams)	Moderately thick, well to excessively drained, moderately fine to moderately coarse textured (silt loams and loams)	High clay content, water retardant layer, moderately fine to fine textured (sandy clay loams)	Fine textured, thin clayey soils with claypan or clay layer near surface
Location	Generally found in upland areas	Generally found in upland areas	Generally found in wetlands and floodplains	Generally found in wetlands and floodplains
Permeability	High	Moderate	Low	Very Low
Erodibility	Low to moderate	Low to moderate	Moderate to high	Moderate to high
Compaction	Low	Low	Moderate	High
Shrink or Swell Potential	Low	Low	Moderate	High
Flooding Frequency	None to very rare	Rare	Occasional to frequent	Frequent
Run-off Potential	Low	Low	Moderate	High
Infiltration Rate	High	Moderate	Low	Low
Recharge Potential	High	High	Low	Low

¹Hydrologic soil classes are based on the soil hydrologic groups as assigned by the Natural Resources Conservation Service. Other parameters, e.g., flooding frequency and recharge potential are not directly attributable to soil hydrologic group.

Over 60% of the soils in the Beech Creek, Big Sandy Creek, and Hickory Creek Savannah units belong to classes "A" and "B," while Turkey Creek and Lance Rosier have between 40% and 60%. The water corridor units typically have less than 30% of classes "A" and "B," and the majority of soils are within class "D."

Soil Erodibility

Most of the soils in classes "A" and "B" are low to moderately erodible, while soils in classes "C" and "D" are moderately to highly erodible. Erosion also depends on the rainfall energy, slope, slope length, vegetative cover,

and site conservation or management practices. Even though most slopes within the preserve are relatively flat (less than 2%), soil erosion control is necessary whenever vegetative cover is removed or when water is concentrated and flow velocities are high. This is especially important for trail and road development.

Soil Compaction

Typically, soils with a high clay content are most subject to compaction. Soil compaction resulting from foot travel or vehicle use reduces the pore spaces in the soil and impedes the penetration of rainfall and plant

roots (Meek et al. 1992). Even though drying and shrinking of the soils and subsequent wetting and expansion would tend to negate some of the adverse impacts over time, clayey soils should not be traversed when saturated. Vehicular travel on clayey soils under saturated conditions would form compacted tracks. These tracks would have the effect in flat topography of changing surface drainage patterns by forming small drainage channels that can locally modify the hydroperiod (frequency and duration of saturation) of an impacted site. Compaction would also tend to severely reduce the permeability of the soil. Soils within class “D” are most prone to compaction.

Shrink-Swell Potential

Clayey soils that are composed of expansive clays would tend to expand and contract with seasonal moisture variations. Due to the water resources of the area, flat topography, and high seasonal water tables, the depth of shrinkage cracks produced in clayey soils would probably not exceed one to two feet. Soils below the seasonal water table would be saturated and thus swollen. The combined effects of shrink-swell and compaction make road and trail construction difficult in areas where there are clayey soils. Typically, soils in class “D” are more prone to shrink and swell.

Flooding Frequency

Soil maps assign flooding frequencies generally based on soils and vegetation. In the preserve, flooding frequencies typically range from occasional to frequent in classes “C” and “D,” and from none to rare in classes “A” and “B.”

Frequent flooding infers that flooding is likely to occur, often under usual weather conditions; more than a 50% chance of flooding in any year, but less than a 50% chance of flooding in all months of any year. Soils are covered by flowing water for long durations, generally ranging from 7 to 30 days. Such soils would typically occur on level or depressional landscapes with

restricted surface drainage or restricted permeability. Usually only water tolerant plants would be present.

Occasional flooding infers that flooding is expected infrequently under usual weather conditions, and there is a 5% to 50% chance of flooding in any year, or flooding occurs 5 to 50 times in 100 years. Soils are covered by flowing water for shorter durations, generally ranging from two to seven days. Such soils are typically relatively permeable and occur on level or depressional landscapes, or are soils with restricted permeability on low sloping or swampy terrain. For flooding frequencies from none to rare, the chance of flooding in any year ranges from 5% to near zero, respectively.

Recharge Potential and Water Conditions

Recharge is a complex process that is dependent on many factors such as rainfall amount and duration, soil texture, soil structure, vegetative cover, and soil moisture. As mentioned at the beginning of this section, a simplified index of infiltration and runoff is the soil hydrologic group. The infiltration rate is the rate at which water enters the soil at the surface and is controlled by the surface conditions. The hydrologic group also indicates the rate at which water moves in the soil. The rate that water moves through the soil is controlled by the composition, textures, and structure of the soil.

Soils in class “A” have low runoff potential and high infiltration rates even when thoroughly wetted. Typically, these soils consist of deep, well to excessively drained sands, loamy sands, or sandy loams. Class “B” soils have moderate infiltration rates when thoroughly wetted and consist of moderately deep, well to excessively drained soils with fine to moderately coarse textures such as silt loams or loams. Class “C” soils have low infiltration rates when thoroughly wetted and consist of soils with a water-retardant layer and moderately fine to fine textures such as sandy clay loams. Class “D” soils have high

runoff potential and low infiltration rates when thoroughly wetted. Such soils primarily consist of clay soils with high shrink-swell potential, soils with a permanent high water table, soils with a claypan, or clay layer near the surface, and shallow soils over nearly impervious material.

In relation to recharge, flooding, and water table conditions, classes “A” and “B” generally have high recharge potential, lower flooding frequencies, and a highly variable water table. Classes “C” and “D” all have a high water table, with over 50% of the soils having frequent to occasional flooding frequencies.

The water resources, its components, and their interaction must be known or inferred in order to properly assess the impacts of surface uses and developments. Surface uses, types and levels of development, and the characteristics of the soils dictate the rainfall runoff relationships of the system. Rainfall of a certain magnitude and duration, soil permeability, and water holding capacity with depth all determine how much water the soil would hold before runoff occurs. The slope and roughness of the land surface and soil would control the general speed of both overland flow and shallow subsurface or lateral flow. Surface uses and types and levels of development, soils, and slope would also determine the erodibility of the soil and potential for sediment input into streams. The balance of all of the above would ultimately determine the flow in streams and recharge into aquifers.

CLIMATE CHANGE EFFECTS ON SOILS

Soils within the preserve are likely to incur some long-term changes because of climate change. Longer periods of drought or rain could alter soil moisture, affecting soil stability, nutrient content, and structure.

WATER RESOURCES

Introduction

Water is one of the most pervasive resources in the preserve. Most of the preserve units either contain or are adjacent to third-order perennial streams and four of the existing 15 management units are river or stream corridor units. In addition to these major river or stream reaches, the preserve contains a wide variety of minor hydrologic features: floodplains, sloughs, oxbows, baygalls, acid bogs, and low-order¹ tributary streams (i.e., streams of single origin). The origin and occurrence of practically all of these features is strongly affected by the surface and subsurface geology.

Major Drainages

All units of the preserve are within the watershed or basin of the Neches River, except for the Menard Creek corridor unit, which is in the Trinity River basin. Both of these drainage basins trend from northwest to southeast and have gentle slopes with channels that meander from the headwaters to the Gulf of Mexico. The Neches and Angelina Rivers constitute the two major rivers within the Neches River basin. The mainstem Neches River headwaters are in northeast Texas, in Van Zandt, Smith, and Henderson counties. The Angelina River originates in Smith and Rusk counties.

The Neches River basin is roughly 200-miles long by 50-miles wide, and drains an area of approximately 10,000 square miles. The Angelina River drains the northern one-third of the basin, while the Neches drains the remaining two-thirds before reaching the Gulf of Mexico through Sabine Lake. Major tributaries to the Neches within the preserve are Big Sandy Creek or Village Creek, Turkey Creek, Pine Island and Little Pine Island

¹ First order streams are the smallest streams or tributaries that do not have water flowing into them. Second order streams have one or more first order tributaries flowing into them. The Neches is a third order stream, as it receives water from second order tributaries.

bayous, Hickory Creek, and Beech Creek. The drainages generally follow dendritic patterns that are indicative of horizontal or near horizontal bedrock and gentle sloping topography.

Within the Menard Creek corridor unit, Menard Creek is a tributary to the Trinity River. Its headwaters are north of the Dallas-Fort Worth metroplex, in the northwest part of the basin. The Trinity River basin drains approximately 18,000 square miles, encompassing parts of 34 counties before entering the Gulf of Mexico through Trinity and Galveston bays (TNRCC 1996).

Minor Hydraulic Features

In addition to these major drainages, the surface water network in all units of the preserve is composed of numerous unnamed creeks, sloughs, acid bogs, and baygalls that greatly affect both the hydrology and hydrochemistry of the surface and near-surface groundwater environments.

Baygalls (named for sweet bay and gallberry holly) occur in depressions formed by abandoned channels on terraces. In the preserve, baygalls frequently occur in relatively lower depressional areas, where water stands for much of the year (e.g., Lance Rosier unit). Additionally, baygalls may form at the contact of two geologic formations with differing hydraulic properties. Baygalls accumulate a large amount of organic debris; this results in water that is high in organic acids, low in dissolved oxygen, and exhibits low pH values.

Similar to baygalls, sloughs channel and capture water. Sloughs, however, are within the active floodplain, and therefore subject to a greater degree of hydrologic exchange with mainstem drainages. In addition to the periodic input of floodwaters, sloughs may receive sediments during floods. Water quality in sloughs can vary from that observed in the mainstem watercourse to that of baygalls depending on the elapsed time between flood events.

Acid bogs generally form at sites where terrace-level tributary streams enter a main drainage. The loss in gradient from terrace to active floodplain results in sediment deposition, long-term aggradation, and shifting channels. Acid bogs are subject to the same water quality controls as baygalls and consequently exhibit low pH waters with organic acid turbidity and low dissolved oxygen. Additionally, acid bogs may be subject to flooding due to their location in floodplains. Acid bogs are similar to baygalls in plant species composition.

Water Quality

A relatively large amount of water quality data exists for the major drainages in the preserve. These data are essentially of two types: (1) studies that were either very limited geographically or temporally, or (2) more comprehensive monitoring programs where the period of data collection spanned months or years, and included numerous stations. Separate monitoring programs have been undertaken by both the U.S. Geological Survey and the National Park Service.

The U.S. Geological Survey has 6 stations that are operational. The NPS Inventory and Monitoring Program has 6 stations and the Lower Neches Valley Authority has 13 stations in the preserve watershed.

The National Park Service has established 15 water quality monitoring stations within six preserve watersheds or sub-watersheds: Beech Creek, Mill Creek, Big Sandy Creek or Village Creek, Black Creek, Menard Creek, and Pine Island Bayou. Additionally, there are 5 water quality stations established on the mainstream of the Neches River. Between 1984 and 1994, nearly monthly measurements were made at 14 of the 20 stations, resulting in 1,781 records of field parameters and 678 records of lab parameters (Hall and Bruce 1996).

General Water Quality or Hydrochemical Regime. General conclusions drawn from these studies are that the quality of water

resources of the preserve was fair to excellent, although in some areas water quality has degraded with respect to particular parameters (Harrel 1985, Flora 1984, Flora 1985, Hughes et al. 1987, Hall and Bruce 1996). Compared to other rivers in Texas, the Neches River generally has lower values for ion concentrations (especially bicarbonate and calcium), hardness, specific conductance, pH, and total dissolved solids.

Water quality in the preserve has been impacted by human activities such as residential development, agricultural activities, logging operations, and oil and gas development. Changes in these activities can have a beneficial impact on water quality. Some studies have suggested that reductions in salinity at locations in the preserve may be the result of improved oil field brine management and reduced disposal within the watershed (Kaiser et al. 1994); or perhaps the reduction in oil and gas activities over the same period may have contributed to lowering salinity (particularly chloride) concentrations. Parameters of concern include *E. coli*, low dissolved oxygen (DO) levels, high concentrations of metals, and increased salinity. In addition to these concerns, a number of state water quality standards violations have been recorded within the preserve. The watercourses where these concerns and violations were observed are described in the following sections.

NPS Stream Categories. The major water resources of the preserve have been divided into three classes by the National Park Service based on a combination of ambient water quality and monitoring status. Category 1 waters are those streams whose water quality presently ranges from very good to excellent. Streams in the preserve included in category 1 are: Big Sandy Creek, Beech Creek, Turkey Creek, and Black Creek (within the Neches Bottom and Jack Gore Baygall unit). Category 2 waters are those already exhibiting water quality degradation for one or more parameters, often due to nonpoint source pollution or legally permitted point-source discharges. Streams

in the preserve included in category 2 are Little Pine Island Bayou and Menard Creek. Category 3 waters are those major stream segments within the preserve that are included in the Texas Surface Water Quality Standards (2010) and are routinely monitored by the U.S. Geological Service. Category 3 stream segments that flow through the preserve are the Neches River, from Town Bluff Dam to the tidal zone (Beaumont unit area), and Pine Island Bayou (Flora 1984).

State-designated Stream Segments and Uses. In accordance with EPA guidelines, the Texas Commission on Environmental Quality has classified major stream segments within the state according to designated uses (table 15). In order to support or achieve the designated uses of these stream segments, the Texas Commission on Environmental Quality has promulgated specific numerical standards for each use and each segment (Kaiser et al. 1993). The preserve contains three state-designated stream segments; all other streams are classified as off-segment and are subject to the same controls as the mainstem segment. Designated uses for stream segments of the preserve are primarily for contact recreation (e.g., swimming, boating), medium-to-high-quality aquatic habitat for protection of aquatic life and riparian vegetation, and for public water supply. In addition to designated uses, each stream segment has a water quality designation indicating the applicable regulatory framework. This may be either “effluent limited,” which indicates that the segment is meeting its designated uses, or “water quality limited,” which indicates failure to meet designated uses.

The state-established anti-degradation policy is designed to protect water quality at existing levels and prevent a deterioration of water quality below achievable uses for a given stream segment. The policy has three levels of protection (1) existing uses would be maintained and protected, (2) for instream segments whose quality exceeds designated uses, degradation may only be allowed for

important social and economic development, and (3) no degradation would be allowed for outstanding natural resource waters.

Presently, no waters in the state are designated as outstanding natural resource waters.

TABLE 15. STATE-DESIGNATED STREAMS

Segment	Description	Uses
601 (Neches River)	From the confluence with Sabine Lake in Jefferson and Orange counties upstream to the confluence with Pine Island Bayou Major tributaries include Ten-mile Creek, Tiger Creek, and Anderson Gully	Contact recreation, intermediate aquatic habitat
602 (Neches River)	From 7.0 miles upstream of I-10 in Jefferson and Orange counties to Town Bluff Dam in Jasper and Tyler counties Major tributaries include Village Creek and Pine Island Bayou	Contact recreation, high quality aquatic habitat, public water supply
607 (Pine Island Bayou Watershed)	From the confluence with the Neches River in Hardin and Jefferson counties to FM 787 in Hardin County	Contact recreation, high quality aquatic habitat, public water supply
608 (Big Sandy-Village Creek Watershed)	From the confluence with the Neches River upstream to about 53 miles to Lake Kimball Dam in Hardin County	Contact recreation, high quality aquatic habitat, public water supply
Menard Creek Watershed (is an off-stream component of Segment 802 of the Trinity River Basin)	Originates in central Polk County and flows about 48 miles before entering the Trinity River	Contact recreation, high quality aquatic habitat, public water supply

For detailed information such as the hydrochemical regime; stream segments, uses, or permits; and violations, exceedances, or problems for each individual watershed, please see appendix E.

Wetlands

Wetlands are lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this classification, wetlands must have one or more of the following three attributes: (1) at least periodically, the land supports predominantly hydrophytes; (2) the substrate is predominantly undrained hydric soil; and (3) the substrate is nonsoil and is saturated with water or covered by shallow water at some time during the growing season of each year (Cowardin et al. 1979).

Wetlands are significant in that they produce a large amount of primary production and provide important habitat for the wildlife of the preserve. All types of wetlands act as a nutrient source, sink, or transformer, and their role may change for different nutrients or for the same nutrient during different seasons (NRC 1995). In general, wetlands function as nutrient cycles and various wetland types maintain different cycle rates. Floodplain wetlands tend to be high-nutrient and bogs are usually low-nutrient. The availability of nutrients in the system, in turn, affects the productivity and biodiversity of the wetlands (NRC 1995). 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. 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 (NRC 1995). Wetlands also provide essential habitat for 60 % of all threatened and 40% of all endangered species (Feierabend 1992). Overall, each type of wetland may provide similar functions but for different organisms.

At least 40% of the preserve is composed of wetlands that can be classified in three systems, based on the Cowardin classification system: palustrine, riverine, and lacustrine wetlands. Table 16 lists the acreage of Cowardin classification wetlands by wetland type.

**TABLE 16. COWARDIN CLASSIFICATION SYSTEM
WETLANDS IN THE BIG THICKET NATIONAL PRESERVE**

Wetland Type	Area (Acres)
Palustrine System	31,530
Palustrine System with two classes (complex)	180
Riverine System	3,125
Lacustrine System	60
Total	34,895

Note: Based on National Wetlands Inventory maps published in 1987 by the U.S. Fish and Wildlife Service

Overall, the wetlands currently mapped under the *National Wetlands Inventory* (NWI) Program in the preserve appear to underestimate the total wetlands acreage. Based on fieldwork during January and February 1999, multiple localities determined to be wetlands in the field were not mapped by the *National Wetlands Inventory*. Additionally, topographic maps (USGS 7.5-minute quadrangle; scale: 1:24000) of the preserve indicate depressions that are not entirely mapped as wetlands by the *National Wetlands Inventory*. NWI wetland mapping is

difficult in large areas with mineral soils, facultative vegetation, and minor topographic relief (NRC 1995), conditions similar to those found in the preserve. The wetland boundaries on the NWI maps are also estimates because the area of the preserve was mapped from a single air photo for each topographic map; whereas photos taken during each of the seasons may produce different wetland boundaries. Although not all of the existing wetlands of the preserve are mapped, each of the Cowardin wetland types found illustrates the different habitats and wetlands that occur within the various units of the preserve. Wetlands are part of the mosaic of plant and animal communities and support a diverse assemblage of life in the preserve.

The majority of wetlands in the preserve fall within the palustrine system (nontidal wetlands dominated by trees, shrubs, or persistent emergents). Nonvegetated wetlands smaller than 20 acres, less than 6-foot deep, lacking a wave-formed or bedrock shoreline, and with low salinity (less than 0.5 parts per thousand from ocean-derived salts), also fall under the palustrine system (Cowardin et al. 1979). The palustrine classes found in the preserve are forested, scrub-shrub, emergent, unconsolidated bottom (also called open water), or mixtures of classes (i.e., complexes).

The palustrine emergent wetlands of the preserve contain nonwoody aquatic plants such as rushes (*Juncus* spp.), arrowheads (*Sagittaria* spp.), sedges (*Carex* spp.), grasses, vines, pitcherplants (*Sarracenia alata*), among others. Organisms found in emergent wetlands include aquatic invertebrates (e.g., insects, snails, crayfish), aquatic vertebrates (e.g., fish), amphibians (e.g., salamanders, frogs, toads), reptiles (e.g., snakes, turtles, alligators), birds, and mammals (e.g., beaver, muskrat). Emergent wetlands are generally considered to have high productivity rates and act as nutrient pumps as plants take in ions and then release some back to the water and soil when they die (Mitsch and Gosselink 1993).

The palustrine forested and scrub-shrub wetlands are also referred to as riparian wetlands, bottomland hardwood forests, and floodplain forests. These wetlands tend to be linear in shape as they form in floodplains (Mitsch and Gosselink 1993). The forested and scrub-shrub wetlands are characterized by a dominance of woody vegetation including bald cypress (*Taxodium distichum*), tupelo gum (*Nyssa aquatic*), black gum (*Nyssa sylvatica*), oaks (*Quercus* spp.), river birch (*Betula nigra*), sweetgum, sweetbay (*Magnolia virginiana*), sycamore (*Plantanus occidentalis*), American hornbeam, baygall holly (*Ilex coriacea*), red maple (*Acer rubrum*), and red bay (*Persea borbonia*). They also contain some nonwoody vegetation such as various grasses, vines, mosses, and other hydrophytes. They have high biodiversity, and more substances flow through these riparian wetlands than other types (Mitsch and Gosseling 1993). The hydrology of these wetlands is sustained by a high water table and flooding. Additionally, the functioning of these areas is connected to the physical, chemical, and biological processes of the nearby streams (NRC 1995).

The palustrine unconsolidated bottom wetlands consist of less than 30% vegetative cover (Cowardin et al. 1979). The types of vegetation, if any, at these sites is similar to vegetation found in forested, scrub-shrub, and emergent wetlands. These wetlands are essentially small, shallow ponds that provide water and nutrients to organisms. The ponded sites that are isolated from streams often offer crucial habitat for migrating waterfowl (NRC 1995). The unconsolidated bottom wetlands also provide habitat for aquatic invertebrates and vertebrates, reptiles, amphibians, birds, and mammals.

The riverine system consists of wetlands and deepwater habitats within stream channels. The riverine classes found in the preserve are unconsolidated bottom and unconsolidated shore. The majority of the riverine wetlands lie within the Neches River corridor, including the Neches Bottom and Jack Gore Baygall unit. Besides the river and some other

channels, additional riverine wetlands are pointbars and sites found immediately along the Neches, Little Pine Island Bayou, and Pine Island Bayou.

Wetlands larger than 20 acres, situated in topographic depressions or a dammed river channel, and with vegetation covering less than 30%, are classified as lacustrine wetlands (Cowardin et al. 1979). Only two places in the preserve are currently categorized as lacustrine, with classes of unconsolidated bottom or unconsolidated shore. These sites provide habitat for various organisms, hunting opportunities, and the possibility for nature trails.

The following rare vegetation communities are found in wetland areas and are designated as special management areas: Wetland Baygall Shrub Thicket, Wetland Pine Savanna, Swamp Cypress-Tupelo Forest, and Royal Fern Bog.

Riparian Corridors

Most riparian corridors in the preserve lie within the 100-year floodplain. These areas are also referred to as riparian wetlands, bottomland hardwood forests, and floodplain forests. The riparian areas are ecologically important because they

- Reduce floods by slowing water flow through riparian vegetation including trees.
- Improve water quality when floodwater overflows the banks of the stream or river. Riparian vegetation slows the floodwater so that it can no longer carry its load of sediment that then settles out. The vegetation grows quickly through the sediment, stabilizing it with roots and covering it with plants that utilize the nutrients that could otherwise harm downstream water quality.
- Provide a vital groundwater recharge area when riparian soils absorb

excess water during spring snowmelt and other flood events.

- Provide shade that keeps water temperatures cool for fish and vegetative cover for animals looking for food, shelter, and reduced temperatures along the riverbanks.
- Provide key resources that support biological diversity both in the riparian area and nearby uplands.

The preserve's water corridor units and riparian corridors are composed primarily of floodplain forests. According to Harcombe et al. (1996), floodplains include the broad, flat terraces between the bluffs of the Neches River and along some of the major streams. Floodplain Hardwood Forest occurs on low terraces along the Neches River and in strips along Little Pine Island Bayou, Village Creek and its tributaries, and Menard Creek. Smaller stream floodplains support Floodplain Hardwood Pine Forest.

Riparian corridors in the preserve consist of two distinct biological communities: the bottomland hardwood forest community located on the floodplain terrace adjacent to major streams; and the aquatic community present within the stream. Two vegetation types—Floodplain Hardwood Forests and Floodplain Hardwood Pine Forests—best represent bottomland hardwood forests on floodplain terraces adjacent to major streams. In addition, complexes (or extensive intermingling) of these vegetation types define the riparian corridor.

Riparian areas exist throughout the preserve wherever creeks, rivers, or sloughs are found. These areas are best defined as “interfaces between terrestrial and aquatic ecosystems. As ecosystems they encompass sharp gradients of environmental factors, ecological processes, and plant communities. Riparian areas or zones are not easily delineated but are composed of mosaics of landforms, communities, and environments within the larger landscape” (Gregory et al. 1991).

Riparian corridors are important in maintaining the ecological integrity of the preserve. These areas are formally designated as a special management area and specific protection is provided. Where the riparian corridor is not defined by these vegetation types or complexes of these types, the corridor width is defined as up to 300 feet from the banks of major streams, whichever area is greater.

Climate Change and its Effects on Water Resources

Water resources within the preserve are likely to incur some long-term or short-term changes because of climate change. Longer periods of drought or rain could alter the amount of water in the preserve's water corridors, wetlands, and riparian areas, affecting bank soil stability, nutrient content, and species structure.

VEGETATION

Introduction

Vegetation is a fundamental component of the biological diversity of the preserve. Roughly 1,826 species of trees, shrubs, forbs, and grasses are believed to grow in the preserve.

A variety of environmental factors including geography, climate, and soil contribute to the botanical diversity of the preserve. Big Thicket lies at an ecotone between forests to the east and prairies to the west. Moderated by warm Gulf breezes, the climate of the region is subtropical with relatively high levels of rainfall that are evenly distributed throughout the year. Just a short distance west, rainfall begins to drop off quickly, and this sudden transition partly explains why Big Thicket is the farthest western extent of many eastern plant species. Edaphic (soil) conditions ranging from relatively impermeable clays to coarse sands also contribute significantly to the floristic diversity of the preserve. Taken together, the interplay of

geography, climate, and soils plays an important role in the resiliency of the vegetation and also causes abrupt transitions in vegetation communities: upland pine savannas and sandhills with yucca and cacti often lay just a stone's throw from bottomland hardwood forests and cypress swamps and sloughs.

Three major vegetation communities can be found in Big Thicket: upland, slope, and floodplain. In addition, wetland plants are abundant in Big Thicket, but the majority of species are temperate. Pinelands, cypress swamps, prairies, and wetlands are the most prevalent vegetation types in the preserve and are dominated by temperate species. Tropical species are found in pinelands, mixed-hardwood, and cypress swamps. Preserve staff and partners have completed a thorough inventory of the preserve's vascular plants.

Upland Vegetation Community

The three upland vegetation types (upland pine forest, sandhill pine forest, and wetland pine savanna) are all strongly influenced by fire and edaphic (soil) conditions. Historically, the dominant pine species in the upland pine forest was longleaf pine. In many of these communities, longleaf pine is no longer dominant, due to factors such as aggressive fire suppression and logging, and subsequent replanting with faster growing species such as shortleaf pine and loblolly pine. Many upland pine stands have converted from longleaf pine to a mixed pine-oak type (upper slope pine oak) due to the impact of reduced fire frequency.

The sandhill pine forest differs from the upland pine forest in that it is found on very well-drained, sandy soils. The term "sandhill" was borrowed from a similar vegetation type found in the sandhills of the Carolinas. The term is topographically misleading, however, because these communities are actually on sandy, riverine bluffs and terraces, not hills. In spite of high precipitation, rapid infiltration limits soil moisture, and these areas support a wide variety of plants such as

yucca and cacti that are adapted to xeric (dry) conditions and frequent fire. Dominant tree species include post oak (*Quercus stellata*) and bluejack oak (*Quercus incana*). Three types of native pines are also found widely scattered and include longleaf pine (*Pinus palustris*), shortleaf pine (*Pinus echinata*), and loblolly pine (*Pinus taeda*). Past impacts of logging and subsequent fire suppression in these areas may explain why longleaf pine is not the dominant pine species in these communities. The shrub layer, while present, is indistinct in these communities.

Sandhill pine forest is the rarest upland plant community in the preserve and surrounding the Big Thicket region. This community best exemplifies the "Desert Southwest" component of the biological crossroads paradigm that is often used to describe the ecological setting of Big Thicket. Approximately 230 acres of sandhill pine forest exist in the preserve on the Sandhill Loop (trail) in the Turkey Creek unit and in the Big Sandy Creek unit. Historically, the federal-endangered Texas trailing phlox (*Phlox nivalis* ssp. *texensis*) was documented in this vegetation community. Phlox was recently reintroduced to the sandhills in an attempt to restore this endangered endemic plant.

In contrast, the well-drained, sandy soils of the sandhill pine forest type, wetland pine savannas are found on poorly drained soils, with seasonal ponding. The interplay of wetland conditions and frequent fires in these systems is believed to inhibit the invasion of trees. Wetland pine savannas are among the rarest plant communities in the southeast and in the preserve. Over the past two centuries, these communities have been significantly degraded due to human settlement and fire suppression; less than 3% of these communities remain. Compared with all other plant communities in the preserve, wetland pine savannas contain the richest botanical diversity—roughly 100 species of forbs per acre can be found.

Fire plays a critical role in preventing fire-intolerant trees and plants. Unfortunately,

the effects of 75 years of aggressive fire suppression in the Big Thicket region has made these plant communities among the rarest in the preserve due to invasion by shrubs and trees. The preserve is using prescribed fire and mechanical thinning as a tool to restore and to maintain these botanically rich communities.

The third type of upland plant community is upland pine forest. These pyric (fire-dependent) communities are found on dry uplands and intertributary ridges. Soil type and past disturbances such as logging and fire are important factors in determining the age and abundance of tree species in these forests. A prototypical stand of upland pine forest is dominated by longleaf pine, and to a lesser extent by loblolly pine and shortleaf pine. Several species of oaks are commonly associated with this community including post oak, bluejack oak, and blackjack oak (*Quercus marilandica*). In stands where fire has burned at frequent intervals, the woody understory is largely absent, and the forest is open and park-like with a rich herbaceous layer of grasses and forbs. Absent frequent fire, the woody understory quickly encroaches and is dominated by species such as flowering dogwood (*Cornus florida*), flame-leaf sumac (*Rhus copallina*), American beautyberry (*Callicarpa americana*), wax-myrtle (*Myrica cerifera*), and yaupon (*Ilex vomitoria*).

Slope Vegetation Community

The slope community contains three distinct vegetation types: upper slope pine oak forest, middle slope oak-pine forest, and lower slope hardwood pine forest. The transition from dry to mesic (moist) soil conditions generally results in a shift from upland forest communities to slope communities. This increase in soil moisture is reflected in the shift from longleaf pine to loblolly pine and shortleaf pine. The species composition of oaks also shifts, with southern red oak dominating on the upper slopes and white oak (*Quercus alba*) in high abundance on the wetter, lower slopes. Other significant

hardwood species include southern magnolia (*Magnolia grandiflora*) and American beech (*Fagus grandiflora*). Given the abundance of these three species, the slope forests are often referred to alternatively as beech-magnolia-loblolly pine forests. Of all vegetation types in the preserve, many visitors to the preserve consider these open forests to be the most beautiful and stately. Aside from their aesthetic qualities, the American beech-southern magnolia series (as designated by the Texas Natural Heritage Program) is considered imperiled because of its rarity statewide and globally.

Floodplain Vegetation Community

Floodplain vegetation communities generally occur along river and creek floodplains throughout the preserve, and include the following four vegetation types: floodplain hardwood pine forest, floodplain hardwood forest, wetland baygall shrub thicket, and swamp cypress-tupelo forest. The floodplain hardwood pine forest type generally grows along smaller floodplains, where the transition from terrestrial to aquatic environments grows along smaller floodplains, where the transition from terrestrial to aquatic environments occurs over a relatively short distance. Dominant pine and hardwood species in this vegetation type are loblolly pine and American beech. American hornbeam (*Carpinus caroliniana*) is an abundant understory species.

Moving from lower order to higher order streams, the floodplains increase in size and floodplain hardwood pine forests are replaced by floodplain hardwood forest communities. This vegetation type is often generally referred to as “bottomland hardwood forest.” Extensive examples of these forests are found along the Neches River floodplain, especially in the Neches Bottom and Jack Gore Baygall unit. Dominant tree species in this type include sweetgum (*Liquidambar styraciflua*) and water oak (*Quercus nigra*).

Swamp cypress-tupelo forest is found in secondary river and creek channels and along the fringe of oxbow lakes and sloughs throughout the floodplain forests of the preserve. As the name implies, the dominant tree species are bald cypress (*Taxodium distichum*) and tupelo (*Nyssa aquatic*).

Over the past 100 years, most of the old growth forest in the region has been removed. Longleaf pine forests were generally logged first, followed by loblolly forests and eventually the bottomland hardwood forests. Accessibility to timber was a major problem in the bottomlands due to periodic flooding and wet conditions. While the swamp cypress-tupelo forest type was logged extensively for cypress, relic stands (often just a few individuals) escaped axe and saw. They now represent perhaps the only example of old growth left in the preserve. These stands are a rare reminder of the extensive primordial forested swamps that once blanketed the Big Thicket region. Very little information on the locations of old-growth cypress stands exists in the preserve, so mapping all of these areas is not currently possible. However, remaining old-growth stands or individuals are expected to occur in special management areas.

The fourth floodplain community is the wetland baygall shrub thicket. The term “baygall” is descriptive of the two dominant tree species that are commonly found in these communities: sweetbay magnolia (*Magnolia virginiana*) and gallberry holly (*Ilex glabra*). Baygalls occur most extensively along the broad floodplain of the Neches River in the Neches Bottom and Jack Gore Baygall unit. However, they are not restricted solely to floodplains, and can occur out of the floodplain in association with seeps and springs and ponded areas on uplands and slopes. Patches of baygalls are occasionally found in wetland pine savannas, and some have suggested that their presence is the result of fire suppression.

The Flatland Hardwood Forest type occurs in the preserve on flat, low elevation areas

where drainage patterns are poorly developed and precipitation remains ponded for long periods of time. Of all the vegetation communities in the preserve, this particular community appears to be endemic to Big Thicket. Dominant deciduous tree species include swamp chestnut oak (*Quercus prinus*), willow oak (*Quercus phellos*), and laurel oak (*Quercus laurifolia*). An interesting geomorphic feature known as sand mounds are abundant in this community, and the drier microsites on these mounds frequently support loblolly pine. Jungle-like thickets of dwarf palmetto often dominate the understory in flatland forests. Along with baygalls, these dense palmetto thickets perhaps best exemplify the original and seemingly impenetrable Big Thicket.

Nonnative, Invasive Plant Species

Chinese Tallow (*Triadica sebifera*).

Chinese tallow is a nonnative tree from China. It spreads by birds and moving water, grows rapidly, and can cause large-scale ecosystem modification, creating forests without native plant or animal species. Tallow can survive full sunlight, shade, flooding, drought, and is resistant to pests. Tallow is susceptible to herbicides and somewhat susceptible to fire. The sap and berries of the tree contain a toxin that is potentially harmful to humans and wildlife, and its leaves may also contain a toxin that has the ability to modify soil chemistry (USGS 2000).

Water hyacinth and hydrilla. Water hyacinth (*Eichornia crassipes*) and hydrilla (*Hydrilla verticillata*) have invaded several of the preserve’s waterways, where they often form dense mats. Neither of these plant species can invade seasonally dry wetlands, and the plants appear to be restricted to permanent waterways.

Giant salvinia (*Salvinia molesta*). Giant salvinia is a floating, rootless aquatic invasive fern that is native to South America. It is generally found in still waters of lakes and ponds, oxbows, ditches, or in slow flowing

streams, rivers, backwater swamps, and marshes. It is spread by human transport such as on boats, trailers, wheels, fishing or other recreational gear, and boots; as well as by natural drainage and flow in rivers and streams (USGS 2008). *Salvinia* forms thick mats, up to three feet deep, on the surface of water, thus clogging waterways, keeping light from entering the water, reducing oxygen concentrations, degrading water quality for aquatic species and recreational uses, and ultimately out-competing native plants that provide food and habitat for native animals and waterfowl (TPWD 2010a). Eradication requires herbicides and biological control organisms.

Other, less prominent, nonnative invasive plants in the preserve include, but are not limited to, the Japanese honeysuckle (*Lonicera japonica*), Chinese wisteria (*Wisteria sinensis*), Japanese climbing fern (*Lygodium japonicum*), Chinaberry (*Melia azedarach*), and Coral ardisia (*Ardisia crenata*).

Climate Change and its Effects on Vegetation

Climate change is anticipated to affect the vegetation of the preserve because of the projected increases in annual temperature, changes in precipitation patterns, and increases in severity of storms. However, the rate and magnitude of these changes and the impact on specific communities of vegetation species would vary widely based on localized features such as elevation and slope aspect, and on the competitive advantage that climate change gives to insects, diseases, and nonnative or invasive species.

FISH AND WILDLIFE

Introduction

The Big Thicket region has long been recognized for possessing a diverse array of fauna and flora. This area provides habitat for plant and animal species of the southeast

swamps, pineywood forest, post-oak belt, Great Plains, southwest deserts, and the coastal prairie.

The abundant and diverse vegetation of the preserve supports aquatic and terrestrial habitats for a variety of fish and wildlife. Many studies of specific types of wildlife, such as inventories of mammals, have been performed in the Big Thicket region over the past century. Some of the most thorough inventories were conducted shortly after the preserve's establishment in 1974. The following section summarizes these studies, literature reviews, and wildlife observations to describe fauna believed to inhabit the preserve. Rare, threatened, and endangered species of plants and animals are discussed under the endangered and threatened species section.

Mammals

Of the 184 mammals listed for Texas, 59 are either documented or believed to inhabit the preserve. Several large species are now extirpated in Big Thicket due to a variety of factors including habitat destruction and overhunting. These include the jaguar, ocelot, red wolf, and the Louisiana subspecies of the American black bear. Although occasional sightings of black bears have been reported near the preserve, no populations are believed to be reproducing in east Texas.

Birds

Birds are the most visible and diverse group of vertebrate fauna found in the preserve. Currently, 296 species have either been documented or are believed to inhabit the preserve. This figure is thought to be low because no comprehensive inventory of birds has been performed. The preserve lies on a major migratory flyway, and many species of birds are transient during spring and fall migrations. Birds found in Big Thicket predominantly consist of three categories: passerines (including many neotropical songbirds), raptors, and waterfowl. The abundance and variety of birds in Big Thicket

contribute to one of the favorite visitor activities—bird-watching.

Reptiles and Amphibians

Approximately 51 species of reptiles and amphibians are believed to inhabit the preserve. This figure represents roughly 33% of the 219 species of reptiles and amphibians in Texas. The most diverse group of reptiles in Big Thicket is snakes. Texas has 68 species of snakes, and half of these inhabit Big Thicket. Other types of reptiles include skinks, lizards, turtles, and the American alligator. Three types of amphibians including frogs, toads, and salamanders inhabit Big Thicket.

Fish

Of all faunal groups in the preserve, fish are perhaps the most thoroughly inventoried: 92 species are believed to inhabit preserve waters. In small tributaries, the most abundant species of fish include minnows, darters, bass, and bullhead catfish. This pattern shifts in larger tributaries, which are dominated by channel, blue, and flathead catfish; sunfish; largemouth and spotted bass; and crappie.

Invertebrates

A comprehensive inventory of lepidoptera, which includes butterflies and moths, has documented almost 1,800 species (Bordelon and Knudson 1999). In aquatic environments, insects and mussels are the most thoroughly documented species. Comprehensive inventories in the Village Creek drainage have documented 249 species of common macroinvertebrates including dragonflies, caddisflies, mayflies and stoneflies. Three species of aquatic insects are endemic to the Big Thicket region (Abbott and Stewart 1997) and two are candidates for federal listing (see table 17). Thirty-five species of mussels, including the Texas heelsplitter (*Potamilus amphichaenus*), wartyback (*Quadrula nodulata*), and sandbank pocketbook (*Lampsilis satura*), live

in the Lower Neches River watershed (Howells 1996). This portion of the watershed includes most of the units of the preserve.

Habitat Fragmentation

The preserve consists of eight discrete land units connected by four narrow water corridor units. The water corridor units, varying in width from 1,000 to 1,500 feet, were established in part to offset the effects of fragmentation by providing ecological connectivity between otherwise isolated units. However, the degree to which these habitat corridors serve as migration routes or enhance the persistence of fish and wildlife species has not been adequately tested.

With few exceptions, the preserve's land and corridor units are crossed by roads, trails, pipeline and power line corridors, oil and gas operations, and one railway. Therefore, the geographic configuration of the units, along with the further contributions of human-induced developments, result in fragmentation of wildlife habitat. In general, habitat fragmentation has two major interrelated consequences for biological diversity: (1) population isolation and decrease in effective population size, and (2) creation of edge habitat and its effects (Harcombe and Callaway 1997).

Population Isolation. Habitat fragmentation can result in demographic isolation of populations or subpopulations, resulting in inadequate exchange between populations or subpopulations to maintain demographic and genetic viability. Isolated populations are at greater risk of decline due to effects of random events such as storms, drought and reduced food availability. The effects of habitat fragmentation may explain why most of the original predators of the Big Thicket (jaguars, black bears, red wolves, and ocelots) are now extirpated.

Edge Habitat. Another potential effect associated with habitat fragmentation is the creation of "edge" habitat. Edge habitat is

produced whenever there is an abrupt discontinuity between vegetative cover (Harris 1988). Pipeline rights-of-way are a good example of edge habitats, and the preserve's water corridor units are a long continuous edge zone. Impacts of edge habitats, often referred to as "edge effects" include the movement of nonnative species into interior habitats, and increased predation and mortality (e.g., road kill) as animals cross edges between habitats (Harris and Gallagher 1989). While the impacts of edge effects are known to be ecologically significant, there is no generally accepted threshold of significance. Rather, it is generally accepted that increased edge habitat, often described quantitatively as the edge-to-interior ratio, has a greater ecological impact as the ratio increases.

Nonnative, Invasive Wildlife Species

Feral Hogs (*Sus scrofa*). Wild hogs were likely introduced by early Spanish explorers. Their rooting habits cause extensive disturbance to vegetation and soils, and may cause a shift in plant succession. They also compete with some other native wildlife for certain foods. Current management activities include hunting and trapping (TPWD 2003).

Red Imported Fire Ants (*Solenopsis* spp.). Red imported fire ants originate from Brazil and were imported to the United States in the 1930s. They pose a great ecological threat to native ant species, birds, and any other animal, including reptiles, amphibians, and humans, that come into contact with their mounds. They are quick to attack and do so in large numbers, often killing the smaller intruders. Mounds can contain hundreds of thousands of fire ants as well as multiple queen colonies. Eradication is difficult and generally requires insecticides (TPWD 2010b).

Asian Clams (*Corbicula fluminea*). Asian clams originate from southern Asia and were introduced in the United States in 1938. The most prominent impact of Asian clams is biofouling of power plants and industrial

water systems whereby the clams clog condenser tubes, raw service water pipes, and firefighting equipment. They are also known to cause problems in irrigation canals and pipes and adversely affect drinking water supplies. Ecologically, they alter benthic substrates and compete with native species for limited resources (Foster et al. 2011).

Southern Pine Beetles (*Dendroctonus frontalis*). The southern pine beetle is responsible for the loss of hundreds of thousands of acres in forests in the eastern and southeastern portions of the United States. In east Texas, loblolly pines are one of the main hosts of the southern pine beetle and while longleaf pines have more resistance to beetle outbreaks, they can be successfully colonized. In Big Thicket National Preserve, the federal-endangered red-cockaded woodpecker is dependent on mature pine forest habitat for cavity nesting, roosting, and foraging for insects (Clarke and Nowak 2009).

Climate Change and its Effects on Fish and Wildlife

Climate change is anticipated to affect the fish and wildlife and habitat of the preserve because of the projected increases in annual temperature, changes in precipitation patterns, and increases in severity of storms. However, the rate and magnitude of these changes and the impact on specific populations of fish and wildlife species would vary widely based on localized features such as elevation and slope aspect, and on the competitive advantage that climate change gives to insects, diseases, and nonnative or invasive species.

ENDANGERED AND THREATENED SPECIES AND SPECIES OF SPECIAL CONCERN

Overview of Species

Under the Endangered Species Act, the National Park Service has responsibility to address impacts to federal-listed threatened, endangered, and candidate species and species proposed for listing. Also, NPS policy requires that state-listed species, and others identified as species of management concern by the park unit staff, are to be managed in park units in a manner similar to those that are federal-listed. Big Thicket National Preserve does not have any species of management concern identified. Thus, federal- and state-listed species would be addressed in this general management plan following federal law and NPS policy.

The terms “endangered” and “threatened” describe the official federal status of certain species in the preserve as defined by the Endangered Species Act. The term “candidate” is used officially by the U.S. Fish and Wildlife Service when describing those species for which the Service has on file sufficient information on biological vulnerability and threats to support issuance of a “proposed rule to list,” but issuance of the proposed rule is precluded. No candidate species are currently believed to inhabit the preserve. The term “proposed” describes species for which a “proposed rule to list” has been published in the *Federal Register*;

however, a finalized rule has not yet been issued. Texas has enacted regulations similar to the Endangered Species Act that confer endangered and threatened status to certain species that inhabit areas in the state. NPS *Management Policies 2006* dictate that federal candidate species, proposed species, and state-listed endangered and threatened species are to be managed to the greatest extent possible as federal-listed endangered and threatened species. Therefore, these species are included in this discussion.

A listing of species of proposed, candidate, endangered and threatened species specific to Big Thicket is problematic to compile because listed species are rare by default, and current, comprehensive inventories of flora and fauna in the preserve are incomplete. Moreover, the U.S. Fish and Wildlife Service publishes lists by county, and political boundaries do not coincide with natural boundaries such as habitats or ecoregions. Because the preserve is in parts of seven east Texas counties, not all of the species listed for these counties (such as marine species) have suitable habitat. Nonetheless, all federal-listed and state-listed species believed to occur permanently or transiently (such as migrating birds) in the preserve based on past inventories, existing and potential habitat, documented sightings, and professional judgment are listed in the following table. For the full listing of rare, threatened, and endangered species and species of concern for all seven counties see appendix F.

TABLE 17. RARE, THREATENED, OR ENDANGERED SPECIES OR SPECIES OF CONCERN

Common Name	Scientific Name	Federal Status	State Status	County
AMPHIBIANS				
Pig frog	<i>Lithobates grylio</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Tyler
BIRDS				
Bachman's sparrow	<i>Aimophila aestivalis</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler
Bald eagle	<i>Haliaeetus leucocephalus</i>	DL	T	All
Black rail	<i>Laterallus jamaicensis</i>	R/NL	R/NL	Jefferson
Brown pelican	<i>Pelecanus occidentalis</i>	DL	E	Jefferson, Orange
Henslow's sparrow	<i>Ammodramus henslowii</i>	R/NL	R/NL	All
Peregrine falcon	<i>Falco peregrinus</i>	DL	T	All
American peregrine falcon	<i>Falco peregrinus anatum</i>	DL	T	All
Arctic peregrine falcon	<i>Falco peregrinus tundrius</i>	DL	R/NL	All
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	E	Hardin, Jasper, Liberty, Polk, Tyler
Reddish egret	<i>Egretta rufescens</i>	R/NL	T	Jefferson
Sprague's pipit	<i>Anthus spragueii</i>	C	R/NL	All
Swallow-tailed kite	<i>Elanoides forficatus</i>	R/NL	T	All
White-faced ibis	<i>Plegadis chihi</i>	R/NL	T	Hardin, Jasper, Jefferson, Liberty, Orange

TABLE 17. RARE, THREATENED, OR ENDANGERED SPECIES OR SPECIES OF CONCERN

Common Name	Scientific Name	Federal Status	State Status	County
Wood stork	<i>Mycteria americana</i>	R/NL	T	All
FISH				
American eel	<i>Anguilla rostrata</i>	R/NL	R/NL	All
Blue sucker	<i>Cycleptus elongatus</i>	R/NL	T	Hardin, Jasper, Tyler
Creek chubsucker	<i>Erimyzon oblongus</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler
Ironcolor shiner	<i>Notropis chalybaeus</i>	R/NL	R/NL	Jasper, Orange
Orangebelly darter	<i>Etheostoma radiosum</i>	R/NL	R/NL	Jasper, Polk
Paddlefish	<i>Polyodon spathula</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler
Western sand darter	<i>Ammocrypta clara</i>	R/NL	R/NL	Hardin, Jasper, Tyler
INSECTS				
A mayfly	<i>Plauditus gloveri</i>	R/NL	R/NL	Jasper
Bay skipper	<i>Euphyes bayensis</i>	R/NL	R/NL	Jefferson
Gulf Coast clubtail	<i>Gomphus modestus</i>	R/NL	R/NL	Liberty
MAMMALS				
Black bear	<i>Ursus americanus</i>	T/SAT; NL	T	All
Louisiana black bear	<i>Ursus americanus luteolus</i>	T	T	All
Plains spotted skunk	<i>Spilogale putorius interrupta</i>	R/NL	R/NL	All

TABLE 17. RARE, THREATENED, OR ENDANGERED SPECIES OR SPECIES OF CONCERN

Common Name	Scientific Name	Federal Status	State Status	County
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	R/NL	T	All
Southeastern myotis bat	<i>Myotis austroriparius</i>	R/NL	R/NL	All
MOLLUSKS				
Creeper (squawfoot)	<i>Strophitus undulatus</i>	R/NL	R/NL	All
Fawnsfoot	<i>Truncilla donaciformis</i>	R/NL	R/NL	All
Little spectaclecase	<i>Villosa lienosa</i>	R/NL	R/NL	All
Louisiana pigtoe	<i>Pleurobema riddellii</i>	R/NL	T	All
Sandbank pocketbook	<i>Lampsilis satura</i>	R/NL	T	All
Southern hickorynut	<i>Obovaria jacksoniana</i>	R/NL	T	Hardin, Jasper, Jefferson, Orange, Polk, Tyler
Texas heelsplitter	<i>Potamilus amphichaenus</i>	R/NL	T	All
Texas pigtoe	<i>Fusconaia askewi</i>	R/NL	T	All
Triangle pigtoe	<i>Fusconaia lananensis</i>	R/NL	T	Hardin, Tyler
Wabash pigtoe	<i>Fusconaia flava</i>	R/NL	R/NL	All
Wartyback	<i>Quadrula nodulata</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Polk, Tyler
REPTILES				
Alligator snapping turtle	<i>Macrochelys temminckii</i>	R/NL	T	All
Louisiana pine snake	<i>Pituophis ruthveni</i>	C	T	Hardin, Jasper, Liberty, Polk, Tyler

TABLE 17. RARE, THREATENED, OR ENDANGERED SPECIES OR SPECIES OF CONCERN

Common Name	Scientific Name	Federal Status	State Status	County
Northern scarlet snake	<i>Cemophora coccinea copei</i>	R/NL	T	Hardin, Jasper, Jefferson, Liberty, Orange, Tyler
Sabine map turtle	<i>Graptemys ouachitensis sabinensis</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Tyler
Texas horned lizard	<i>Phrynosoma cornutum</i>	R/NL	T	Jefferson, Liberty, Orange
Timber rattlesnake	<i>Crotalus horridus</i>	R/NL	T	All
PLANTS				
Navasota ladies'-tresses	<i>Spiranthes parksii</i>	E	E	Jasper
Neches River rose-mallow	<i>Hibiscus dasycalyx</i>	C	R/NL	Jasper
Texas trailing phlox	<i>Phlox nivalis ssp texensis</i>	E	E	Hardin, Polk, Tyler

Sources: USFWS, last updated 3/8/2011; and TPWD, last updated 2/28/2011.

Key:

E, T – Federal- or State-listed Endangered or Threatened
 PE, PT – Federally Proposed Endangered or Threatened
 SAE, SAT – Federal-listed Endangered or Threatened by Similarity of Appearance
 C – Federal Candidate for Listing; formerly Category 1 Candidate
 DL, PDL – Federally Delisted or Proposed for Delisting
 NL – Not Listed
 NT – Not tracked or no longer tracked by the State
 R/NL – Rare, but with no regulatory listing status

Birds

Only one federal-listed bird, the endangered red-cockaded woodpecker, and one federal candidate species, Sprague's pipit, occur within the preserve. The preserve is currently actively restoring habitat for the red-cockaded woodpecker.

Red-cockaded Woodpecker (*Picoides borealis*). Red-cockaded woodpeckers (federal endangered, state endangered) are year-round inhabitants of the pineywoods of east Texas. Red-cockaded woodpeckers prefer open, park-like stands of mature pine maintained by frequent fire. Little of this habitat remains in the preserve due to the lasting impacts of logging and fire suppression. In time, however, pine forest regeneration and periodic prescribed fire should create more favorable habitat in uplands throughout the preserve. Until recently, active colonies were documented in upland pine forests in the Big Sandy unit. These colonies became inactive in the mid-1990s, but the cavity trees and associated habitat remain and could be recolonized in the future.

Sprague's pipit (*Anthus spragueii*). Sprague's pipit (federal candidate species) is a migratory bird that likely does not nest in the preserve due to lack of suitable habitat, as it prefers large patches of native grassland with a minimum of about 360 acres; however, the preserve does provide suitable wintering range. According to the U.S. Fish and Wildlife Service, a study has determined that the pipit warrants threatened or endangered status; however, to date, its listing has been precluded by higher priority actions (USFWS 2011).

Mammals

Since the turn of the century, several species of predatory mammals have been extirpated due to a variety of factors including predator control, overhunting and poaching, habitat loss and population isolation. These species include the jaguar, red wolf, and ocelot.

Currently, only one federal-listed mammal is believed to occur in or near the preserve, the threatened Louisiana black bear. The preserve is actively restoring habitat for the Louisiana black bear.

Louisiana Black Bear (*Ursus americanus* ssp. *luteolus*). The Louisiana black bear is federal-listed as threatened and state-listed as threatened. The closest known reproducing populations of Louisiana black bears are in the Atchafalaya basin in Louisiana. Occasional sightings of bears have been reported in east Texas, so occurrences of bears in the preserve (especially wandering males) are possible. Two separate studies aimed at identifying potential habitat for black bear reintroduction have identified suitable habitat in the Jack Gore and Neches Bottom unit of the preserve (Garner 1996; Epps 1997). This area could serve as core habitat for bears in the future, through reintroduction efforts or expansion of existing populations in Louisiana. However, any reintroduction effort would require the active participation and support of a number of public and private land management agencies and the public to ensure the provision of sufficient habitat and to prevent poaching and other bear-human conflicts. Continued fragmentation of habitat in the Big Thicket and surrounding region could preclude the possibility of black bear reintroduction.

Plants

Two federal-listed plants, the endangered Navasota ladies'-tresses and the endangered Texas trailing phlox, and one federal candidate plant species, the Neches River rose-mallow, occur in the preserve.

Texas Trailing Phlox (*Phlox nivalis* var. *texensis*). Texas trailing phlox is a federal-endangered and state-endangered plant species that is endemic to southeast Texas. Populations of phlox are only currently found in three counties: Hardin, Polk, and Tyler. Texas trailing phlox is a fire-adapted plant species that grows in fire-maintained

openings in upland longleaf pine savannas or post oak-bluejack oak woodlands on deep sandy soils. Considered very rare and imperiled less than a decade ago, its numbers have increased at some sites during the last few years. This trend may indicate that prescribed burning of its habitat, which allows more light to reach the ground and possibly influences nutrient availability, is essential to its continued survival and recovery (Texas Parks and Wildlife 1997; Ajilvsgi 1979). Phlox currently grows in two locations in the Big Sandy unit and in two locations in the Turkey Creek unit. The population in the Turkey Creek unit was established from cuttings taken from plants in Roy E. Larsen Sandylands sanctuary, owned and managed by The Nature Conservancy of Texas.

Navasota ladies'-tresses (*Spiranthes parksii*). Navasota ladies'-tresses is a federal-endangered and state-endangered species of orchid that is endemic to southeast Texas. Navasota ladies'-tresses grows in moist, sandy soils in small openings on gentle slopes and along intermittent tributaries of the Brazos, Navasota, and Neches rivers. The species has a limited range and low population numbers. Reasons for endangerment include habitat loss and degradation due to development and road construction (USFWS 1992). Most populations of Navasota ladies'-tresses have been documented in post oak savannah vegetation community types west of Big Thicket; however, a separate population exists in northwestern Jasper County just east of the Upper Neches River corridor unit. Although this plant has not been documented in the preserve, it could occur given the close proximity of the preserve to the Jasper population and the existence of favorable habitat along upper Neches River.

Neches River rose-mallow (*Hibiscus dasycalyx*). The Neches River rose-mallow is a federal candidate species native to Texas and found within the preserve. The rose-mallow prefers wetlands areas with open sun;

it is usually found in standing water in the late winter and spring, where water elevations slowly drop during the summer (USFWS 2011a).

Reptiles

Only one federal candidate reptile species (Louisiana pine snake) occurs in the preserve. The preserve is currently actively restoring habitat for the Louisiana pine snake.

Louisiana Pine Snake (*Pituophis melanoleucus ruthveni*). The Louisiana pine snake is a federal candidate species and state-listed as threatened. The Louisiana pine snake mainly uses small mammal (especially pocket gopher) burrows as shelter (Craig Rudolph, pers. comm.), and feeds chiefly on small mammals. The snake is limited to sandy soils in hardwood-conifer forests of western Louisiana and east Texas. Within this broad ecoregion, upland longleaf pine savanna habitat appears to be preferred (Conant 1975). To date, only one Louisiana pine snake has been found in the Lance Rosier unit of the preserve, although favorable habitat exists in both the Big Sandy and Turkey Creek units.

Climate Change Effects on Endangered and Threatened Species and Species of Concern

Climate change is anticipated to affect the threatened and endangered species and habitat of the preserve because of the projected increases in annual temperature, changes in precipitation patterns, and increases in severity of storms. However, the rate and magnitude of these changes and the impact on specific populations of threatened and endangered species would vary widely based on localized features such as elevation and slope aspect, and on the competitive advantage that climate change gives to insects, diseases, and nonnative or invasive species.

CULTURAL RESOURCES

OVERVIEW

The cultural resource topics analyzed in this general management plan consist of archeological resources; historic structures, sites, and cultural landscapes; and ethnographic resources. Although comprehensive information regarding the preserve's cultural resources has not been compiled, evidence gathered from various surveys and compliance-related undertakings supports Big Thicket's rich cultural history spanning thousands of years and that the preserve was not an overwhelmingly forbidding place as has at times been postulated. Archeological and other cultural resources have been identified, documenting the presence of early prehistoric peoples, American Indian inhabitants, and European Americans who settled and pursued industrial activities in the area primarily during the latter 19th and early 20th centuries. Evidence of past human activities is often subtle and difficult to discern in the landscape. Resources are subject to loss and deterioration by natural weathering and erosion. Nevertheless, the preserve retains prehistoric encampments, homesteads, logging camps and mills, roads and trails, oil and gas production sites, and other sites and material remains that document patterns of historic land use and adaptations to the regional environment. Many of these resources retain cultural importance for traditionally associated peoples, such as the Alabama-Coushatta Tribe of Texas and the descendants of European American settlers.

ARCHEOLOGICAL RESOURCES

The first professional archeological survey of Big Thicket National Preserve was conducted by Texas A&M University in 1974/1975, with surface investigations conducted in all of the preserve's units at that time. No subsurface

shovel testing was conducted. Although limited in scope, the investigations established a valuable regional context for the preserve's archeological resources. University archeologists examined five previously recorded sites and recorded seven new sites in the preserve area (Blanton and Associates 1999, Brazos Valley Research Assoc. 2006). A comprehensive archeological survey of the preserve has not been undertaken to date. The limited extent of surveys, with correspondingly few sites recorded, has contributed to what some archeologists consider a misconception that prehistoric peoples found the Big Thicket an inhospitable wilderness and largely avoided the area except for occasional hunting forays. An alternative perspective suggests the scarcity of identified sites in the Big Thicket may be attributed to inadequate survey and testing strategies, compounded by dense vegetation and other factors that have concealed sites and impeded investigations (MacRoberts and MacRoberts 2008).

Despite the lack of comprehensive archeological surveys, several project area-specific surveys have been conducted in fulfillment of section 106 compliance requirements for seismic surveys and oil and gas exploration. These surveys have been conducted primarily in the Beaumont, Neches Bottom and Jack Gore Baygall, and Lance Rosier units. Although some reports indicate that about 30 archeological sites have been recorded in the preserve, only 15 sites are presently listed in the NPS archeological sites management information system (NPS, Orcutt, pers. comm., October 25, 2010). Evaluative testing to establish site eligibility for the National Register of Historic Places has not been completed in most instances. Identified prehistoric sites have typically been found in buried contexts with exposed stone flakes from tool-making activities and occasional ceramic sherds. Hearths and fire

pits are common site features. Most of the known prehistoric sites date to the Archaic and Late Prehistoric periods (NPS 2006, Brazos Valley Research Assoc. 2006).

Prehistoric occupation of this portion of southeastern Texas is recognized as beginning with the Paleo-Indian period (ca. 8,000 to 6,000 BC). Paleo-Indian people were typically nomadic hunters of large game (megafauna) at the time of the last ice age. The large fluted projectile points they manufactured are perhaps the most distinguishing lithic artifacts of the period. Regional Paleo-Indian sites and a large percentage of subsequent Archaic period sites (ca. 6,000 BC to AD100) have been discovered, primarily in the coastal area south of Beaumont. Shell middens represent a typical early to middle Archaic site type. More widespread utilization of areas beyond the coastal zone, including the Neches River and its tributaries, occurred during the latter part of the Archaic period, ca. 1500 BC to AD 100 (NPS 2006).

Prehistoric populations in east Texas at the beginning of the Late Prehistoric period (ca. AD 100) were influenced to a large extent by interaction with people associated with the Hopewell Culture, centered in the Lower Mississippi Valley. Among the innovations introduced to the region by this cultural exchange were the use of ceramics, the bow and arrow, and maize agriculture. The end of the Late Prehistoric period (ca. AD 1500) generally coincided with the period of American Indian contact with European and Spanish explorers. Inhabitants of the area at this time are commonly identified in the historical record as various tribal groups associated with the Caddo and Atakapa peoples. The Caddo Indians constructed large temple mounds, smaller burial mounds, and resided in agricultural villages in the pine forests of east Texas. Caddoan Mounds State Historic Site was a major village and ceremonial center built between AD 750 and AD 1250. The site, about 130 miles northwest of Beaumont, Texas, contains temple mounds, a burial mound, and a diverse

assemblage of stone, ceramic, and metal artifacts (NPS 2006).

Historic archeological sites are widely scattered throughout the preserve, commonly associated with early 19th century homesteading and ranching, late 19th century timber industry activities, and the boom period of oil and gas development during the early 20th century. Although few of these sites have been formally recorded, they include the remains of former homesteads; logging camps and mills; hunting camps; river craft; roads, trails, and traces; ferry crossings; steamboat landings; abandoned communities; and early oil and gas production sites. Camps and villages are also anticipated to exist in the preserve associated with the migration of the Alabama and Coushatta tribes into the area (NPS 2006).

Sites associated with water transportation have been found along the Neches River and its tributaries, notably Little Pine Island Bayou. In 1991, the wooden remains of a suspected ferryboat were exposed along the bank of the Neches River, about a mile downstream of the Sheffield boat ramp. NPS archeologists and other specialists analyzed and recorded the discovery. Construction details and historical references provided evidence to suggest the boat was likely associated with one of several ferry operations known to operate as early as the 1830s on the Neches upstream of the discovery site (NPS, Bradford 1992).

To further the preserve's efforts to document and protect archeological resources, and to provide a predictive model to assist cultural resource surveys conducted as part of oil and gas surveys, Moore Archeological Consulting prepared a gazetteer (multimedia reference source) that summarized all the publicly available archeological data within a 2-mile area surrounding the preserve. Information was collected from several sources including archives of the Texas Historical Commission (Austin), the Texas Archeological Research Laboratory (Austin), and the National Park Service. Data from 63 cultural resource

surveys was digitized and compiled into an ArcView database that includes pertinent site descriptions, geographic and mapping data and bibliographical references (Dureka and Moore 2003).

Additional studies, reports and investigations would assist the management of the preserve's archeological resources. Among these, an archeological overview and assessment would describe and evaluate the preserve's known and potential archeological resources, identify the need for additional field surveys, and recommend future research. Based on recommendations from the overview and assessment, additional reconnaissance surveys would be carried out to more systematically identify sites and assist site probability assessments throughout the preserve. Selected sites, including those identified by previous surveys, may merit more intensive investigations (e.g., subsurface testing, remote sensing analysis) to assist determinations of site integrity, condition and national register eligibility.

Among the anticipated consequences of climate change are the heightened intensity and frequency of severe storms and hurricanes. These factors present potential threats to buried archeological resources in the preserve as storms contribute to rising water levels, perhaps inundating sites in low-lying areas, or along streams, rivers and lake shores. Intensified storm-related flood waters may also accelerate soil erosion leading to the disturbance and loss of vulnerable sites. The preserve would implement site protection and stabilization measures to minimize or mitigate these resource threats and possibly undertake data recovery excavations for sites that cannot be adequately protected in situ.

HISTORIC STRUCTURES, SITES, AND CULTURAL LANDSCAPES

In the late 1970s, historians of Texas A&M University surveyed the preserve and identified approximately 150 structures. Although none of the structures was formally

assessed for their eligibility to be listed in the National Register of Historic Places, several were recommended worthy of preservation as visitor discovery sites (Blanton and Associates, Inc. 1999). Few standing historic structures presently remain in the preserve. Many of the structures identified in the 1970s are suspected to have collapsed or have lost architectural integrity, and are presently more likely to be representative of historical archeological sites. The Lily Bunkhouse (a nonhistoric building in the Big Sandy unit) is proposed for possible demolition under alternative 3.

Although there are few identified historic structures in the preserve, several historic sites have associated cultural landscapes. No cultural landscape reports have been completed for the preserve, and detailed inventories and reports are required for many of these landscapes to more fully identify contributing features and provide baseline information to support treatment recommendations. Because of the close association of cultural landscapes to historic sites and structures at the preserve, these topics are presented together where appropriate. By NPS definition, a cultural landscape is

a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions (NPS Director's Order 28).

The log Staley Cabin (in the Turkey Creek unit) was built in the 1920s by settlers Jimmy and Elda Staley. The cabin served as the preserve's visitor center until the present visitor center was constructed in 2001. It is

presently used as the preserve's environmental education center, providing a place for school groups to participate in natural and human history programs. Although perhaps the preserve's best-preserved historic structure, modifications to the cabin (primarily to the interior) have compromised its integrity and its potential national register eligibility. Recent grading around the cabin has improved site drainage to prevent rainwater from collecting at the base of the log walls. A cultural landscape inventory for the Staley Cabin site has not been undertaken.

Remnants of the former Voth Mill are along the banks of Pine Island Bayou near Beaumont. The Keith Lumber Company constructed the first sawmill at the site in 1902. The company harvested, milled, planed, and kiln-dried the area's abundant longleaf pines. The lumber was then shipped to markets via the Texas and New Orleans Railroad, and the Gulf, Colorado and Santa Fe Railroad. Narrow-gauge tram lines facilitated the transport of logs to the mill from outlying timber stands. Much of the lumber was for railroad ties and timbers for oil derrick construction. In 1922, the mill was acquired as a subsidiary of the Kirby Lumber Company and incorporated into the latter company's vast network of mills and timber holdings. The mill was modified for hardwood production, and a company town for the mill employees was established at Voth. The milling operation contributed substantially to the local economy. However, the company was hit hard by the Great Depression of the 1930s and ensuing production declines and financial setbacks eventually led to the closure of the Voth Mill in 1952. The former company town no longer exists. Following the closure, the facility was systematically dismantled; buildings and structures were leveled, and building materials and machinery were salvaged and removed from the site. Subsequent development and encroaching vegetation have further obscured physical evidence of the site, although several building foundations, footings, walls, and other

structural remnants exist (Shapins Associates 2005).

In 2005 the Voth Mill and its associated cultural landscape were evaluated for listing in the National Register of Historic Places. Despite the mill's important historical associations with the timber industry in Big Thicket and its contributing role in the economic development of southeast Texas, the site was recommended ineligible for listing in the national register because of its substantial loss of historic integrity and contributing cultural landscape elements (Shapins Associates 2005).

A cultural landscape inventory (level II, phase I) was undertaken for the preserve's historic tram routes (Shapins Associates 2004). The literature review and project scoping for the *Cultural Landscapes Inventory* (CLI) included a historical overview, photographic and map documentation, and recommendations for further analysis. Researchers visited the Beech Creek unit to correlate potential tram routes with evidence from 1930s aerial photographs. The tram roads were developed by the timber companies in the latter 19th century to provide a means to access and transport timber from deep within the Big Thicket to the sawmills and connections to the major rail lines. The first tram roads were often constructed to the banks of the Neches River and other rivers and tributaries from where the logs were then floated downstream to the mills. The trams, originally animal-powered, gave way to steam-powered locomotives around 1880 to pull the heavy timber loads on narrow-gauge tracks. Timber production in the Big Thicket peaked in 1907. However, the clear-cutting methods employed in harvesting the timber could not be economically sustained, and the timber stands were eventually exhausted. Nearly all the tram roads were abandoned by 1939 as many of the mills closed and the Great Depression compounded the industry's economic downturn. Because of the noncontiguous nature of the preserve's units, only part of the former tram network is within the boundaries of the preserve. The

tram roads were intended to be temporary and the rails were relocated to tap new areas as needed. In part because of this temporary nature, the integrity of the roads and their visibility in the landscape has been compromised and obscured in many instances because of erosion and the growth of vegetation. Linear berms are all that remain to mark the tram roads in some areas, and several of the tram routes were later adapted for truck and auto roads or became utility and pipeline corridors (Shapins Associates 2004).

Other potential cultural landscapes identified in the CLI database for the preserve include the Brazeal Homestead complex (Big Sandy Creek unit), the birthplace of naturalist and long-time preserve advocate Lance Rosier (Lance Rosier unit), the Teel Homestead (Lance Rosier unit), the Hicksbaugh Community (Turkey Creek unit), and the Hooks Bear Camp (Lance Rosier unit). The cultural landscapes associated with these sites primarily reflect late 19th and early 20th century subsistence homesteading activities and (in the case of the abandoned Hicksbaugh Community) the logging and timber industry. The Hooks Bear Camp was the site of a 20th century commercial hunting camp that provided visitors opportunities to hunt black bears. No standing structures are present at these sites, although they are anticipated to possess historical archeological resources that could expand understanding of historic lifeways in the Big Thicket. Cultural landscape features may also be present in the preserve associated with historic ferry landings, wagon roads and trails, farmsteads, and oil and gas exploration activities and camps. In 1901, the major oil discovery at Spindletop (near Beaumont) ushered in the early 20th century oil boom period in Texas and prompted the development of oil fields throughout the region. Profitable oil wells were developed at Saratoga near the Lance Rosier unit. Although the boom period of oil exploration was initially concentrated along the southern edge of Big Thicket, most units of the

preserve received some level of oil exploration by the 1950s (NPS 2006).

Additional studies, reports, and investigations would assist in the management of the preserve's historic buildings, structures, and cultural landscapes. Among these, a historic resource study would provide baseline information documenting and identifying the preserve's historic resources and structures. It would provide the historic and thematic context for evaluating the national register significance of historic properties, assess their condition and integrity, and provide the framework for additional research. As necessary, the preserve would also compile or update pertinent management information and data regarding historic structures in the List of Classified Structures (LCS). Historic structure reports would also be prepared as necessary to guide appropriate preservation treatment of historic structures (e.g., rehabilitation, restoration) in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Cultural landscape inventories and reports may also be required to identify, document, and guide management treatment of selected cultural landscapes in accordance with *The Secretary of Interior's Standards for the Treatment of Historic Properties and Guidelines for the Treatment of Cultural Landscapes*.

Among the anticipated consequences of climate change are the heightened intensity and frequency of severe storms and hurricanes. These factors present potential threats to historic buildings, structures, and cultural landscape features. Storm-driven winds, rain, and debris can adversely impact the integrity of historic properties as contributing architectural and landscape elements are damaged or destroyed. Preserve staff would consequently implement measures to stabilize at-risk historic structures and cultural landscape features to minimize the loss of historic fabric and character-defining architectural and landscape elements.

ETHNOGRAPHIC RESOURCES

As defined by the National Park Service in Director's Order 28: *Cultural Resources Management Guideline*, an ethnographic resource is "a site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it." Ethnographic resources typically hold significance for traditionally associated groups whose sense of purpose, existence as a community, and identity as an ethnically distinctive people are closely linked to particular resources and places.

Prior to 16th century contact with Europeans in southeast Texas, Caddo and Atakapa Indians are thought to have occupied seasonal camps in Big Thicket for hunting, fishing, and foraging activities. However, they are not believed to have established permanent villages in Big Thicket. The continued existence of the Atakapa as a distinct people is doubtful although they may have merged with other tribes. The Caddo groups that historically lived near the preserve were resettled on reservations in Oklahoma in 1859 (NPS 2006).

In the 1780s, the Alabama and Coushatta tribes migrated to Texas from their earlier homelands in the southeastern United States. The tribes lived in settled groups on the north and west edges of Big Thicket. To facilitate travel through the difficult conditions and terrain of Big Thicket, they developed an intricate network of trails that often followed the ridges between streams and avoided major water crossings. The present reservation of the Alabama-Coushatta Tribe of Texas was established in 1853 and adjoins the north boundary of the Big Sandy unit. The Alabama and Coushatta were once related but separate groups; both tribes are members of the Upper Creek Confederacy of Indians and are of the Muskogean Nation. Their languages are similar to the Muskogean dialect. The U.S. government relinquished trusteeship of tribal lands and assets in 1954,

and in 1987 granted federal recognition to the tribe (Alabama-Coushatta Tribe of Texas website). Information shared during consultation meetings conducted prior to the present general management plan between preserve staff and the Alabama-Coushatta Tribe of Texas revealed that the tribe retains a strong traditional association with preserve lands primarily for hunting and subsistence purposes. Although no specific locations in the preserve are presently identified as having particular traditional, religious, or ceremonial significance, the Coushatta Trace that crosses the Big Sandy unit is recognized as an important historic corridor for the tribe. The Coushatta Trace served as a trade route between Texas and Louisiana during the 18th and 19th centuries. Precontact archeological sites are also regarded by the tribe as culturally important and should not be disturbed. Former village sites, hunting camps, and other places of cultural importance are likely to occur in the preserve but have not been identified (NPS 2006).

Big Thicket is thought to have been generally avoided by immigrants and settlers during the Spanish and Mexican colonial periods. Although Lorenzo de Zavala is credited as the first to lay claim to Big Thicket as part of a land grant he received in 1829 from the Mexican government, no Mexican colonists arrived in the area at the time (*The Handbook of Texas Online*). However, beginning in the 1830s and continuing to the early 20th century, Anglo-American settlers immigrated to the area. These early settlers were commonly self-sufficient, small-scale farmers and stock raisers from the upper south who established homesteads in or near Big Thicket and used the resources primarily for subsistence activities such as hunting and fishing. During the historic period, large-scale farming and ranching activities were impeded by Big Thicket's dense vegetation and low-lying wetland areas that were unsuitable for agriculture and impractical to clear. Places having potential ethnographic importance to the descendants of these settlers include the Blue Hole (water source) in the Neches Bottom and Jack Gore Baygall

unit, and the Hooks Bear Camp and the Lance Rosier birthplace site in the Lance Rosier unit (NPS 2006).

To gain greater understanding of the preserve's ethnographic resources and culturally associated peoples the preserve staff would, as funding permits, conduct appropriate research and investigations (e.g., ethnographic overviews and assessments, traditional use studies, ethnographic landscape studies, oral histories) that inform NPS management and decision making. NPS staff would continue to consult on a government-to-government basis with the Alabama-Coushatta Tribe of Texas and other culturally associated tribes as appropriate to assist the identification and protection of ethnographic resources within the preserve that retain traditional tribal importance. In accordance with NPS *Management Policies 2006*, the American Indian Religious Freedom Act, and other laws and policies, tribal access would be maintained to places in the preserve having traditional religious, ceremonial, and cultural significance. The National Park Service would not disclose the location and character of sites and resources to the general public if disclosure would

result in significant invasion of privacy, risk harm to historic resources, or impede traditional religious use and access by tribal members.

Among the anticipated consequences of climate change are the heightened intensity and frequency of severe storms and hurricanes. These factors present potential threats to ethnographic resources in the preserve as storms contribute to rising water levels, perhaps inundating sites in low-lying areas, or along streams, rivers, and lake shores. Intensified storm-related flood waters may also accelerate soil erosion leading to the disturbance and loss of vulnerable sites and resources. Associated tribes and other groups with cultural associations to the preserve may also encounter increased difficulties accessing places of cultural importance because of downed trees, washed out trails and roads, and other obstacles. In consultation with traditionally associated tribes and other groups, the preserve would strategize and implement site protection, stabilization, and other measures to minimize or mitigate the potential impacts presented by these resource and access threats.

VISITOR USE AND EXPERIENCE

OVERVIEW

Congress provided direction in section 4(b) of the enabling legislation, to limit the construction of roads, vehicular campgrounds, employee housing, and other public and administrative facilities in the interest of maintaining the ecological integrity of the preserve. Therefore, development has followed a conservative approach, with careful siting and sustainable design being applied, when development is warranted, to retain natural qualities and processes.

VISITOR USE ACTIVITIES

Recreational use of the preserve is primarily day use visits—comprised of approximately 20% Village Creek paddlers, 15% education groups, 10% visitor center users, 7% trail users, and 5% hunters. The remaining 43% of recreational visits is distributed among the remaining units of the preserve, with very little overnight use. In 2010, the National Park Service began managing and counting the use of the popular Village Creek corridor unit, which brings the average annual preserve visitation up to 139,105. This reflects a 20% increase attributed to water recreation visits on Village Creek. The Big Thicket National Preserve visitor center is centrally located and easily accessible from the state highway. The preserve film, exhibits, and book store attract some visitors; however, it is not necessary to come to the visitor center before going to any of the preserve units, trails, or waterways. Visitors who spend time at the visitor center make up roughly 10% of total visitation. About 7% of preserve visitors hike a trail. A robust education program accounts for up to 15% of total visitation on average. Big Thicket National Preserve has a cultural history of hunting and managing a hunting program is part of the enabling legislation. Zones in six units totaling 47,400 acres are

open to hunting with 2,200 permits issued annually; about 5% of recreation visits are hunters.

The U.S. Army Corps of Engineers, Lower Neches Valley Authority, and Texas Department of Transportation provide access to boat ramps and launches through or on their respective agencies property. These agencies construct and maintain boat ramps, canoe launch sites, and parking areas that provide preserve visitors access to preserve water corridor units. The preserve provides information boards and trash facilities at these locations, and leads interpretative and educational programs from these sites.

Some current uses are illegal within the preserve:

All houseboats (generically speaking—a boat that is designed and equipped for use as a dwelling) should comply with laws and regulations including proof of registration, sanitation, camping as articulated in the Superintendent's Compendium, and unattended property regulations. The majority of houseboats found within the waters of the preserve are not commercially produced and most are not registered as vessels. Additionally, these houseboats are frequently lashed to trees on a permanent basis, which causes damage to preserve resources.

VISITOR USE AREAS

Each unit of the preserve is different. These differences range from the type of resources in the unit (e.g., floodplain forests to cypress sloughs to savannas to mixed hardwood and pine forests) to visitor opportunities. Trails in the preserve have been developed in the units take advantage of this uniqueness and expose trail users to these different environments.

The following section lists the recreational attributes found in each unit of the preserve. These areas include day use areas, hiking trails, canoe routes, and birding hot-spots.

Day Use Areas

There are 26 day use areas in the following 10 units:

- Beaumont unit
- Beech Creek unit
- Big Sandy Creek unit
- Hickory Creek Savannah unit
- Lance Rosier unit
- Menard Creek corridor unit
- Neches Bottom and Jack Gore Baygall unit
- Turkey Creek unit
- Upper Neches River corridor unit
- Village Creek corridor unit

Hiking Trails

Currently, the preserve maintains about 45 miles of designated trails within five units of the preserve; the majority, over 75%, of the designated trails are in only two of the 15 units. Four of the preserve's nonwater corridor units do not have any trails; one of which is a new unit and another the largest unit in the preserve (Lance Rosier unit). The current designated trails in the preserve are greatly geographically dispersed and the nearby large metropolitan centers, such as Houston and Beaumont and their surrounding regions, offer relatively few places to hike.

There are currently nine hiking trails in the following five units:

- **Beech Creek Unit.** One trail; Beech Woods Trail is a 1.0-mile loop.
- **Big Sandy Creek Unit.** Three trails; Woodland Trail has three distance options of 3.3, 4.5 and 5.4 miles; the

Beaver Slide Trail is 1.5 miles long; and Big Sandy Trail is a multimode loop trail that is 18.0 miles long for horseback riding, hiking, and off-road bicycle riding.

- **Hickory Creek Savannah Unit.** One trail; Sundew Trail has a total of 1.2 miles, with an inner loop 0.4 mile and an outer loop of 1.0 mile. The inner loop is designed for full accessibility.
- **Menard Creek Unit.** One trail; Birdwatcher's Trail is 0.4 mile one way and is at the confluence of Menard Creek and the Trinity River.
- **Turkey Creek Unit.** Three trails; Turkey Creek Trail is 15.0 miles long with three trailheads; Pitcher Plant Trail is a 0.5 mile fully accessible trail that connects with Turkey Creek; and the Kirby Nature Trail, a two loop trail, with an inner loop that is 1.7 miles long and an outer loop that is 2.4 miles long. Fishing and canoeing occurs on Turkey and Village Creeks.

Canoe Routes

There are three designated paddling routes

- Cook's Lake
- Franklin Lake to Johns Lake
- Village Creek (designated Texas paddling trail)

Marked canoe routes include Franklin Lake to Johns Lake (about 2 miles one way); and Cook's Lake (about 3 miles from the confluence to Cook's lake and return). Scatterman Lake Loop is a proposed five-mile loop from the Salt Water Barrier and return.

Most of the creeks and rivers flowing through the preserve are navigable either year-round, seasonally, or after a significant rainfall. Other canoeable waterways include

- Some sections of waterways, such as the 40-mile stretch of the Neches River through the Neches Bottom and Jack Gore Baygall unit, are nationally publicized for their wild character.
- Aside from the Neches River, Village Creek is also widely publicized as one of the finest canoeing streams in east Texas.
- The lesser known Turkey Creek through the Turkey Creek unit offers an outstanding experience for those seeking to paddle through riparian forests of hardwood and pine.
- Little Pine Island Bayou through the Lance Rosier unit is normally unnavigable, but after intense rainfall, it floods the surrounding forest and becomes canoeable.
- For the most intrepid canoeists, the Little Pine Island Bayou offers a challenging two-day journey through one of the least traveled sections of the preserve.

Many other canoeing and boating possibilities exist in secondary channels, sloughs, and oxbow lakes throughout the preserve.

Birding

Bird migrations through the preserve peak between late March and early May, and again in October and November. The more sought after birds for bird watchers are the red-cockaded woodpecker, the brown-headed nuthatch, and the Bachman's sparrow. The last reported sighting of an ivory-billed woodpecker in the preserve was in May 1971. The ivory-billed woodpecker is now officially listed as extinct. Dense vegetation can make birding for migratory songbirds difficult in much of the preserve. The eight birding hot spots in the preserve include the following:

- **Collin's Pond.** Collin's Pond, located at the head of the Woodlands Trail in the Big Sandy Creek unit, is good

habitat for a variety of song birds and waterfowl—thrushes, warbler, herons, and egrets.

- **Birdwatcher's Trail.** Panoramic views of expansive sandbars from high bluffs on the east bank of the Trinity River offer good birding opportunities for shorebirds, raptors, and migrant song birds.
- **Teel House Road.** This road runs through Lower Slope Hardwood Pine Forest in the Lance Rosier unit. Neotropical migrants can be seen here in the spring and fall.
- **Pitcher Plant Trail.** This loop trail runs through wetland pine savanna and upland pine habitats, and has good access to floodplain communities. Woodpeckers, nuthatches, and other neotropical migrants can be seen here in the spring a fall.
- **Sundew Trail.** This is an open and park-like wetland savanna, and it is good habitat for pine warblers and brown-headed nuthatches.
- **Kirby Nature Trail.** This is a series of loop trails that go through slope forest, baygall, floodplain, cypress slough and stream bank communities with good access to arid sandhill communities, too. This trail is good for warblers, vireos, woodpeckers and resident song birds.
- **McQueen's Landing.** This is a canoe and boat launch ramp below the dam at B.A. Steinhagen Lake. It is a viewing area for bald eagles in the winter.
- **Cook's Lake.** This is a backwater area off of Pine Island Bayou, not far from its confluence with the Neches River. It is a very scenic area to go birding by canoe. The swamp forest and floodplain forest communities in Cook's Lake provide good habitat for herons, egrets, raptors, and swallows.

Roads

The preserve maintains 9.5 miles of dirt and gravel roadways. By virtue of the preserve's configuration, visitors must travel over a road and highway system consisting of farm-to-market roads, county roads (both improved and unimproved), and state and U.S. highways to get to the preserve. For visitors from outside the region seeking the location of a specific unit, or a specific attraction in a unit, the effort can easily become a navigational challenge.

Hunting and Trapping

The enabling legislation for Big Thicket National Preserve, while mandating that the preserve be administered in a manner that would assure in perpetuity the natural and ecological integrity, also directed the National Park Service to provide for continued traditional recreational uses of the preserve, including hunting and trapping. The act further directed that these activities would be "conducted in accordance with applicable laws of the United States and the State of Texas." The National Park Service is allowed to and does "designate zones where and periods when, no hunting, fishing, trapping or entry may be permitted for reasons of public safety, administration, floral and faunal protection, and management, or public use and enjoyment." The act also directed that, "except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having jurisdiction over hunting, fishing, and trapping activities."

The consumptive use of resources such as hunting and trapping is generally prohibited in NPS-administered areas. In order to implement and guide the consumptive uses authorized in the enabling legislation, the National Park Service determined that it was necessary to develop special regulations. In 1979, special regulations were developed and implemented in 36 CFR 7.85 to address

hunting and trapping activities specifically in the preserve.

Since 1979, approximately 2,000 permits have been issued each year for hunting, and an annual average of 12 permits for trapping.

Hunters are presently issued permits, on a first-come, first-served basis at annual sign-ups held during July and August. Permitted hunters may hunt in one of the following open units: Big Sandy unit, Beech Creek unit, Lance Rosier unit, portions of the Beaumont unit, and areas in the Neches Bottom and Jack Gore Baygall unit. A total of 47,400 acres in these units are open to hunting. Hunting season generally begins October 1 and continues through January 15 each year. Texas State seasons and bag limits are followed during this period. While applying general Texas hunting regulations, the superintendent applies additional restrictions to hunters in order to protect preserve resources and provide for additional hunter and visitor safety such as not allowing seismic surveys to take place in hunting areas during the preserve's hunting season. Hunting areas are not generally closed to public use during hunting season, except that backcountry camping is not permitted in areas open to hunting during hunting season. During the 2008–2009 season (October to January), 4,580 trips were made by hunters into hunting areas. Hunters harvested 185 deer, 1,912 squirrels, 168 hogs, 81 rabbits, and 35 waterfowl.

Trapping is permitted in the Lance Rosier unit, Beaumont unit, and areas in the Neches Bottom and Jack Gore Baygall unit, a total of 35,000 acres. As with hunters, Texas State trapping regulations apply and the superintendent has implemented additional restrictions to protect preserve resources and provide for visitor safety. During the 2008–2009 season (December to January), there were 80 trap nights with 141 raccoon, 31 opossum, and one otter harvested. No nutria, mink, or bobcat were harvested.

No hunting is permitted on lands that have been added to the preserve since 1993.

PRESERVE ADMINISTRATIVE AREAS

Preserve administrative developments include:

- Headquarters and Maintenance Facility
- Big Thicket Visitor Center
- Wildland Fire Management Facility
- Beaumont Visitor Contact Station
- Woodville Ranger Office
- Seale House
- Lily Estate House
- Lily Bunkhouse
- Ranch House
- Saratoga Field Research Station
- Big Sandy Radio Tower
- Staley Cabin

The Big Thicket visitor center serves as the primary contact point for all preserve visitors and is open seven days per week, year-round. The Staley Cabin grounds are the focal point for most environmental educational programs conducted by preserve staff due to the proximity of the Kirby Nature Trail (Turkey Creek unit). A small book sales area, brochures, limited exhibits, video tape viewing, orientation, outside restrooms, picnic tables and nearby Kirby Nature and Turkey Creek trailheads are found at this location. Average visitation at the visitor center for 1990–2000 is 10,843 persons.

VISITOR USE STATISTICS

Annual visitation peaked in 1994, with 127,313 visitors. From 1997–2000, annual visitation steadily declined and started to increase again in 2001. Visitation dropped again in 2005 and 2006 but has since been

generally increasing. The increase may be due to two reasons: (1) increased visitation, or (2) improved methods of counting visitation. Over the last five years (2006–2010), the NPS Public Use Statistics Office numbers show that an average of 104,209 visitors come to the preserve each year (table 21). Because visitation counts are limited and are largely based on visitor center counts, these data may underestimate the number of annual visitors to the preserve. For a more detailed discussion of annual visitation counts please see the discussion in the socioeconomics section.

While majority of visitor use is regional in nature, the visitor registration log at the visitor center records visitors from all 50 states and at least 20 countries annually. It is felt that Big Thicket's biosphere reserve designation may interest international visitors.

Backcountry camping is generally a low use in the preserve, but is conducted in only designated areas. There are no developed or drive-in campgrounds.

SEASONAL VISITOR USE PATTERNS

Visitor use patterns are predictable during the spring and fall seasons.

Spring is the busiest visitor use period. Early spring travelers, mostly bird watchers from a majority of states and several countries, converge on the region and preserve. In late spring, school groups participating in preserve educational programs arrive daily in groups of 100 for several weeks. Weekend use increases as visitors from the region use trails, and go fishing and boating.

Summer use is light because of high temperatures and humidity. Users are families from outside the region on traditional summer family vacations visiting several attractions in a two- or three-week period. Local limited visitation continues with fishing and boating activities.

Fall visitor use is moderate to high consisting of late seasonal travelers and school groups. Depending on weather conditions, regional visitor use can be high as people are enjoying outdoor recreation during cooler temperatures and lower humidity.

Winter use is light, with seasonal travelers consisting of retirees and some regional visitor use. During hunting season, from October through early January, up to 2,300 permits are issued for hunting in select units. Hunting limits other visitor uses, such as hiking, horseback riding, and off-road bicycling, due to safety issues and concerns.

Big Thicket National Preserve provides public access to natural areas in an area with rapidly growing population and sprawling development pattern. The preserve provides an array of educational and visitor experiences compatible with the preservation of the natural setting and resources. The National Park Service has a presence in outlying communities, involvement with civic organizations and activities, and partnerships with volunteer groups.

Programs currently provided include

- curriculum-based education programs; about 25,000 contacts in fiscal year (FY) 2011
- formal and informal interpretive programs; over 2,500 contacts in FY 2011
- junior ranger programs; 337 new junior rangers in FY 2011
- community outreach programs; over 3,000 contacts in FY 2011
- citizen science programs in partnership with the Thicket of

Diversity All Taxa Biodiversity Inventory; 320 contacts in FY 2011

- teacher workshops; 200 contacts in FY 2011

The following types of facilities, materials, or activities are provided:

- visitor center, exhibits, and film; over 10,000 visits in FY 2011
- twenty-two preserve publications; 25,000 distributed in FY 2011
- nine frontcountry and primitive hiking trails; two have self-guided interpretation and only a few wayside interpretive panels exist
- multiuse trail to permit horse use and bicycles in the Big Sandy unit
- nonmotorized paddle trails in Village Creek and parts of the Beaumont unit
- accessible hunting trail

Climate Change and its Effects on Visitor Use and Experience

Because humans are so adaptable, climate change may have limited effects on total visitation at the preserve. However, in the long term, it could alter the timing of visits and activities at the preserve. As discussed above, most visitation to the preserve occurs in the spring when temperatures are mild and birding activities are most frequent. Visitor numbers currently drop in the summer when temperatures are warmest. Higher temperatures and lower river levels associated with climate change could shift more visitation toward cooler seasons and nonwater-based activities.

SOCIOECONOMICS

OVERVIEW

The Big Thicket National Preserve lies within seven counties (Hardin, Jasper, Jefferson, Liberty, Orange, Polk, and Tyler) in rural southeast Texas. These seven counties would form the primary focus area for the socioeconomic environment. These counties and the communities within them are most likely to be influenced by actions taken on the preserve. The region's land area consists of 2,025 square miles, and the preserve encompasses a total of 108,208 acres in 15 units across the region.

Ten incorporated cities and three unincorporated towns are within 5 miles of the Big Thicket National Preserve boundary. Due primarily to the rural nature of the area and general lack of growth, data, and information collection was focused on the counties. In the state of Texas, unincorporated, or "general law," cities and towns as well as counties cannot regulate land use activities through zoning or other regulations, nor can they annex additional land without the consent of the landowner(s). Only three communities have populations large enough ("Home Rule" cities) to engage in zoning, including Beaumont, Lumberton, and Silsbee.

The principal city in the southeast Texas Region is Beaumont, which is on the Gulf Coast approximately 110 miles east of Houston. About 20% of the region's population lives in the city of Beaumont. The Beaumont-Port Arthur Metropolitan Statistical Area (MSA) is composed of Hardin, Jefferson and Orange counties and includes 70% of the study area population. Given the large influence of the Beaumont-Port Arthur MSA on the largely rural region, socioeconomic data and impacts for the MSA would be provided where available.

Other smaller incorporated cities in the region are Silsbee, Wildwood, Kountze, Jasper, Lumberton, Saratoga, Woodville, and Sour Lake. These towns are relatively small, but serve as gateway communities for the preserve.

The Alabama-Coushatta Tribe of Texas Reservation borders the Big Sandy Creek unit of the preserve to the north. Given the proximity of the reservation to the preserve, impacts from actions proposed in the draft general management plan on the reservations and its inhabitants would be discussed whenever data is available.

The southeast Texas region (seven counties) is the primary geographic unit of analysis for this socioeconomic impact study, and when data permits, specific impacts to the Beaumont-Port Arthur MSA, and the Alabama-Coushatta Tribe of Texas Reservation, which is adjacent to the preserve.

ECONOMIC HISTORY

By 1820, Louisiana cattlemen drove cattle herds across the Sabine and Neches rivers to graze on Gulf Coast saltgrasses in the southern part of the region. The northern counties included small farms and timber operations. In the 1840s, shingle manufacture and timber exports complemented spinning, leatherwork, and soap and candle making. Shipbuilding, which grew from the lumber industry before 1850, took place next to the lumber mills in Sabine Pass and Beaumont. Steam-driven industry developed in 1846, and the first steam sawmill in Beaumont operated in 1856 (Kleiner 2011).

Commercial timbering began in the Big Thicket region in the 1850s, but progress was slow as logs had to be floated down the

Neches River to sawmills in Beaumont. Large timber operations developed once the railroads arrived in the 1880s. Railroads meant logs could be shipped faster, increasing profits, and expanding operations. By World War I, the Big Thicket region had four major railroads with 400 miles of track, along with many tram lines used to haul timber from the cutting site to the larger railroad (Anderson 2004).

The cutting was extensive, characterized by one writer as a “cut and get out” policy. The land was heavily taxed, so the incentive was to move as quickly as possible over the land. Competition from multiple companies, and a sense that the forest was infinite left little time and money for reforestation.

However, timber was not the only resource attracting attention to Big Thicket. The first oil well in Texas was drilled in 1869 in Saratoga. But early drilling was crude and oil spills were frequent, damaging a portion of Big Thicket by killing trees and polluting waterways. By the end of the oil boom, three oil rushes had enveloped the region from Saratoga, Sour Lake, and Batson. More than 231 million barrels of oil had been pumped from these sites alone. Adding the oil production from the sawmill towns of Silsbee, Votow, Buna, and Village Mills increases the figure by an additional 180 million barrels. All told, more than 32,000 acres within Big Thicket were oil-producing (Anderson 2004). The oil industry expanded after World War II to include refineries and chemical plants, largely along coastal areas.

DEMOGRAPHICS

Units of Big Thicket National Preserve are in Hardin, Jasper, Jefferson, Liberty, Orange, Polk, and Tyler counties, which would be the main focus of demographics for this general management plan.

Population: Past, Current, and Projected

Changes in the size of the region’s population have been erratic over the past few decades. The 1940, 1950, and 1960 census counts identified steady population growth for southeast Texas. The 1970 census showed the two largest cities (Beaumont and Port Arthur) losing population. Additionally, the overall growth in the population of the most populous county (Jefferson) was slight. However, by the late 1970s the region once again began to show overall growth.

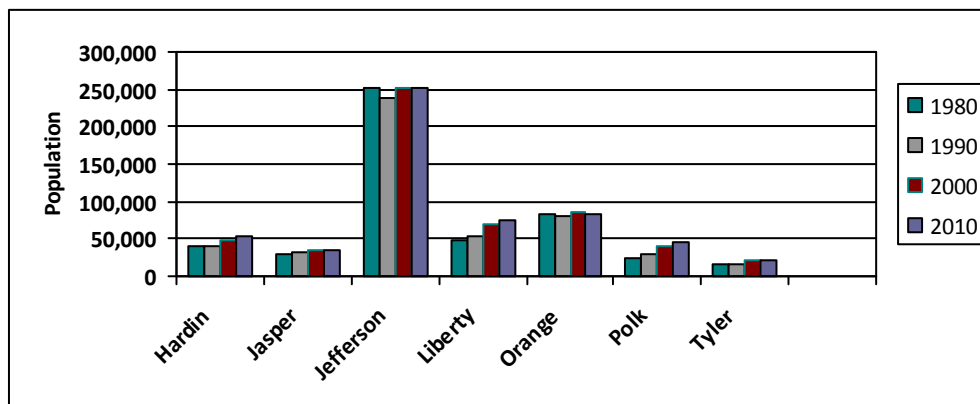
The 1980 census count showed the region’s population had grown to an all-time high of 493,996. Further, the early 1980s saw an expanding local economy based on the petro-chemical industry, with the promise of continued economic and population growth to come. However, the decade’s early promise of an economic boom changed to an economic bust by 1985, in conjunction with the international, national, and state downturn in the oil industry.

In the 1980s, falling oil prices and the savings and loan crisis negatively impacted the area and resulted in historically high unemployment rates due to the loss of some 17,000 high-paying manufacturing jobs and the resulting negative spin-off effects. In June 1986, the region’s unemployment rate stood at an all-time high of 18.3%. As jobs left the region, there was also a corresponding loss of population. The 1990 census count showed a population reduction to 492,387 residents. The Beaumont and Port Arthur MSA was the only urban center in Texas to lose population.

The economic and employment situation noted above has impacted the area through migration patterns as well. The U.S. Census Bureau reports that the population of the seven counties in the region in 2000 was 552,852. In 2007, the population was estimated by the American Communities

Survey to have dropped by approximately 2,122 to 550,730—a decrease of 0.4% (U.S. Census 2000, 2007). The Texas state demographer indicates that Jasper, Jefferson, Orange, and Tyler counties all had net out-migration from 2000 to 2007. The negative growth rate for the region contrasts with the 14.6% increase in population for

the state of Texas in the same period (Texas Demographer's Office 2009). However, by the 2010 census, overall population had rebounded and increased to 567,277—an increase of 2.6 % from 2000, which is attributed to increases in oil and gas and manufacturing employment (figure 7).



Source: 2010 U.S. Census Bureau & Texas State Demographer's Office

FIGURE 7: POPULATION TRENDS IN SOUTHEAST TEXAS REGION

Much of the study area was affected by hurricanes Katrina and Rita in 2005, which may have had a negative impact on population during the 2000 to 2007 period. According to the Texas state demographer's office, the region is expected to grow in population in the coming years. The demographer's office projects that it would increase to 636,842 in 2020, and 673,237 in the year 2030. Based on these estimates, the compound annual growth rate (CAGR) of the population from 2000 to 2030 is expected to be 65%, which is essentially the same as the projected CAGR for the state as a whole (Texas Demographer's Office 2008).

Racial and Ethnic Composition

The southeast Texas region described above was 68.9% white, 20.7% black or African American, and about 0.6% American Indian and 1.9% Asian, 6.2% some other race, and

1.8% more than one race, according to the 2010 census.

Age Distribution of Population

Based on 2007 American Communities Survey data, the southeast Texas region population is somewhat more heavily distributed among the lower age groups. This creates a unique opportunity for the preserve to connect with youth (and directly and indirectly to their families) through formal and informal education. Table 18 displays the breakdown of the southeast Texas region's population by age group. Table 19 displays the breakdown of Beaumont-Port Arthur MSA population by age group.

**TABLE 18: AGE DISTRIBUTION IN
SOUTHEAST TEXAS REGION**

Age Cohort	Total	Percent of 2007 Population
9 years and under	77,184	14.0%
10 to 19 years	83,548	15.1%
20 to 34 years	108,516	19.6%
35 to 44 years	86,543	15.7%
45 to 54 years	72,282	13.1%
55 to 64 years	50,108	9.1%
65 to 74 years	41,208	7.5%
75 to 84 years	25,326	4.6%
84 years and over	8,137	1.5%

Source: U.S. Census Bureau, ACS 2007

Beaumont-Port Arthur MSA Demographics and Economics

As of 2009, there were 377,001 people, 144,333 households, and 99,964 families within the MSA. The racial makeup of the MSA was 66.2% White, 25.0% African American, 0.4% American Indian, 2.1% Asian, 4.9% from other races, and 1.3% from two or more races. Hispanic or Latino of any race comprised 8.01% of the population. The median income for a household in the MSA was \$43,744, and the median income for a family was \$53,922. The per capita income for the MSA was \$22,181.

Among people at least five years old living in the Beaumont-Port Arthur, Texas, metropolitan area in 2005–2009, 12% spoke a language other than English at home. Of those speaking a language other than English at home, 72% spoke Spanish, and 28% spoke some other language; 42% reported that they did not speak English very well (U.S. Census 2000, 2009). This moderate proportion of non-English speakers

provides an opportunity for the preserve staff to reach the non-English-speaking population and develop appropriate programming.

**TABLE 19. AGE DISTRIBUTION IN
BEAUMONT-PORT ARTHUR MSA**

Age Cohort	Total	Percent of 2009 Population
Under 9 years	51,744	13.80%
10 to 14 years	26,130	6.90%
15 to 19 years	27,043	7.20%
20 to 24 years	27,194	7.20%
25 to 34 years	49,746	13.20%
35 to 44 years	49,713	13.20%
45 to 54 years	55,824	14.80%
55 to 59 years	22,371	5.90%
60 to 64 years	17,514	4.60%
65 to 74 years	25,334	6.70%
75 to 84 years	18,134	4.80%
85 years and over	6,254	1.70%

Source: U.S. Census Bureau, American Community Studies 2009

Alabama-Coushatta Tribe of Texas Reservation Demographics

Population: Past, Current, and Projected. The Alabama-Coushatta Tribe of Texas Reservation is comprised of 4,593.7-acre on U.S. Highway 190, seventeen miles east of Livingston in Polk County. The total population of the Alabama-Coushatta Tribe of Texas Reservation was estimated at 832 in 2009, per the U.S. Census Bureau.

Among people at least five years old living on the Alabama-Coushatta Tribe of Texas Reservation and on Off-Reservation Trust Land in Texas in 2005-2009, 34% spoke a language other than English at home. About 10% spoke Spanish, about 2% spoke Asian-Pacific Islander languages, and 23% spoke some other language; 28% reported that they did not speak English “very well” (U.S. Census 2000, 2009). The Alabama-Coushatta language is a Muskogean dialect. This relatively high proportion of non-English speakers provides a unique opportunity and challenge for the preserve staff to reach this population and develop appropriate programming.

Age Distribution of Population. Based on American Communities Survey, the median age was 24 years. Forty-two percent of the population was 19 years or younger; 11% was 65 years and older (see table 20). The largest population concentration lies in the 9 years and under age category. Similar to the overall age distribution, the overall young age of the population creates an opportunity for the preserve to connect with youth and their families through formal and informal education.

TABLE 20. AGE DISTRIBUTION OF ALABAMA-COUSHATTA TRIBE OF TEXAS RESERVATION

Age Cohort	2009	Percentage of 2009 Population
9 years and under	230	27.6%
10–19 years	122	14.6%
20–34 years	188	22.6%
35–44 years	101	12.1%
45–54 years	70	8.4%
55–64 years	45	3.6%
65–74 years	30	7.5%
75–84 years	25	3.0%
85 years and over	4	0.5%

Source: U.S. Census Bureau, American Community Studies 2009

ECONOMY AND EMPLOYMENT

According to census estimates, in 2007 the labor force of the seven counties in the study area consisted of 241,653 workers. Of these workers, 19,327 were unemployed, for an unemployment rate of 8.0%. The unemployment rate in Texas during the same time was 6.9%. Figure 8 compares the unemployment rates of the Beaumont-Port Arthur MSA and the state of Texas from 1999 to 2008. The figure reveals fluctuating unemployment rates for the state and MSA, with the Beaumont-Port Arthur MSA unemployment consistently several points higher than the state average. The MSA unemployment increased from 2001 to 2003 during a period of national recession, but fell consistently every year after 2003, reaching a low of 5.3% in 2007 before trending upward again following state and national trends. The unemployment rate in the first half of 2011 exceeded 10% for the Beaumont-Port Arthur MSA and 8% for the state of Texas.

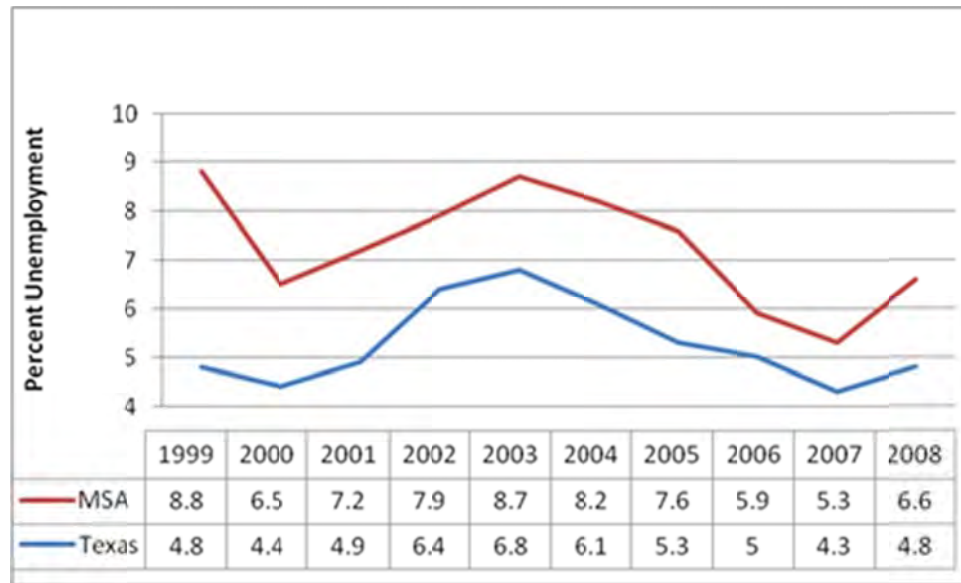


FIGURE 8. UNEMPLOYMENT RATE IN BEAUMONT-PORT ARTHUR MSA

HISTORICAL VISITOR USE AND ECONOMIC IMPACT

Visitation Data

TABLE 21. RECREATION VISITS, 1995–2008

Year	Recreation Visits	Percent Change
2010	140,489	39.8%
2009	100,509	7.34%
2008	93,634	–0.44%
2007	94,048	4.60%
2006	89,914	–7.37%
2005	97,071	–10.49%
2004	108,452	8.81%
2003	99,672	–3.60%
2002	103,398	35.72%
2001	76,186	18.13%
2000	64,493	11.56%
1999	57,811	–17.26%
1998	69,872	–11.36%
1997	78,827	–31.27%

TABLE 21. RECREATION VISITS, 1995–2008

Year	Recreation Visits	Percent Change
1996	114,694	–9.24%
1995	126,376	

Source: www.nature.nps.gov (NPS 2009b)

Table 21 shows that the number of recreation visits to the preserve has varied considerably from just over 57,000 in 1999 to 140,000 in 2010, with significant variation. The average for the time range is about 91,000 visitors annually and about 102,000 for the last six years. Visitation in 2005 and 2006 was impacted by Hurricane Rita. The July to December season tends to represent higher levels of visitation. Given there is not a single entrance to the preserve, exact counts of visitation are very difficult. The higher number in 2010 reflects the addition of counting at Village Creek, increased school groups, increase in hunter counts and revised visitation formulas based on observation, registration, outfitters, and counters.

This compares to Texas state park visitation levels for 2007 of 183,569 for Lake Livingston State Park, 33,475 for Village Creek State Park, and 30,542 for Martin Dies, Jr. State Park (TPWD 2011). Visitation at Trinity National Wildlife Refuge is approximately 22,000 visitor use days per year. Of these, 700 came to hunt, 18,000 (85%) came for fishing or crabbing, 1,000 came to observe wildlife, 150 came for wildlife photography, 1,700 participated in interpretive programs, and 450 came with a boat (Trinity NWF 2010). Totals may exceed 100%, because some visitors participate in more than one activity. Visitation levels specific to Angelina National Forest are not available.

Visitor Activities

Based on a 1998 study through Stephen F. Austin University, the most common recreational activities within the preserve were hiking (65%) and visiting the visitor center (67%). Other activities with high participation were picnicking (34%), bird-watching (36%), nature study (31%), and auto touring (22%). Lower levels of participation were reported for backpacking or camping (18%), swimming (16%), fishing (12%), paddling (11%), and viewing wildlife other than birds. Many visitors drive through the preserve in order to reach another destination, so signs to indicate when visitors enter and leave the preserve become important. Some visitors participated in other forms of outdoor recreation including motorboating (97%), ranger-led programs (7%), hunting (7%), bicycle riding (6%), and horseback riding (3%). The percentages reported exceed 100% because visitors have participated in more than one of these activities (Gulley 1999).

Length of Stay

According to the results of the 2009 visitor information survey, approximately 97% of preserve visitors spent less than a day at the

preserve. It is estimated the average visitor spends about 4 hours at the preserve.

Visitor Spending and Economic Impact

The 2008 Money Generation Model (MGM) estimates that the 93,634 visitors to Big Thicket National Preserve generated \$6,485,000 in spending, of which \$6,162,000 was nonlocal spending. The nonlocal spending is estimated to have generated 124 jobs in the area with \$2,461,000 in labor income (Stynes 2009).

Park Employment and Economic Impact

In 2010, there were 23 full-time positions and 6.7 FTE part-time positions at Big Thicket National Preserve with a payroll of \$2.776 million. The Money Generation Model (MGM) estimates that these 30 jobs resulted in an additional 45 jobs with a resulting income of \$4.331 million. Further, there are approximately 10 FTE fire positions at Big Thicket National Preserve, with additional salary not included above.

Impacts of payroll for each park unit were estimated by applying economic multipliers to wage and salary data to capture the induced effects of NPS employee spending on local economies. As with the Money Generation Model, distinct multipliers were used for parks in rural areas, parks in or near small cities, and parks in larger metropolitan regions. The overall employment multiplier for NPS jobs is 1.5. For every two NPS jobs, another job is supported through the induced effects of employee spending in the local region. There are additional local economic effects from NPS purchases of goods and services from local suppliers and from construction activity. These impacts were not estimated.

Payment in Lieu of Taxes

The National Park Service contributed \$100,500 payment in lieu of taxes in fiscal year 2010 for the seven counties associated with Big Thicket National Preserve. Overall federal payment in lieu of taxes for all federal lands in these seven counties was in excess of \$175,000 for 2010 (USDI 2011).

LAND USE

Regional Changes in Land Use

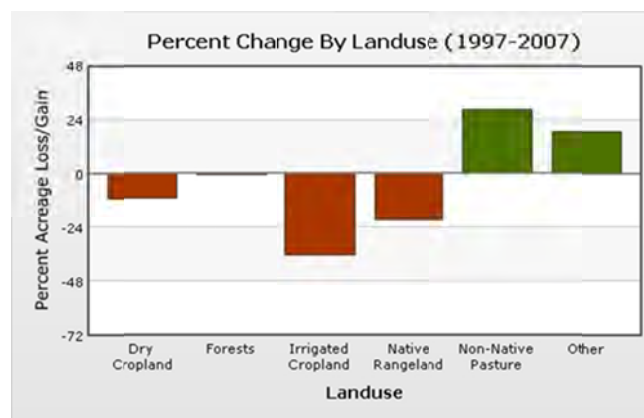
According to the Texas Forest Service, nearly three quarters of the land in southeast Texas is wooded, "... principally pine and pine-hardwood. Some of the forest acreage is owned by large corporations, and lumber and pulpwood are the chief products. Cleared areas are used mostly for pasture, but some are used for crops. Rice, grain sorghum, corn, and soybeans are commonly grown. Many small subdivisions are being developed throughout the area" (TFS 2004).

More broadly within the state of Texas, forests contribute to the economy and the environment. The state of Texas contains 26 million acres of forestland, primarily in the eastern third of the state. This forestland provides the state with its third most valuable agricultural commodity, creating

more than 91,000 jobs with more than \$2.3 billion in wages and salaries. In addition, forests in Texas provide nontimber benefits such as clean water, habitats for diverse wildlife, eco-tourism, historical preservation, and carbon sequestration abilities. For these reasons, it is vitally important to protect forestland in Texas (TFS 2004).

Private nonindustrial landowners own approximately 63% of the forestland in Texas, while the forest industry accounts for about 16% of forest ownership in Texas. These landowners face increasing incentives to utilize their land for nonforest purposes due to population growth and a rising demand for nonagriculturally developed land. Because of these pressures, forestland in Texas is becoming increasingly fragmented and thus the benefits of forests are being negated. Therefore, Texas displays a need for a program that fosters a long-term commitment to sustainable forest management.

The Texas A & M Institute for Renewable Resources tracks agricultural land use trends over time. The seven counties of the study area show a decrease in croplands, native rangelands and forests, and an increase in nonnative pasture and other uses for the decade from 1997 to 2007 as shown in the figure 9.



Source: Texas Land Trends, TAMU

FIGURE 9. LAND USE TRENDS FOR STUDY AREA

OPERATIONS AND FACILITIES

OVERVIEW

NPS operations at Big Thicket National Preserve are organized into five personnel divisions: administration, facility management, resources management, resources and visitor protection, and resource education. The approved FTE staff ceiling is presently at 38.8 positions, although current staff numbers are well below the ceiling. The preserve management has requested additional base funding to restore lapsed positions. Inadequate staffing has hindered the preserve staff's ability to effectively carry out necessary resource and visitor use management activities. This limitation is particularly challenging in consideration of the logistical difficulties faced by preserve staff in managing multiple, noncontiguous, and widely dispersed land and water units.

Hurricanes Rita (2005) and Ike (2007) caused extensive damage to the combined administrative and visitor contact headquarters facility in Beaumont, which is leased through the U.S. General Services Administration. As a consequence, the building was unusable for ongoing operations and the preserve's existing maintenance complex (about 7 miles north of Kountze along U.S. Route 69 in Hardin County) was selected as the new location for the headquarters complex. The headquarters building, completed in 2009, provides consolidated office and administrative space for the various divisions.

The following briefly summarizes the responsibilities of the preserve's divisions and associated facilities:

ADMINISTRATION

The administration division oversees internal personnel matters, provides purchasing and

contracting, manages the preserve budget, manages correspondence, and oversees information technology.

FACILITY MANAGEMENT

The facility management division oversees construction and repair work; maintains vehicles, boats, and other equipment; administers service contracts; designs and constructs new facilities; provides waste water and potable water testing; and responds to emergency repairs as needed. The maintenance garage, shops, and storage facilities are at the headquarters area.

RESOURCES MANAGEMENT DIVISION

The resources management division oversees issues regarding natural and cultural resources, conducts research or administer contracts to conduct research, oversees the oil and gas management program, works with cooperators and researchers (e.g., the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program), and manages the preserve fire program.

In 2008, a permanent fire management facility was constructed on a 6-acre parcel near Woodville, Texas. The facility serves as a base of operations for the preserve's wildland fire response teams, for prescribed fires undertaken to restore longleaf pine and hardwood forest communities and fire-dependent ecological conditions, and for fire preparedness and prevention activities. The fire management program receives funding that is separate from funding for other preserve operations. The preserve staff jointly responds to wildland fires and other "all risk incidents" such as hurricanes under the cooperative agreement for Texas

Interagency and Wildland Fire Management, and the Stafford Act Response Agreement between the Department of the Interior, U.S. Forest Service, U.S. Fish and Wildlife Service, Bureau of Indian Affairs, Texas Forest Service, and Texas Parks and Wildlife Department. In addition, the National Park Service, U.S. Fish and Wildlife Service, and Texas Nature Conservancy have a memorandum of understanding regarding fire response. A mutual response agreement exists between the National Park Service and the Texas Forest Service allowing each to respond to fires during wildland fire emergencies. Local volunteer fire departments respond to structural fires in the preserve.

Oil and gas management program staff oversee nonfederal oil and gas operations in the preserve, ensuring that operations are conducted in accordance with NPS servicewide regulations (36 CFR Part 9, Subpart B) and the preserve's 2006 *Oil and Gas Management Plan*. To minimize the impacts of oil and gas operations on preserve resources, operators are encouraged to directionally drill from outside the preserve boundary and are required to incorporate standard operating procedures to mitigate the impacts associated with surface operations and the maintenance of access road rights-of-way. Abandoned oil and gas sites, abandoned pipelines, and abandoned road rights-of-way are reclaimed where appropriate and feasible.

RESOURCES AND VISITOR PROTECTION DIVISION

The resources and visitor protection division oversees federal visitor protection and law enforcement, conducts search and rescue operations, assists the resources management division with resource protection, and oversees the safety program throughout the preserve.

The few rangers on staff are often challenged to provide adequate patrol coverage and protection for the preserve's 15 units. In many cases the preserve's 530 miles of boundary are not clearly marked or defined, presenting opportunities for undesignated or unauthorized access. Visitors and others are occasionally unaware that they've entered the preserve and are subject to NPS rules and regulations. Among the issues commonly facing the law enforcement and protection staff are hunters poaching wildlife without a permit; dumping trash, old appliances, cars, etc. along the banks of the Neches River and other areas; and illegal ORV use. Although the preserve partners with investigators from the Texas Parks and Wildlife Department, the Texas Commission on Environmental Quality, and city, county, and state law enforcement officers, it is often difficult to apprehend and prosecute offenders (NPCA 2005).

Neighboring sheriffs' departments include those of Hardin, Jasper, Jefferson, Liberty, Orange, Polk, and Tyler counties. Neighboring municipal and city police departments are in Beaumont, Kountze, Lumberton, Orange, Saratoga, Silsbee, Sour Lake, Vidor, and Woodville. Emergency response departments operate in Hardin County and are jointly operated by Jasper, Newton, and Sabine counties.

RESOURCE EDUCATION DIVISION

The resource education division oversees visitor use operations, including the visitor center and preserve webpage, manages the education program, provides interpretive walks and field trips, participates in community events and festivals, produces in-house publications, engages in and promotes partnerships, manages the volunteer program, and maintains news media contacts and press releases.

The preserve's environmental education center is managed by the division from the

Staley Cabin (in the Turkey Creek unit). The 1920s-era log structure provides a place for school groups and others to participate in natural and human history programs. On a reservation basis, the preserve staff provides curriculum-based education programs for school groups (prekindergarten through 12th grade), as well as universities and special interest groups.

The preserve's visitor center is near the headquarters facilities. The center provides visitors with opportunities to view the preserve's orientation film ("Big Thicket: America's First National Preserve") and another film ("Users Guide to the Big Thicket") that provides viewers an overview of several preserve ecosystems. In addition, a "discovery room" is in the visitor center to provide hands-on examples of the preserve's biodiversity and opportunities to learn about fire ecology and firefighting. Further, a dedicated classroom (used for programs, training, and meetings) is available to local partners.

OTHER FACILITIES

Additional NPS facilities at the preserve include the field research station at Saratoga (along Highway 770 near the northwest corner of the Lance Rosier unit). The Big Thicket Association operates the research station under an agreement with the preserve and Rice University. The facility includes a small laboratory, library, classroom, kitchen, dining area, and dormitory. Researchers and graduate students (typically from local universities and other organizations) use the research station. The facility is available for other education groups when it is not being used by researchers. However, the facility is often under-used, receiving only a limited number of annual research requests (NPCA 2005).

The current *Housing Needs Assessment and Housing Management Plan* documents the need for three housing units. Housing for seasonal NPS employees is provided at the

Lily Bunkhouse (Big Sandy Creek unit) and at the Ranch House (Turkey Creek unit). A newly acquired property in Silsbee (the Seale House-Village Creek unit) includes a house, ranger station, barn and sheds, and satellite office space for seasonal resource education and resource protection staff. Future housing could include the Lily Estate House (life estate). Once the Lily Estate House becomes preserve property, it, along with the other three existing houses, would be assessed for condition and suitability for housing and for a determination as to which three to maintain. If any structures are not necessary they will be removed.

The facility management division strives to maintain about 45 miles of officially designated trails in good condition, although many more miles of undesignated trails exist in the preserve. While most of the trails are for hiking only, multiuse trails (for horseback riding, bicycling, and hiking) are also in Big Sandy Creek. Preserve units containing designated trails include the following:

- **Big Sandy Creek Unit:** Woodlands Trail, Big Sandy Trail, Beaver Slide Trail
- **Turkey Creek Unit:** Turkey Creek Trail, Pitcher Plant Trail, Kirby Nature Trail, Sandhill Loop
- **Beech Creek Unit:** Beech Woods Trail
- **Hickory Creek Savannah Unit:** Sundew Trail
- **Menard Creek Corridor Unit:** Birdwatchers Trail

The preserve staff maintains paved parking lots and unpaved roads

- **Big Sandy Creek Unit:** Lily Road and Firelane Road
- **Turkey Creek Unit:** Ranch House Road

- **Neches Bottom and Jack Gore Baygall Unit:** Timber Slough Road and Zig Zag Road
- **Lance Rosier Unit:** Teel Road, Cotten Road, and Fire Tower Road. In addition, the preserve manages two public boat ramps on the Neches River, McQueen's Landing and Confluence.

There are 26 day use areas throughout the preserve; 11 of these areas have vault toilets that require regularly scheduled pumping. One of the more difficult challenges facing the facility management division is the commitment of extended time for crews to travel to the widely separated and noncontiguous preserve units to carry out restroom and trash cleanup and disposal (R. Moore, pers. comm., November 18, 2010). Other visitor use facilities (e.g., picnic tables, kiosks) are maintained at trailheads, parking areas, boat ramps, and day use areas.

ENVIRONMENTAL LEADERSHIP

In accordance with NPS *Management Policies 2006*, the preserve staff strives to demonstrate environmental leadership in its operations by incorporating environmentally responsible measures into facility designs and construction, and by addressing LEED construction standards. As feasible, alternative energy sources are used for facilities and utility vehicles. Recycling and green purchasing are among the energy conservation measures adopted at the preserve.

Through the Texas Clean Rivers program, the preserve staff also works with the Lower Neches Valley Authority (LNVA) and the U.S. Geological Survey to monitor water quality. Under the direction of the Gulf Coast Inventory and Monitoring Network, the Lower Neches Valley Authority monitors water quality and quantity at six locations within the preserve and at 13 sites outside but near the preserve. The U.S. Geological Survey also monitors water quality at six stations in the Lower Neches Valley. Most waters are in good condition for most measured parameters.



Chapter 4 ENVIRONMENTAL CONSEQUENCES



INTRODUCTION

The National Environmental Policy Act requires that environmental documents discuss the environmental impacts of a proposed federal action, feasible alternatives to that action, and any adverse environmental effects that cannot be avoided. In this case, the proposed federal action would be the adoption of a general management plan for Big Thicket National Preserve. This chapter analyzes the environmental impacts of implementing the four alternatives on natural resources, cultural resources, visitor experience, the socioeconomic environment, and NPS operations and management. The analysis is the basis for comparing the beneficial and adverse effects of implementing the alternatives.

Because of the general, conceptual nature of the actions described in the alternatives, the impacts of these actions are analyzed in general, qualitative terms. Thus, this environmental impact statement should be considered a programmatic analysis. For the purposes of analysis, it is assumed that all of the specific actions proposed in the alternatives would occur during the life of the general management plan.

This environmental impact statement generally analyzes several actions, such as the development of recreational facilities and the maintenance of facilities for visitor orientation and NPS operations. If and when proposed site-specific developments or other actions are ready for implementation following the approval of the general management plan, appropriate detailed environmental and cultural compliance documentation would be prepared. This compliance would be in accordance with the National Environmental Policy Act and

National Historic Preservation Act, and would meet requirements to identify and analyze each possible impact for the resources affected.

This chapter begins with a description of the methods and assumptions used for each impact topic. Impact analysis discussions are organized by alternative and then by impact topic under each alternative. The existing conditions for all of the impact topics that are analyzed were identified in the “Affected Environment” chapter. All of the impact topics retained for detailed analysis are assessed for each alternative.

The analysis of alternative 1 identifies future conditions if no major changes to facilities or NPS management occurred. The three action alternatives are then compared to alternative 1 to identify the incremental changes that would occur as a result of changes in facilities, uses, and management. Impacts of recent decisions and approved plans, such as the *Big Thicket National Preserve Oil and Gas Management Plan* (NPS 2006), are not evaluated as part of this environmental analysis, except as part of cumulative impact analysis. Although these actions would occur during the life of the general management plan, they have been (or would be) evaluated in other environmental documents.

Cumulative impacts are discussed under each alternative and are identified when this project is considered in conjunction with other actions occurring in the region. The discussion of cumulative impacts is followed by a conclusion statement. The key impacts of each alternative are briefly summarized at the end of “Chapter 2: The Alternatives, Including the Preferred Alternative.”

CUMULATIVE IMPACTS ANALYSIS

A cumulative impact is described in the CEQ regulation 1508.7 as follows:

Cumulative impacts are the impacts that result from incremental impacts of the action when added to other past, present, and reasonably foreseeable actions, regardless of what agency (federal or nonfederal) or person undertakes such other action. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time.

Each cumulative impact analysis is additive, considering the overall impact of the alternative when combined with effects of other actions—both inside and outside the park unit—that have occurred or that would likely occur in the foreseeable future.

To determine potential cumulative impacts, past, present, and future potential actions and developments within and surrounding Big Thicket National Preserve were considered by the GMP planning team. The area included the seven surrounding counties: Jasper, Hardin, Liberty, Jefferson, Orange, Tyler, and Polk.

In this case, most of the cumulative impacts that can be analyzed in this environmental impact statement are due to actions that have occurred in the past, are currently taking place, and would likely continue to occur in the future. The National Park Service is encouraging the implementation of mitigation measures for oil and gas operations. The National Park Service reviews and comments on applications to the Texas Commission on Environmental Quality for industrial and municipal outfalls, helps the public and local residents identify

the preserve boundary, and provides education and outreach about natural processes. The following actions were considered in the analysis of cumulative impacts:

- Oil and gas exploration and drilling operations, including operation of machinery and vehicles, seismic exploration, development of drilling pads, roads, and pipelines.
- Industry discharges from paper mills and refineries that may include metals, organic materials, hydrocarbons, and variations in pH and temperature into tributaries that flow directly into the Neches River.
- Improper design, maintenance, or operation of private septic tanks resulting in discharges of pollutants in the bayou connected to the Neches River.
- Logging within the preserve boundary is a past use that largely eliminated old growth forests and created canals, which affect natural sheet flow of water.
- In general, the State of Texas provides counties with limited powers to control land use beyond protecting public safety and environment (i.e., protecting drinking water supplies). This scenario, along with population shifts from rural areas to urban regions, contributes to the ongoing conversion of agricultural and forest lands in this region to housing and other development.
- Past loss or modifications of historic structures and cultural landscapes (e.g., encroaching vegetation that obscures historic roads and homestead sites).

To determine the potential cumulative impacts on the resources, other projects and actions within these action areas were identified. Projects were identified by discussions with NPS staff, federal land managers, and representatives of city and county governments. Potential projects identified as possible contributors to cumulative impacts included any planning or development activity that was currently being implemented, or is expected to be implemented in the future. Impacts of past actions were also considered in the analysis. Projects and actions that could contribute to cumulative impacts include the following:

- The Texas Commission on Environmental Quality is implementing an Environmental

Flows Law, which would be required for every dam, to allow flows to maintain natural hydrologic regimes important for wildlife, riparian vegetation, and water quality.

- The USACE Sabine-Neches Waterway Improvement Project is intended to improve navigation and provide for larger vessels to use the channel. Among other actions, the project includes deepening the channel and extending the channel by over 13 miles.
- Expanded refineries and chemical processing plant are planned to come online in the near future.

METHODS AND ASSUMPTIONS FOR ANALYZING IMPACTS

The GMP planning team based the impact analysis and the conclusions in this chapter on the review of existing literature and studies, information provided by experts in the National Park Service and other agencies, and staff insights and professional judgment. The team's method of analyzing impacts is further explained below. It is important to remember that all the impacts have been assessed assuming that mitigative measures would be implemented to minimize or avoid impacts. If mitigative measures described in "Chapter 2: The Alternatives" were not applied, the potential for resource impacts and the magnitude of those impacts would increase.

The environmental consequences for each impact topic were identified and characterized based on impact type (adverse or beneficial), intensity, context, and duration. Cumulative effects are discussed later in this section.

Impact intensity refers to the degree or magnitude to which a resource would be beneficially or adversely affected. Each impact was identified as negligible, minor, moderate, or major, in conformance with the definitions for these classifications provided for each impact topic. Because this is a programmatic document, the intensities were expressed qualitatively.

Context refers to the setting within which an impact may occur, such as the affected region or locality. In this document most impacts are either localized (site-specific) or preservewide.

Impact duration refers to how long an impact would last. The planning horizon for this general management plan is approximately 20 years. Unless otherwise specified in this document, the following terms are used to describe the duration of impacts:

- **Short term:** The impact would be temporary in nature, lasting three years or less, such as the impacts associated with construction or disruption of visitor use to an area.
- **Long term:** The impact would last more than three years and could be permanent in nature, such as the loss of soil due to the construction of a new facility. Although an impact may only occur for a short duration at one time, if it occurs regularly over a longer period of time the impact may be considered to be a long-term impact. For example, the noise from a vehicle driving on a road would be heard for a short time and intermittently, but because vehicles would be driving the same road throughout the 20-year life of the general management plan, the impact on the natural soundscape would be considered to be long term.

Effects also can be direct or indirect. Direct effects are caused by an action and occur at the same time and place as the action.

Indirect effects are caused by the action and occur later or farther away, but are still reasonably foreseeable. This document discloses and analyzes both direct and indirect effects, but does not differentiate between them in the discussions.

The impacts of the action alternatives describe the difference between implementing the no-action alternative and implementing the action alternatives. To understand a complete picture of the impacts of implementing any of the action alternatives, the reader must also take into consideration the impacts that would occur in alternative 1.

In analyzing impacts of the alternatives, several of the action alternatives call for the possibility of establishing district ranger stations in the northern, central, and southern portions of the preserve. For

purposes of analysis, it is assumed that if these ranger stations are established, existing buildings leased by the General Services Administration and would be used outside the preserve.

NATURAL RESOURCES

DEFINITIONS

Duration. The following definitions of duration apply to all natural resource topics:

- **Short Term:** Short-term impacts would be from the completion (“now”) of the general management plan up to three years in duration.
- **Long Term:** Long-term impacts would be a time frame of greater than three years and extending up to 20 years or longer.

extensive, but would likely be successful.

- **Major:** Impacts would result in a change to soils that would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to address any adverse effects, and their success would not be guaranteed.

SOILS

Methodology

The methodology and intensity levels used to evaluate adverse impacts on soils are described below. Because it takes thousands of years to renew soil naturally, all impacts would be long term.

- **Negligible:** Impacts would result in a change to soils, but the change would be so slight that it would not be of any measurable or perceptible consequence.
- **Minor:** Impacts would result in a change to soils that would be detectable, but the change would be small and of little consequence and would be expected to be localized. Mitigation measures, if needed to address adverse effects, would be simple and successful.
- **Moderate:** Impacts would result in a change to soils that would be readily detectable, and could occur in several units. Mitigation measures, if needed to address adverse effects, could be

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. No major facility developments would occur under alternative 1 that would have the potential to affect soils in the preserve. Maintenance of existing facilities, roads, and trails would probably result in some erosion or alteration of soil properties, resulting in long-term, negligible to minor, adverse impact in localized areas.

Minimally sized, primitive boat ramps and launches could be designated and positioned for minimal impact to resources; water trails could be designated with signs directing visitors to day use areas. Any necessary construction would be the minimum required to establish a primitive boat ramp or launch, or bringing an existing ramp or launch up to proper code for visitor health and safety, resulting in long-term, negligible to minor, adverse impacts to soils.

The possible establishment of district ranger stations outside the preserve would not affect soils because these ranger stations would occupy existing buildings.

Visitor contact stations could be co-located with existing facilities, and would have long-term, negligible, adverse impacts to soils due to potential increased use of the area.

Soils in the preserve would likely continue to be compacted and eroded by hikers, hunters, and campers in local areas, particularly along existing unofficial trails, and in existing backcountry campsites. The long-term, adverse impact would be negligible to minor on increased erosion in the preserve.

In some areas, new human-created, social trails may result from increased visitation, particularly in areas such as White Sand Beach and the visitor center area. Unofficial trails could result from stormwater runoff. These long-term, adverse impacts would likely be minor and limited in extent.

Overall, alternative 1 would have a negligible to minor, long-term, adverse impact on preserve soils, primarily due to maintenance activities, development of facilities, and continued visitor use of the area.

Cumulative Impacts. Soils in the area surrounding the preserve have been altered by past oil and gas activities, logging, development, and off-road vehicle use. In the future, some soils would likely be eroded and lost, and soil properties would likely continue to be altered by oil and gas exploration, pipelines, and any new developments in the area (e.g., homes and roads). The loss and alteration of soils due to past land uses and reasonably foreseeable external actions would likely result in long-term, minor to moderate, adverse impacts on area soils.

When the long-term, negligible to minor, adverse effects from visitation in alternative 1 are added to the past and reasonably foreseeable impacts from actions outside the preserve, there would be a long-term, minor to moderate, adverse cumulative impact on area soils. However, the actions in alternative 1 would contribute a very small increment to the overall impact.

Conclusion. Most of the preserve's soils would not be affected by the actions in alternative 1. However, some soils would be eroded or lost, and soil properties would be altered due to visitor use in localized areas

such as along trails, around newly used facilities, new facilities, and from the development or designation of small, primitive boat launches. These adverse impacts would likely be long term and negligible to minor in extent. When the impacts inside the preserve in alternative 1 are added to past, present, and reasonably foreseeable impacts from developments outside the preserve, there would be the potential for long-term, minor to moderate, adverse cumulative impacts on area soils—although the actions in alternative 1 would add a very small increment to this overall impact.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Under alternative 2, there would be additional impacts to soils by visitor use (e.g., compaction). The promotion of low-impact activities could lead to greater visitation with a localized, long-term, negligible to minor, adverse effect on soils. To accommodate this increase in visitors, construction of signs and wayside exhibits would also increase, causing long-term, localized, negligible adverse soil disturbance.

New facility construction under alternative 2 would be minimal. To minimize impacts on soils, proposed facilities would be developed outside the preserve boundaries to the extent possible. Some facilities could be built, such as additional primitive boat ramps and picnic and day use areas. In general, new developments would impact soils by further covering and disrupting the natural soil horizons (layer of soil parallel to the soil layer) and soil function. Site preparation, landscaping, and construction equipment would disturb and compact soil. Additionally, the planned paving of existing unpaved parking areas and expanding paved bus parking would increase surface water runoff by obstructing rainwater and keeping it from infiltrating the ground. This increase in surface water runoff would increase the rate of erosion in drainage channels and streambeds. Mitigation efforts, such as

installing erosion matting and silt fences, would help reduce the soil impacts in the area. Also, to the extent possible, development would be sited in previously disturbed areas. Depending on the type and extent of construction activities, increased erosion and soil compaction, as well as removal of topsoil during construction would result in long-term, minor to moderate, adverse effects on soils.

Under alternative 2, additional hiking trails would be developed where appropriate, and new trailheads with visitor parking would be constructed. The construction and improvement activities of these new trails on pristine land and trailheads would result in soil disturbance. This alternative also explores the possible reuse of abandoned roadbeds as trails. New backcountry trails in alternative 2 include the Canal-Saltwater Barrier Trail, the Magnolia Trail and Loblolly Loop (multiuse), the Fern Hollow Trail, the Yellow Bluff Ferry Trail, and the Oxbow Trail. A new primitive trail would be developed in the Lance Rosier unit and a new frontcountry trail would connect the visitor center to Village Creek and the Turkey Creek Trail (Village Creek Trail). While most impacts would be contained in defined visitor use areas and on trails, new trails in the Lance Rosier and the Neches Bottom and Jack Gore Baygall units would increase access to sand mounds, which have been identified as special management areas. This may create an increase in social trails over the sand mounds and other features, which would lead to erosion. Assuming use of best management practices (such as avoiding inundated areas) during construction and later use to prevent erosion and compaction, the overall long-term adverse impacts would likely be moderate for new trails developed where appropriate, and negligible for those utilizing abandoned roadbeds. This impact would occur in areas throughout the preserve. Construction of a hardened accessible hunter trail would have long-term, minor to moderate, adverse impacts on soils.

Trail expansions would also provide increased opportunities for mountain biking and horseback riding. Mountain biking would be expanded and allowed on an existing administrative road in the Beech Creek unit (Magnolia Trail and Loblolly Loop) and the northeast portion of the Lance Rosier unit. Horseback riding would be expanded to include trails in the Beech Creek unit (Magnolia Trail and Loblolly Loop), the Oxbow area of the Beaumont unit, and the northeastern portion of the Lance Rosier unit. These activities would lead to soil compaction and erosion, contributing a long-term, moderate, adverse effect on soils.

Twenty dispersed backcountry campsites (10 feet by 10 feet) could be developed along land and water trails. This could affect up to approximately 2,000 square feet of soil. However, building the campsites on platforms would largely prevent potential soil compaction, erosion, and runoff impacts. Some impacts would still occur due to the use of dead and down woody material for campfires, preventing this organic material from returning to the soils and further depleting soils of critical nutrients. The effects would likely be long-term, minor, and adverse, depending on the type of soil.

Motorized boating activity increases riverbank erosion as a result of wave action. Use of motorized boats, other than personal watercraft, would be allowed in the Neches River and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook's and Scatterman lakes. This would contribute a long-term, minor, adverse effect to soils. In alternative 2, implementation of a nonmotorized boating area upstream of the confluence of Village Creek with the Highway 96 bridge would restrict boat traffic and landings, benefitting riverbanks easily eroded by the wave action of boats. This would have a long-term, minor, beneficial effect in the preserve soils.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased

monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to soils in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 2 would have a minor to moderate, long-term impact on the preserve's soils, primarily due to the establishment of new visitor facilities and increased visitor use.

Cumulative Impacts. Soils in most of the area surrounding the preserve have been altered by past oil and gas activities, logging, development, and off-road vehicle use. In the future, some soils would likely be eroded or lost, and soil properties would likely continue to be altered by oil and gas exploration and by other new developments (e.g., homes and roads) in the area. The loss and alteration of soils due to past land uses and reasonably foreseeable external actions would likely result in a long-term, minor to moderate, adverse impact on area soils.

When the long-term, adverse, minor to moderate effects from development of new facilities and increased visitation in the preserve and the long-term, minor to moderate, beneficial impacts of prohibiting motorized boating in some areas are added to the past and reasonably foreseeable impacts external to the preserve, there would be a long-term, minor to moderate, adverse cumulative impact on area soils. However, the actions in alternative 2 would contribute a very small increment to the overall impact.

Conclusion. Most of the preserve's soils would not be affected by the actions in alternative 2. However, some minor to

moderate, long-term, adverse impacts to soils would occur due to increased visitor use, development of new facilities, and new motorboating activities in localized areas. When the impacts inside the preserve in alternative 2 are added to past and reasonably foreseeable impacts from new developments outside the preserve, there would be the potential for long-term, minor to moderate, adverse cumulative impact on area soils—although the actions in alternative 2 would add a very small increment to this overall impact.

Alternative 3

Analysis. Under alternative 3, there would be additional impacts to soils by visitor use (e.g., compaction). The promotion of low-impact activities could lead to greater visitation with a long-term, negligible to minor, adverse, and localized effect on soils. To accommodate this increase in visitors, the construction of wayside exhibits and displays may also cause long-term, negligible, adverse, and localized soil disturbance.

New facility construction under alternative 3 would be minimal. To minimize impacts on soils, proposed occupied facilities would be developed outside preserve boundaries or in already disturbed areas to the extent possible. Some facilities such as picnic and day use areas could be constructed as appropriate to facilitate visitor activities, and some parking areas would be paved. In general, impacts on soils would be exacerbated by additional development that would further cover and disrupt natural soil horizons and soil function. Construction activities may increase erosion and soil compaction, as well as remove topsoil during construction. Site preparation, landscaping work, and construction equipment also would disturb and compact soil. Mitigation efforts, such as installing erosion matting and silt fences, would help reduce the impact on the soils in the areas. Depending on the type and extent of construction activities, increased erosion and soil compaction, as well as the removal of topsoil during construction would result in

long-term, minor to moderate, adverse effects on soils.

The construction of boat ramps at Johns Lake, and the Lower Cypress area of the Beaumont unit and in association with Lamar University, would have long-term, negligible to minor, adverse and localized impacts on soils. The clayey soils along the waterways of the preserve are moderately to highly erodible, and during the proposed construction events, these soils could be easily be disturbed.

Under alternative 3, additional hiking trails would be developed where appropriate, and new trailheads with visitor parking would be constructed. The construction and improvement activities of these new trails would result in soil disturbance. This alternative also explores the possible reuse of abandoned roadbeds as trails. New backcountry trails in alternative 3 include the Magnolia Trail and Loblolly Loop (multiuse), Fern Hollow Trail, Fire Tower Trail, and hiking trails from the visitor center to Village Creek (Village Creek Trail). The Neches Bottom and Jack Gore Baygall unit would include a new primitive trail. While most impacts would be contained in defined visitor use areas and on trails, new trails in the Lance Rosier and Neches Bottom and Jack Gore Baygall units would increase access to sand mounds, which have been identified as special management areas. This may create an increase in social trails over the sand mounds and other features, which would lead to erosion. Assuming use of best management practices (such as avoiding inundated areas) during construction and later use to prevent erosion and compaction, the overall adverse impacts would likely be moderate for those trails developed where appropriate, and negligible for those utilizing abandoned roadbeds, and long-term. This impact would occur in areas throughout the preserve.

Trail expansions would also provide increased opportunities for mountain biking and horseback riding. Mountain biking and horseback riding would be expanded to an

existing administrative road in the Beech Creek unit (Magnolia Trail and Loblolly Loop). These activities lead to soil compaction and erosion, contributing a long-term, minor to moderate, adverse effect on soils.

If feasible, the Lily Bunkhouse would be designated for demolition. This would require heavy equipment that could further compact soils in the project area; this would have a long-term, negligible, adverse, effect on soils in the area.

Motorized boating activity would increase riverbank erosion as a result of wave action. Use of motorized boats, other than personal watercraft, would be allowed in the Neches River and Pine Island Bayou from the end of Carpenter Road to the confluence with the Neches River including Cook's Lake. This would contribute a long-term, minor, adverse effect to soils. In alternative 3, nonmotorized boating areas would be implemented upstream from the confluence of Village Creek with the Neches River, Cook's Lake to Scatterman Lake loop, and Johns Lake to Franklin Lake waters. These designations would restrict boat traffic and landings, benefitting riverbanks easily eroded by the wave action of boats. This would have a long-term, minor, beneficial effect on preserve soils.

In alternative 3, fire management activities would help improve nutrient cycling in the soils, contributing a long-term, moderate, beneficial impact on soils.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to soils in the preserve. Specific actions that may be

taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 3 would have a minor to moderate, long-term adverse impact on preserve soils, primarily due to the establishment of new visitor facilities and increased visitor use.

Cumulative Impacts. Soils in most of the area surrounding the preserve have been altered by past oil and gas activities, logging, development, and off-road vehicle use. In the future, some soils would likely be eroded and lost and soil properties would likely continue to be altered by oil and gas exploration and by other new developments (e.g., homes and roads) in the area. The loss and alteration of soils due to past land uses and reasonably foreseeable external actions would likely result in a long-term, minor to moderate, adverse impact on soils.

When the long-term, minor to moderate, adverse effects from the development of new facilities, and increased visitation and the long-term, minor, beneficial impacts of prohibiting motorized boating in some areas are added to the past and reasonably foreseeable impacts external to the preserve, there would be a long-term, minor to moderate, adverse cumulative impact on soils. However, the actions in alternative 3 would contribute a very small increment to the overall impact.

Conclusion. Most soils of the preserve would not be affected by the actions in alternative 3. However, some soils would be eroded and lost, and soil properties would be altered due to increased visitor use, and the development or expansion of new trails and other facilities; this would result in long-term, minor to moderate, impacts to soils. When the impacts inside the preserve in alternative 3 are added to past and reasonably foreseeable impacts from oil and gas

exploration and other developments outside the preserve, there would be the potential for long-term, minor to moderate, adverse cumulative impact on area soils; however, the actions in alternative 3 would add a very small increment to this overall impact.

Alternative 4

Analysis. Under alternative 4, there would be additional impacts to soils by visitor use (e.g., compaction). The promotion of low-impact activities could lead to greater visitation with a long-term, negligible to minor, adverse, and localized effect on soils. To accommodate this increase in visitors, the construction of wayside exhibits and signs may also cause long-term, negligible, localized, and adverse soil disturbance.

Under alternative 4, new facilities would be minimal and more dispersed. To minimize impacts on soils, proposed facilities would be developed outside preserve boundaries to the extent possible. Some facilities such as boat ramps, picnic and day use areas, or trails could be constructed as appropriate to facilitate visitor activities. Parking areas would be paved. In general, impacts on soils would be exacerbated by additional development that would further cover and disrupt natural soil horizons and soil function. Construction activities may increase erosion and soil compaction, as well as remove topsoil during construction. Site preparation, landscaping work, and construction equipment also would disturb and compact soil. Mitigation efforts, such as installing erosion matting and silt fences, would help reduce the impact on soils in the area. Depending on the type and extent of construction activities, these long-term adverse impacts on soils would range from minor to moderate.

Under alternative 4, additional roads and trails could be developed to provide new or improved visitor access into undeveloped areas. The construction and improvement activities of these new roads and trails would result in soil disturbance, and contribute a

long-term, moderate, adverse effect to soils. New backcountry trails in alternative 4 include the Magnolia Trail and Loblolly Loop, Alabama Trace Trail, Yellow Bluff Ferry Trail, and a multiuse trail in the Lance Rosier unit. New frontcountry trails would include a hiking trail linking the visitor center to Village Creek and the Turkey Creek Trail (Village Creek Trail), the Fern Hollow Trail, and a multiuse trail in the Lower Neches River corridor unit. New trails could include self-guiding nature trails or trails in the Lance Rosier and Neches Bottom and Jack Gore Baygall units would increase access to sand mounds that have been identified as special management areas. This may create an increase in social trails over the sand mounds and other features, which would lead to erosion. Assuming use of best management practices (such as avoiding inundated areas) during construction and later use to prevent erosion and compaction, the overall adverse impacts would likely be moderate for those trails developed where appropriate, and negligible for those utilizing abandoned roadbeds, and long-term. This impact would occur in areas throughout the preserve. Trail expansions in alternative 4 would also provide increased opportunities for mountain biking and horseback riding. Mountain biking and horseback riding would be expanded to an existing administrative road in the Beech Creek unit (Magnolia Trail and Loblolly Loop), the Oxbow area of the Beaumont unit, and the Lance Rosier unit. These activities lead to soil compaction and erosion, contributing a long-term, minor to moderate, adverse effect on soils.

Twenty dispersed backcountry campsites (10 feet by 10 feet) could be developed along land and water trails. This could affect up to approximately 2,000 square feet of soil. However, building the campsites on platforms would largely prevent potential soil compaction, erosion, and runoff impacts. Some impacts would still occur due to the use of dead and downed woody material for campfires, preventing this organic material from returning to the soils and further depleting soils of critical nutrients. The

effects would likely be long-term, minor, and adverse, depending on the type of soil.

Motorized boating activity increases riverbank erosion as a result of wave action. In alternative 4, motorized boats, other than personal watercraft, would be allowed in all navigable waters except where prohibited for conflicting uses. The loss of soil due to riverbank erosion would have a long-term, minor, adverse effect on preserve soils.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to soils in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 4 would have a minor to moderate, long-term impact on soils in the preserve, primarily due to the establishment of new visitor facilities and increased visitor use.

Cumulative Impacts. Soils in most of the area surrounding the preserve have been altered by past oil and gas activities, logging, development, and off-road vehicle use. In the future, some soils would likely be eroded and lost, and soil properties would likely continue to be altered by oil and gas exploration and other new developments (e.g., homes and roads) in the area. The loss and alteration of soils due to past land uses and reasonably foreseeable external actions would likely result in a long-term, minor to moderate, adverse impact on area soils.

When the long-term, adverse, minor to moderate effects from development of new facilities and increased visitation in alternative 4 are added to impacts from past and reasonably foreseeable developments external to the preserve, there would be a long-term, minor to moderate, adverse cumulative impact on area soils. However, the actions in alternative 4 would contribute a very small increment to the overall impact.

Conclusion. Most soils of the preserve would not be affected by the actions in alternative 4. However, some soils would be eroded and lost, and soil properties would be altered due to increased visitor use, development of new facilities, and new motorboating activities in localized areas. These adverse impacts would likely be long-term and minor to moderate in extent. When the impacts inside the preserve in alternative 4 are added to past and reasonably foreseeable impacts from future oil and gas exploration and other developments outside the preserve, there would be the potential for long-term, minor to moderate, adverse cumulative impact on area soils, although the actions in alternative 4 would add a very small increment to this overall impact.

WATER QUALITY

Methodology

The methodology and intensity levels used to evaluate impacts on water quality are provided below.

- **Negligible:** Impacts would result in a change to water resources, but the change would be so slight that it would not be of any measurable or perceptible consequence.
- **Minor:** Impacts would result in a detectable change to water resources, but the change would be small and of little consequence and would be expected to be localized. Mitigation

measures, if needed to address adverse effects, would be simple and successful.

- **Moderate:** Impacts would result in a change to water resources that would be readily detectable and could occur in several units. Mitigation measures, if needed to address adverse effects, could be extensive, but would likely be successful.
- **Major:** Impacts would result in a change to water resources that would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to address any adverse effects, and their success would not be guaranteed.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. No major facility developments would occur under alternative 1 that would have the potential to affect water resources in the preserve. Maintenance of existing facilities, roads, and trails would probably result in some erosion, resulting in long-term, negligible to minor, adverse impact on water quality in localized areas due to sedimentation.

Minimally sized, primitive boat ramps and launches could be designed and positioned for minimal impact to resources, and water trails could be designated with signs directing visitors to day use areas. Any necessary construction would be the minimum required to establish a primitive boat ramp or launch, or to bring an existing ramp or launch up to proper code for visitor health and safety, resulting in some increased water turbidity. This would be a long-term, negligible, adverse impact to water quality. The possible establishment of district ranger stations outside the preserve would not have

effects on water quality because these stations would be in existing buildings.

Visitor contact stations could be co-located with existing facilities, and would have long-term, negligible, adverse impacts to water quality due to potential increased use of the facility (e.g., increased vehicle emissions and runoff into waterways).

Water quality in the preserve would likely continue to be adversely affected by visitor use in local areas (particularly in areas with higher use such as White Sands Beach) from contact recreation activities, improper disposal of human waste in areas without sanitary facilities, emissions from motorboats, and from sedimentation as a cause of erosion from visitor use on or near riverbanks and waterways. The adverse impacts would likely be long-term, negligible to minor, and limited in extent on water quality degradation in the preserve.

Current backcountry camping opportunities would continue to be offered in areas that are designated for camping. Some sediments and wastes from campers could be deposited in water. The effects on water quality would be long-term, negligible, and adverse.

Overall, alternative 1 would likely have a long-term, negligible to minor, adverse impact on the water quality of the preserve, primarily due to deposition of sediments and wastes from continuing visitor use.

Cumulative Impacts. Several sources of water pollution external to Big Thicket National Preserve have affected, and are likely to continue affecting, the water quality of the preserve. These sources of adverse impact to the preserve's water quality include industry outfalls from paper mills and refineries, pollutants from private septic tanks, and the USACE Sabine-Neches Waterway Improvement Project. Once implemented, the Texas Commission on Environmental Quality's Environmental Flows Law would have beneficial impacts on preserve waterways. When the effects of all of

the above actions are added to the long-term, negligible to minor, adverse water quality impacts of alternative 1, there could be a moderate long-term, adverse cumulative impact to the preserve's water quality, depending on the type and quantity of pollutants that enter preserve waters. However, the increment added by alternative 1 would be relatively small compared to the impact from pollutants being added from actions outside the preserve boundary.

Conclusion. Under alternative 1, there would continue to be negligible to minor, long-term, adverse impacts to the preserve's water quality in localized areas, primarily due to visitor activities (e.g., contact recreation activities, improper disposal of human waste in areas without sanitation facilities, and discharges from motorboats). When the effects of alternative 1 are added to the effects of water pollution from sources outside the preserve, there could be a moderate, adverse cumulative effect on the preserve's water quality. However, the actions in alternative 1 would add only a small increment to the overall cumulative impact.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Visitor access and use would be expanded throughout the preserve under alternative 2, potentially resulting in some increase in erosion along trails and at primary visitor use areas that could have impacts on water quality, such as White Sands Beach. The impact would be due to increased sedimentation and water turbidity in localized areas. This would be a long-term, negligible to minor, adverse impact.

Impacts on water resources from the construction of docks and boat ramps under alternative 2, including a small floating dock on the Neches River in the Canyonlands unit, could impact water quality through erosion and sedimentation, runoff, and pollution during construction and subsequent visitor use. Assuming use of best management practices during construction, and careful

monitoring and management of impacts during use, the overall impacts would likely be short and long term, minor, and adverse. These new boat ramps are included in alternative 2 as improved access points to designated water trails with signs, such as the Village Creek Paddle Trail, and in the Cook's Lake / Scatterman Lake area. Encouragement of water-based recreation and increased use of these trails could lead to greater visitation. This could cause an increase in bank erosion from docking along riverbanks and sanitation issues. This would have long-term, negligible to minor, adverse impacts on water quality.

Use of motorized boats, other than personal watercraft, would be allowed in the Neches River and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook's and Scatterman lakes. Impacts on water quality from motorboat use would include resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on water quality from such activities would likely be long term, negligible to minor, and adverse. Houseboats would still be allowed in the preserve, but would be subject to regulations. Houseboats meeting regulatory standards would still discharge some pollutants, which would have a negligible, long-term, adverse impact on water quality.

The development of 20 backcountry campsites (10 feet by 10 feet each) dispersed along land and water trails could contribute to impacts on water quality through erosion, sedimentation, and dust from visitor use. Increased and prolonged access could lead to elevated sanitation problems. Assuming practicable levels of impact monitoring and management by NPS staff, impacts of these improvements would likely be short term, negligible to minor, and adverse during construction, and long term, negligible to minor, and adverse after construction. These actions would focus visitor use activities in less sensitive areas (e.g., designated trails), thereby protecting areas that are adjacent to waterways.

The expansion of horseback riding in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the northeast portion of the Lance Rosier unit would likely increase waste from horses in localized drainages. The intensity of the impact would depend on the number of horses that are allowed on these new trails. Waste from the horses could result in long-term, minor, adverse, and localized impacts on water quality.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to water quality in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 2 would result in a minor, long-term, adverse impact on the preserve's water quality primarily due to the deposition of sediments and wastes from increased visitor use.

Cumulative Impacts. Several sources of water pollution external to Big Thicket National Preserve have affected, and are likely to continue affecting, the water quality of the preserve. These sources of adverse impact to the preserve's water quality include industry outfalls from paper mills and refineries, pollutants from private septic tanks, and the USACE Sabine-Neches Waterway Improvement Project. Once implemented, the Texas Commission on Environmental Quality's Environmental Flows Law would have long-term, beneficial impacts on preserve waterways. When the effects of all of the above actions are added to

the short- and long-term, minor, adverse water quality impacts of alternative 2, there could be a moderate, long-term, adverse cumulative impact to the preserve's water quality, depending on the type and quantity of pollutants that enter preserve waters. However, the increment added by alternative 2 would be relatively small compared to the impact from pollutants being added from actions outside the preserve boundary.

Conclusion. Under alternative 2 there would continue to be negligible to minor, long-term, adverse impacts to the preserve's water quality in localized areas, primarily due to visitor activities (e.g., contact recreation activities, improper disposal of human waste in areas without sanitation facilities, waste from horse use, effluent spills from noncompliant houseboats, and emissions from motorboats) and due to sedimentation. When all of the effects of alternative 2 are added to the effects of water pollution from sources outside the preserve, there could be a long-term, moderate, adverse cumulative effect on the preserve's water quality. However, the actions in alternative 2 would add only a small increment to the overall cumulative impact.

Alternative 3

Analysis. Alternative 3 includes construction of boat ramps at Johns Lake, Lower Cypress area of the Beaumont unit, and in association with Lamar University. Ramps and docks could impact water quality through disruption of shoreline habitats, erosion and subsequent sedimentation, runoff, and pollution during construction and from visitor use. Assuming use of best management practices during construction, and careful monitoring and management of impacts during use, the overall impacts would likely be long term, negligible to minor, and adverse. These new boats ramps are included in alternative 3 for improved access points to designated water trails with signs, such as the Village Creek Paddle Trail, and the Cook's Lake / Scatterman Lake and the Johns Lake / Franklin Lake areas. Encouragement of

water-based recreation and increased use of these trails could lead to greater visitation. This could cause an increase in bank erosion from docking boats along riverbanks, and could create sanitation issues that would have long-term, negligible to minor, adverse impacts on water quality.

Alternative 3 provides a large area of waterway to be designated as nonmotorized; however, use of motorized boats, other than personal watercraft, would continue in the Neches River and Pine Island Bayou from the end of Carpenter Road to the confluence with the Neches River including Cook's Lake. Impacts on water quality from motorboat use would include resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on water quality from such activities would likely be long-term, negligible to minor, and adverse.

The expansion of horseback riding to a multiuse trail in the Beech Creek unit would likely increase waste from horses in localized drainages. The intensity of the impact would depend on the number of horses that are allowed on these new trails. Waste from the horses could result in long-term, negligible to minor, adverse impacts on water quality.

Alternative 3 also would have a beneficial effect on water quality. Prohibiting houseboats in the preserve in this alternative would eliminate intentional or accidental discharge of effluent, which is believed to be fairly common. Due to the prevalence of houseboats in the preserve, this action would have a long-term, moderate to major, beneficial impact on water quality.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources

compared to alternative 1, and thus result in a long-term, minor, beneficial impact to water quality in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 3 would have a long-term, moderate, beneficial impact on the preserve's water quality, primarily due to the banning of houseboats in the preserve.

Cumulative Impacts. Several sources of water pollution external to Big Thicket National Preserve have affected, and are likely to continue affecting, the water quality of the preserve. These sources of adverse impact to the preserve's water quality include industry outfalls from paper mills and refineries, pollutants from private septic tanks, and the USACE Sabine-Neches Waterway Improvement Project. Once implemented, the Texas Commission on Environmental Quality's Environmental Flows Law would have long-term, beneficial impacts on preserve waterways. When the effects of all of the above actions are added to the long-term, moderate to major, beneficial water quality impacts of alternative 3, there could be a moderate, long-term, adverse cumulative impact to the preserve's water quality, depending on the type and quantity of pollutants that enter preserve waters. However, the increment added by alternative 3 would be relatively small compared to the impact from pollutants being added from actions outside the preserve boundary.

Conclusion. Under alternative 3, there would be minor, long-term, adverse impacts to the preserve's water quality in localized areas, primarily due to visitor activities. But overall, alternative 3 would have a long-term, moderate to major, beneficial impact on water quality from the prohibition of houseboats. When the effects of alternative 3 are added to the effects of water pollution from sources outside of preserve, there could

be a long-term, moderate, adverse cumulative effect on the preserve's water quality. However, the actions in alternative 3 would add a small increment to the overall cumulative impact.

Alternative 4

Analysis. Alternative 4 includes the construction of a small floating boat dock in the Canyonlands unit. Ramps and docks could impact water quality through disruption of shoreline habitats, erosion and subsequent sedimentation, runoff, and pollution during construction and from visitor use. Assuming use of best management practices during construction, and careful monitoring and management of impacts during use, the overall impacts would likely be short and long term, minor, and adverse. These new boats ramps are included in alternative 4 as improved access points to designated water trails with signs, such as the Village Creek Paddle Trail, the Cook's Lake / Scatterman Lake and the Johns Lake / Franklin Lake areas. Encouragement of water-based recreation and increased use of these trails could lead to greater visitation. Greater visitation could cause an increase in bank erosion from docking boats along riverbanks, and result in sanitation issues, which would have long-term, negligible to minor, adverse impacts on water quality.

Use of motorized boats, other than personal watercraft, would continue in all navigable waters, except where prohibited for conflicting uses. Impacts on water quality from motorboat use would include resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on water quality from such activities would likely be long term, negligible to minor, and adverse. Houseboats would still be allowed in the preserve, but would be subject to regulations. Houseboats meeting regulatory standards would have negligible, long-term, adverse impacts on water quality.

The development of 20 backcountry campsites (10 feet by 10 feet each) along land and water trails could contribute to impacts on water quality through resuspension of sediments, erosion, and dust from visitor use. Increased and prolonged access could increase use, which could lead to elevated sanitation problems. Assuming practicable levels of impact monitoring and management by NPS staff, impacts of these improvements would likely be short-term, negligible to minor, and adverse during construction, and long-term, negligible to minor, and adverse after construction. These actions would focus visitor use activities in less sensitive areas (e.g., designated trails), thereby protecting areas that are adjacent to waterways.

The expansion of horseback riding to the Beech Creek unit, the Oxbow area of the Beaumont unit, and the Lance Rosier unit would likely increase waste from horses in localized drainages. The intensity of the impact would depend on the number of horses that are allowed on these new trails. Waste from the horses could result in long-term, minor, adverse, and localized impacts on water quality.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to water quality in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies. Overall, alternative 4 would result in a minor, long-term, adverse impact on the preserve's water quality, primarily due to the deposition

of sediments and wastes from increased visitor use.

Cumulative Impacts. Several sources of water pollution external to Big Thicket National Preserve have affected, and are likely to continue affecting, the water quality of the preserve. These sources of adverse impact to the preserve's water quality include industry outfalls from paper mills and refineries, pollutants from private septic tanks, and the USACE Sabine-Neches Waterway Improvement Project. Once implemented, the Texas Commission on Environmental Quality's Environmental Flows Law would have long-term, beneficial impacts on preserve waterways. When the effects of the above actions are added to the long-term, minor, adverse water quality impacts, of alternative 4, there could be a moderate, long-term, adverse cumulative impact to the preserve's water quality, depending on the type and quantity of pollutants that enter preserve waters. However, the increment added by the alternatives would be relatively small compared to the impact from pollutants being added from actions outside the preserve boundary.

Conclusion. Under alternative 4, there would be minor, long-term, adverse impacts to the preserve's water quality in localized areas, primarily due to visitor activities (e.g., contact recreation activities, improper disposal of human waste in areas without sanitation facilities, waste from horse use, effluent spills from noncompliant houseboats, and emissions from motorboats). When the effects of alternative 4 are added to the effects of water pollution from sources outside the preserve, there could be a long-term, moderate, adverse cumulative effect on the preserve's water quality. However, the actions in alternative 4 would add only a small increment to the overall cumulative impact.

VEGETATION

Methodology

The methodology and intensity levels used to evaluate impacts on vegetation are provided below.

- **Negligible:** Impacts would result in a change to native vegetation, or the natural processes sustaining them, but the change would be so slight that it would not be of any measurable or perceptible consequence.
- **Minor:** Impacts would result in a change to native vegetation, or the natural processes sustaining them, but the change would be small and of little consequence and would be expected to be localized. Mitigation measures, if needed to address adverse effects, would be simple and successful.
- **Moderate:** Impacts would result in a change to native vegetation, or the natural processes sustaining them, and the change would be readily detectable and could occur in several units. Mitigation measures, if needed to address adverse effects, could be extensive, but would likely be successful.
- **Major:** Impacts would result in a change to native vegetation, their habitats, or the natural processes sustaining them, and the change would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to address any adverse effects, and their success would not be guaranteed.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. No major facility developments would occur under alternative 1 that would have the potential to affect vegetation in the preserve. Maintenance of existing facilities, roads, and trails would probably result in some trampling and removal of vegetation, resulting in short- or long-term, negligible to minor, adverse impacts in localized areas.

Minimally sized, primitive boat ramps and launches could be designated and positioned for minimal impact to resources, water trails could be designated with signs directing visitors to day use areas. Any necessary construction would be the minimum required to establish a primitive boat ramp or launch, or bringing an existing ramp or launch up to proper code for visitor health and safety. There would be some removal of vegetation, resulting in long-term, negligible to minor, adverse impacts to vegetation.

The possible establishment of district ranger stations outside the preserve would have no effects on vegetation because these ranger stations would be in existing buildings.

Visitor use of Big Thicket National Preserve, including hiking and backcountry camping, would continue to affect the preserve's vegetation. With use levels expected to stay at present levels or experience a slight increase, some vegetation would likely be lost due to the formation of social trails in popular use areas such as White Sand Beach. Vegetation along the waterways would continue to be trampled and damaged in places when visitors dock their boats, and walk up and down the shoreline. Some existing designated backcountry campsites would probably expand in area over time, and informal campsites would continue to be created or expanded, resulting in changes to and loss of vegetation in localized areas. However, none of these impacts would affect the integrity, distribution, or presence of native plant

communities in Big Thicket National Preserve. Thus, visitor use would be expected to continue to have a long-term, negligible to minor, adverse impact on the preserve's native vegetation in localized areas.

Overall, alternative 1 would be expected to have a negligible to minor, long-term, adverse impact on the preserve's native vegetation, primarily due to continuing trampling and disturbance of plants by visitors.

Cumulative Impacts. Several actions, independent of this alternative, have affected and continue to affect the preserve's vegetation. As described in the "Affected Environment" chapter, much of the preserve's vegetation has been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable developments on adjacent lands, including new oil and gas exploration and the development of new homes would be expected to alter the area's vegetation. The adverse impacts of all of these actions would be long term and moderate to major in extent.

When the effects of all these past and future actions are added to the effects of alternative 1, there would be a long-term, moderate to major, adverse, cumulative effect on the preserve's vegetation. However, the effects of alternative 1 would add a very small increment to the overall adverse cumulative impact.

Conclusion. Alternative 1 would continue to result in long-term, negligible to minor, adverse impacts on the preserve's native vegetation, primarily due to visitor use (e.g., trampling of vegetation). When the effects of alternative 1 are added to other past, present, and future actions occurring independent of this general management plan, such as the continuation of oil and gas exploration and development activities, a moderate to major, long-term, adverse cumulative impact would be expected to the area's native vegetation. The effects of alternative 1 would add a very

small increment to the overall cumulative effect.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. New facility construction under alternative 2 would be minimal. To minimize impacts on vegetation, proposed facilities would be developed outside the preserve boundaries to the extent possible. Some facilities such as boat ramps, parking areas, picnic and day use areas, or trails could be constructed as appropriate to facilitate visitor activities. Vegetation would be removed, trampled, or modified as a result of construction and use of these facilities. Depending on the type and extent of construction activities, these adverse, long-term impacts on vegetation would range from minor to moderate.

Under alternative 2, additional trails for hikers, mountain bikers, and horses would be developed where appropriate, and new trailheads with visitor parking would be constructed. Mountain biking would be expanded and allowed on an existing administrative road in the Beech Creek unit (Magnolia Trail and Loblolly Loop) and the northeast portion of the Lance Rosier unit. Horseback riding would be expanded and allowed on trails in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the northeast portion of the Lance Rosier unit. Some of these new trails could be built on lands with native vegetation, while others would reuse abandoned roadbeds as trails. The process of adding new trails or restoring existing trails could lead to visitor trampling of vegetation, as would the increased opportunities for hiking, mountain biking, and horseback riding. The adverse effects of trail development and of increased numbers of horses and mountain bikes would be long term and negligible to minor. Construction of a hardened accessible hunter trail would have long-term, negligible adverse impacts on native vegetation.

Twenty backcountry campsites (10 feet by 10 feet each) could be developed along land and water trails; these campsites could result in the loss of vegetation in about a 2,000-square foot area. This action also would result in an increased impact on vegetation through visitor trampling. The effects would likely be long-term, minor, and adverse.

Visitor access and promotion of low-impact use would be expanded under alternative 2, potentially resulting in additional impacts on vegetation through visitor trampling along land and water trails and at primary visitor use areas. The impact would be long-term, negligible to minor, adverse, and localized.

In this alternative, fire management activities would be expanded for the purpose of ecological restoration of native biodiversity, including the vegetation of the wetland pine savanna and longleaf pine communities. Fire is frequently necessary for the reproduction of some forest tree species, and these management efforts would regenerate vegetation, contributing a long-term, moderate, beneficial impact.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to vegetation in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 2 would result in a long-term, minor, adverse impact to the preserve's native vegetation, primarily due to increased visitor use and development of new facilities.

Cumulative Impacts. Several actions, independent of this general management plan, could affect the preserve's vegetation. As described in the "Affected Environment" chapter, much of the preserve's vegetation has been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable developments on adjacent lands, including new oil and gas exploration and development activities, and the development of new homes and roads, also would adversely affect the area's vegetation. The impacts of these actions on vegetation in the area would be adverse, long-term, and moderate to major in extent.

When the effects of the actions in alternative 2, including the minor, long-term adverse effects of increased visitor use and development of new facilities, and the beneficial effects of fire management activities are added to past, present, and foreseeable future impacts of actions external to the preserve, there would be a long-term, moderate to major, adverse cumulative impact on area vegetation. However, effects of the actions independent of this general management plan far outweigh the impacts of the actions being proposed in alternative 2—the effects of alternative 2 would add a very small increment to the overall cumulative impact.

Conclusion. Alternative 2 would have some beneficial effects on the preserve's native vegetation due to new fire management activities. But overall, the alternative would result in and long-term, minor, adverse impacts on the preserve's native vegetation, primarily due to visitor use (e.g., trampling of vegetation) and development of new facilities. When the effects of alternative 2 are added to other past, present, and future actions occurring independent of this general management plan, such as the continuation of oil and gas exploration and development, a moderate to major, long-term, adverse cumulative impact would be expected to the area's native vegetation. The effects of alternative 2 would add a very small

increment to the overall adverse cumulative effect.

Alternative 3

Analysis. New facility construction under alternative 3 would be minimal. To minimize impacts on vegetation, proposed facilities would be developed outside preserve boundaries. Some facilities such as boat ramps, parking areas at Johns Lake, and Lower Cypress area, picnic and day use areas, or trails could be constructed as appropriate to facilitate visitor activities. Vegetation would be removed, trampled, or modified as a result of construction and use of these facilities. Depending on the type and extent of construction activities, these long-term, adverse impacts on vegetation would range from negligible to minor.

If feasible, the Lily Bunkhouse would be designated for demolition with a short-term, negligible, adverse, and localized effect due to construction equipment affecting vegetation in the project area. However, with restoration of this area there would be a long-term, negligible to minor, beneficial effect.

Under alternative 3, additional trails for hikers, mountain bikers, and horses would be developed where appropriate, and new trailheads with visitor parking would be constructed. Mountain biking and horseback riding would be expanded to a multiuse trail in the Beech Creek unit. Some of these new trails would be built on lands with native vegetation, while others would reuse abandoned roadbeds as trails. The process of adding new trails or restoring existing trails could lead to visitor trampling of vegetation, as would increased opportunities for hiking, mountain biking, and horseback riding. The adverse effects of trail development and increased numbers of horses and mountain bikes would be long term and negligible to minor.

Current backcountry camping opportunities would continue to be offered in areas that are designated for camping. This would result in

some trampling and removal of vegetation. The effects on vegetation would be long-term, negligible, and adverse.

In alternative 3, fire management activities would be expanded for the purpose of ecological restoration of native biodiversity, including vegetation of the wetland pine savanna and longleaf pine communities. Fire is frequently necessary for the reproduction of some forest tree species, and these management efforts would regenerate vegetation, contributing a long-term, moderate, beneficial impact.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to vegetation in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 3 would result in a long-term, negligible to minor, adverse impact to the preserve's native vegetation, primarily due to increased visitor use and the development of new facilities.

Cumulative Impacts. Several potential actions, independent of this general management plan, could affect preserve vegetation. As described in the "Affected Environment" chapter, much of the preserve's vegetation has been altered by past human activities, including logging, and oil and gas exploration. Current and reasonably foreseeable developments on adjacent lands, including new oil and gas exploration and development, and development of new

homes and roads, would also alter the area's vegetation.

When the effects of the actions in alternative 3, including the negligible to minor, long-term adverse effects of increased visitor use and development of new facilities, and the beneficial effects of fire management activities, are added to the past, present, and future impacts external to the preserve, there would be a long-term, moderate to major, adverse cumulative impact on area vegetation. However, the actions in alternative 3 would contribute a very small increment to the overall impact.

Conclusion. Alternative 3 would have beneficial effects on the preserve's native vegetation due to new fire management activities. But overall the alternative would result in long-term, negligible to minor, adverse impacts on the preserve's native vegetation, primarily due to visitor use (e.g., trampling of vegetation) and development of new facilities. When the effects of alternative 3 are added to other past, present, and future actions occurring independent of this general management plan, such as the continuation of oil and gas exploration and development activities, a moderate to major, long-term, adverse cumulative impact would be expected to the area's native vegetation. The effects of alternative 3 would add a very small increment to the overall adverse cumulative effect.

Alternative 4

Analysis. Under alternative 4, new facilities would be minimal and dispersed. Some facilities, such as boat ramps, parking areas, picnic and day use areas, or trails, could be constructed as appropriate to facilitate visitor activities. Vegetation would be removed, trampled, or modified as a result of construction and use of these facilities. Depending on the type and extent of construction activities, these long-term, adverse impacts on vegetation would range from minor to moderate.

Under alternative 4, additional trails could be developed to provide new or improved visitor access including undeveloped areas. The construction and improvement activities of these new roads and trails could lead to visitor trampling of vegetation, as would the increased opportunities for hiking, mountain biking, and horseback riding. Mountain biking and horseback riding would be expanded and allowed on trails in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the Lance Rosier unit. The adverse effects of trail development and of increased horse and mountain bike use would be long term and minor.

Twenty backcountry campsites could be developed (10 feet by 10 feet each) along land and water trails, which would result in the loss of vegetation in about a 2,000-square foot area. This action would result in an increased impact on vegetation through visitor trampling. The effects would likely be long term, minor, and adverse.

Visitor access and promotion of low-impact use would be expanded under alternative 4, potentially resulting in additional impacts on vegetation through visitor trampling along land and water trails and at primary visitor use areas. The impact would be long-term, negligible to minor, adverse, and localized.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to vegetation in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 4 would result in a long-term, minor, adverse impact to the preserve's native vegetation, primarily due to increased visitor use and development of new facilities.

Cumulative Impacts. Several potential actions, independent of this general management plan, could affect the preserve's vegetation. As described in the "Affected Environment" chapter, much of the preserve's vegetation has been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable developments on adjacent lands, including new oil and gas exploration and development and the development of new homes and roads, would also alter the area's vegetation. The adverse impacts of all of these actions would be long term and moderate to major in extent.

When the effects of the actions in alternative 4, including the minor, long-term adverse effects of increased visitor use and development of new facilities, are added to the past, present, and future impacts external to the preserve, there would be a long-term, moderate to major, adverse cumulative impact on area vegetation. However, the actions in alternative 4 would contribute a very small increment to the overall adverse cumulative impact.

Conclusion. Alternative 4 would result in long-term, minor, adverse impacts on the preserve's native vegetation, primarily due to visitor use (e.g., trampling of vegetation) and development of new facilities. When the effects of alternative 4 are added to other past, present, and future actions occurring independent of this general management plan, such as the continuation of oil and gas exploration and development, a moderate to major, long-term, adverse cumulative impact would be expected on the area's native vegetation. The effects of alternative 4 would add a very small increment to the overall cumulative effect.

WETLANDS

Methodology

The methodology and intensity levels used to evaluate impacts on wetlands are provided below.

- **Negligible:** Impacts would result in a change to wetland values and functions, but the change would be so slight that it would not be of any measurable or perceptible consequence.
- **Minor:** Impacts would result in a change to wetland values and functions that would be detectable, but the change would be small and of little consequence and would be expected to be localized. Mitigation measures, if needed to address adverse effects, would be simple and successful.
- **Moderate:** Impacts would result in a change to wetland values and functions that would be readily detectable and could occur in several units. Mitigation measures, if needed to address adverse effects, would be extensive and likely successful.
- **Major:** Impacts would result in a change to wetlands values and functions that would have substantial consequences on a regional scale. Extensive mitigation measures would be needed to address any adverse effects, and their success would not be guaranteed.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. Under alternative 1, some impacts would continue to occur due to people walking through the wetlands and trampling

vegetation, or degrading wetland water quality through human waste, resulting in short-term, negligible, adverse impacts to wetland vegetation. Backcountry camping would continue to occur possibly in areas near wetland vegetation, resulting in long-term, negligible to minor, adverse impacts to wetland vegetation from vegetation trampling or removal, soil erosion, compaction, and sedimentation in wetlands, and from human waste.

No major facility developments would occur under alternative 1 that would have the potential to affect wetlands in the preserve. Minimally sized, primitive boat ramps and launches could be designated and positioned for minimal impact to resources; water trails could be designated with signs directing visitors to day use areas. Any necessary construction would be the minimum required to establish a primitive boat ramp or launch, or bringing an existing ramp or launch up to proper code for visitor health and safety (less than 0.1 acre in size), resulting in short-term, negligible to minor, adverse impacts to wetland vegetation.

Overall, alternative 1 would have a negligible to minor, long-term, adverse impact on wetlands, primarily due to visitor activities and the development of some new small facilities.

Cumulative Impacts. Several actions independent of this general management plan could affect the preserve's wetlands. As described in the "Affected Environment" chapter, much of the preserve's wetlands have been altered by past human activities, including logging and oil and gas exploration. Current and future development and uses on adjacent lands, including oil and gas exploration and development activities, and the construction of new homes and roads, would also alter the area's wetlands, resulting in a moderate to major, long-term, adverse impact.

When the effects of all these past, present, and future actions are added to the effects of

alternative 1, there would be a long-term, moderate to major, adverse, cumulative effect on the area's wetlands. However, the effects of the actions independent of this general management plan far outweigh the impacts of the actions being proposed in alternative 1—the effects of alternative 1 would add a very small increment to the overall adverse cumulative impact to wetlands.

Conclusion. Alternative 1 would continue to result in long-term, negligible to minor, adverse impacts on the preserve's wetlands due to visitor use (e.g., trampling and human waste), and some minimal facility development. When the effects of alternative 1 are added to other past, present, and future actions occurring independent of this general management plan, such as the continuation of oil and gas exploration and development, a moderate to major, long-term, adverse cumulative impact would be expected to the area's wetlands. The effects of alternative 1 would add a very small increment to the overall cumulative effect.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. As in alternative 1, some impacts would occur due to people walking through wetlands and trampling vegetation, resulting in long-term, negligible adverse impacts.

Generally, new facility construction under alternative 2 would be minimal. To minimize impacts on wetlands, proposed facilities would be developed outside the preserve and wetlands areas to the extent possible.

The construction of docks and boat ramps under alternative 2, including small ramps and launches and a small floating dock on the Neches River in the Canyonlands unit, could result in the loss or alteration of wetland vegetation and soils. Additional trails for hikers, mountain bikers, and horses would be developed in the northeastern portion of the Lance Rosier unit. Some of these new trails could be built on wetlands, which would result in the loss of some plants, and

compaction of soils. Assuming use of best management practices during construction, and careful monitoring and management of impacts during use, the overall impacts would likely be long-term, negligible to minor, and adverse. Less than 0.1 acre of wetlands would likely be affected.

Visitor access and use would be expanded throughout the preserve under alternative 2. Encouragement of water-based recreation and increased use of water trails, such as the Village Creek Paddle Trail, and those in the Cook's Lake/Scatterman Lake area, could lead to greater visitation, which could adversely affect wetlands in localized areas (e.g., soil compaction, displacement of wetland vegetation). The impact would be long term and negligible to minor.

Use of motorized boats, other than personal watercraft, would be allowed in the Neches River and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook's and Scatterman Lakes. Impacts on wetlands from motorboat use would include decrease in water quality from resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on wetlands from such activities would likely be long-term, negligible to minor, and adverse. Houseboats would still be allowed in the preserve, but would be subject to regulations. Houseboats meeting regulatory standards could still discharge some pollutants, which would have negligible to minor, long-term, adverse impacts on wetlands.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to wetlands in the preserve. Specific actions that

may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, under alternative 2 there would be negligible to minor, adverse impacts to wetlands in localized areas, primarily due to visitor use (e.g., use of motorized boats) and the establishment of a few small facilities.

Cumulative Impacts. Several actions independent of this general management plan could affect the preserve's wetlands. As described in the "Affected Environment" chapter, much of the preserve's wetlands have been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable development on adjacent lands, including oil and gas exploration and development and the construction of new homes and roads, would also alter the area's wetlands, resulting in a long-term, moderate to major adverse impact.

When the effects of all these past, present, and future actions are added to the negligible to minor, adverse effects of alternative 2, there would be a long-term, moderate to major, adverse cumulative effect on the preserve's wetlands. However, the effects of alternative 2 would add a very small increment to the overall cumulative impact.

Conclusion. Alternative 2 would result in long-term, negligible to minor, adverse impacts on the preserve's wetlands, due to visitor use (e.g., trampling, and improper sanitation activities), and some minimal facility development. When the effects of alternative 2 are added to other past, present, and future actions occurring independent of this alternative, such as the continuation of oil and gas exploration and development, a moderate to major, long-term, adverse cumulative impact would be expected to the preserve's wetlands. The effects of alternative

2 would add a very small increment to the overall adverse cumulative effect.

Alternative 3

Analysis. As in alternative 1, some impacts would occur due to people walking through wetlands, trampling vegetation, resulting in long-term, negligible adverse impacts.

Generally, new facility construction under alternative 3 would be minimal. To minimize impacts on wetlands, proposed facilities would be developed outside the preserve and wetlands boundaries to the extent possible.

Under alternative 3, additional trails for hikers, mountain bikers, and horses would be developed where appropriate, some of which could be in wetlands. Construction of these trails could affect wetland plants and soils. The construction of docks and boat ramps under alternative 3, including boat ramps at Johns Lake, Lower Cypress area of the Beaumont unit, and in association with Lamar University, could impact wetlands: visitors could trample vegetation and water quality could decrease. Assuming use of best management practices during construction and careful monitoring and management of impacts during visitor use, the overall impacts would likely be long term, negligible to minor, and adverse. Less than 0.1 acre of wetlands would likely be affected.

Visitor access and use would be expanded throughout the preserve under alternative 3. Encouragement of water-based recreation and increased use of water trails, such as the Village Creek Paddle Trail, and the Cook's Lake-Scatterman Lake and the Johns Lake-Franklin Lake areas, could lead to greater visitation. This could adversely affect wetlands in localized areas (e.g., soil compaction, displacement of wetland vegetation). The impact would be long term and negligible to minor.

Use of motorized boats, other than personal watercraft, would continue in the Neches River and Pine Island Bayou from the end of

Carpenter Road to the confluence with the Neches River including Cook's Lake. Impacts on wetlands from motorboat use would include decreases in water quality from resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on wetlands from such activities would likely be long-term, negligible to minor, and adverse. Conversely, the prohibition of houseboats in the preserve would eliminate the discharge of pollutants, resulting in a long-term, negligible to minor, beneficial impact on wetlands.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to wetlands in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, under alternative 3 there would be negligible to minor, adverse impacts to wetlands in localized areas, primarily due to visitor use (e.g., use of motorized boats) and the establishment of a few small facilities.

Cumulative Impacts. Several actions independent of this general management plan could affect the preserve's wetlands. As described in the "Affected Environment" chapter, much of the preserve's wetlands have been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable development on adjacent lands, including oil and gas exploration and development, and the construction of new homes and roads would also alter the area's wetlands.

When the effects of all these past, present, and future actions are added to the negligible to minor, adverse effects of alternative 3, there would be a long-term, moderate to major, adverse, cumulative effect on the area's wetlands. However, the effects of alternative 3 would add a very small increment to the overall adverse cumulative impact.

Conclusion. Alternative 3 would result in short- and long-term, negligible to minor, adverse impacts on the preserve's wetlands due to visitor use (e.g., trampling and improper sanitation activities), and some minimal facility development. When the effects of alternative 3 are added to other past, present, and future actions occurring independent of this general management plan, such as oil and gas exploration and development, a moderate to major, long-term, adverse, cumulative impact would be expected to the area's wetlands. The effects of alternative 3 would add a very small increment to the overall adverse cumulative effect.

Alternative 4

Analysis. As in alternative 1, some impacts would occur due to people walking through wetlands, trampling vegetation, resulting in short- and long-term, negligible, adverse impacts.

Generally, new facility construction under alternative 4 would be minimal. To minimize impacts on wetlands, proposed facilities would be developed outside boundaries of the preserve and wetlands to the extent possible.

The construction of docks and boat ramps under alternative 4, including a small floating dock on the Neches River in the Canyonlands unit, could result in the loss or alteration of wetland vegetation and soils. Additional trails for hikers, mountain bikers, and horses would be developed where appropriate in the Lance Rosier unit. Some of these new trails could be built in wetlands,

which would result in the loss of some vegetation and compaction of soils. Assuming use of best management practices during construction and careful monitoring and management of impacts during use, the overall impacts would likely be short and long term, negligible to minor, and adverse. Less than 0.1 acre of wetlands would likely be affected.

Visitor access and use would be expanded throughout the preserve under alternative 4. Encouragement of water-based recreation and increased use of water trails, such as the Village Creek Paddle Trail and in the Cook's Lake-Scatterman Lake area, could lead to greater visitation. This could adversely affect wetlands in localized areas (e.g., soil compaction, displacement of wetland vegetation). The impact would be long term, and negligible to minor.

Use of motorized boats, other than personal watercraft, would continue in all navigable waters except where prohibited for conflicting uses. Impacts on wetlands from motorboat use would include decreases in water quality from resuspension of sediments and the introduction of additional petrochemicals into the immediate environment. Impacts on wetlands from such activities would likely be long term, negligible to minor, and adverse. Houseboats would still be allowed in the preserve, but would be subject to regulations. Houseboats meeting regulatory standards would still discharge some pollutants, which would have negligible to minor, long-term, adverse impacts on wetlands.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to wetlands in the preserve. Specific actions that

may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, under alternative 4 there would be negligible to minor, adverse impacts to wetlands in localized areas, primarily due to visitor use (e.g., use of motorized boats) and the establishment of a few small facilities.

Cumulative Impacts. Several actions independent of this general management plan could affect the preserve's wetlands. As described in the "Affected Environment" chapter, much of the preserve's wetlands have been altered by past human activities, including logging and oil and gas exploration. Current and reasonably foreseeable developments on adjacent lands, including oil and gas exploration and development and the construction of new homes and roads, would alter the area's wetlands, resulting in a long-term, moderate to major, adverse impact.

When the effects of all these past, present, and future actions are added to the negligible to minor, adverse effects of alternative 4, there would be a long-term, moderate to major, adverse, cumulative effect on the preserve's wetlands. However, the effects of alternative 4 would add a very small increment to the overall cumulative impact.

Conclusion. Alternative 4 would result in short- and long-term, negligible to minor, adverse impacts on the preserve's wetlands due to visitor use (e.g., trampling and improper sanitation activities), and some minimal facility development. When the effects of alternative 4 are added to other past, present, and future actions occurring independent of this general management plan, such as oil and gas exploration and development, a moderate to major, long-term, adverse cumulative impact would be expected to the area's wetlands. The effects of alternative 4 would add a very small

increment to the overall adverse cumulative effect.

FISH AND WILDLIFE

Methodology

The methodology and intensity levels used to evaluate impacts on fish and wildlife are provided below.

- **Negligible:** Impacts would result in a change to a population or individuals of a species or a resource, but the change would be well within the range of natural fluctuations. The changes would be so slight that they would not be of any measurable or perceptible consequence to native fish and wildlife species, their habitats, or the natural processes sustaining them.
- **Minor:** Impacts would result in a change to a population or individuals of a species or a resource that would be detectable, but they would not be expected to be outside the natural range of variability of native species, their habitats, or the natural processes sustaining them. Population numbers, population structure, genetic variability, and other demographic factors for species may have small temporary changes, but long-standing characteristics remain stable and viable. Occasional responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, or other factors impacting population levels. Key ecosystem processes may have disruptions that would be within natural variation. Sufficient habitat would remain functional to maintain viability of all species. Impacts would be outside of critical reproduction periods for sensitive species.

Mitigation measures, if needed to offset adverse effects, would be simple and successful.

- **Moderate:** Impacts would result in a change to a population or individuals of a species or a resource that would be readily detectable, long term, and localized, with consequences at the population level. Breeding animals of concern are present; animals are present during particularly vulnerable life stages such as migration or juvenile states; mortality or interference with activities necessary for survival can be expected on an occasional basis, but is not expected to threaten the continued existence of the species in the park unit. Impacts on native fish and wildlife species, their habitats, or the natural processes sustaining them would be detectable, and they could be outside the natural range of variability for short periods of time. Population numbers, population structure, genetic variability, and other demographic factors for species may have temporary changes, but would be expected to rebound to preimpact numbers and to remain stable and viable. Frequent response to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, or other factors temporarily impacting population levels. Key ecosystem processes might have temporary disruptions that would be outside natural variation (but would soon return to natural conditions). Sufficient habitat would remain functional to maintain variability of all native fish and wildlife species. Some impacts might occur during critical periods of reproduction or in key habitat for sensitive native species. Mitigation measures, if needed to offset adverse effects, could be extensive, but would likely be successful.

- **Major:** Impacts on native fish and wildlife species, their habitats, or the natural processes sustaining them would be detectable, and they would be expected to be outside the natural range of variability for long periods of time or would be permanent. Population numbers, population structure, genetic variability, and other demographic factors for species might have large, temporary declines with long-standing population numbers significantly depressed. Frequent responses to disturbance by some individuals would be expected, with negative impacts to feeding, reproduction, or other factors resulting in a decrease in population levels. Breeding colonies of native species might relocate to other portions of the preserve. Key ecosystem processes might be disrupted in the long term or permanently. Loss of habitat may affect the viability of at least some native species. Extensive mitigation measures would be needed to offset any adverse effects and their success would not be guaranteed.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. No major facility developments would occur under alternative 1 that would affect fish and wildlife populations in the preserve. Continued maintenance of existing facilities, roads, and trails would probably result in some trampling and removal of vegetation in habitats or erosion, sedimentation and runoff affecting fish species' habitat, resulting in a long-term, negligible to minor, adverse impact in localized areas.

Minimally sized, primitive boat ramps and launches could be designated and positioned for minimal impact to resources. Any necessary construction would be the minimum required to establish a primitive

boat ramp or launch, or bringing an existing boat ramp or launch up to proper code for visitor health and safety. This action would result in the loss of some vegetation and wildlife habitat, resulting in long-term, negligible adverse impacts to fish and wildlife populations in localized areas.

The possible establishment of district ranger stations outside the preserve would have no effects on wildlife populations or habitat because these ranger stations would be in existing buildings.

In alternative 1 human use of the preserve would continue to be concentrated in areas such as White Sands Beach and the preserve's shorelines. Animals sensitive to human presence and noise-generating activities already avoid these areas when people are present. Although wildlife that occupy these areas when visitors are present, such as squirrels, mice, and deer, are mostly adapted to the presence of people, wildlife behavior would continue to be affected. In areas with backcountry camping, visitors would likely continue to disturb and temporarily displace some wildlife. Courtship, territory establishment, intra-species communication, predation and predator avoidance, and effective use of habitat would continue to be affected by the noise of visitors. That said, it is expected that fish and wildlife in the areas with higher use would not be noticeably affected by the actions being taken in alternative 1—the effects of continuing visitor use generally would be expected to have a long-term, negligible, adverse impact on wildlife populations and habitats in the preserve.

Some animals would continue to occasionally be injured or killed by motor vehicles driving on roads through the preserve. Some animals, such as mice, squirrels, and birds, also probably would continue to be attracted by visitors feeding them or to areas where food and garbage are available. Even with continued efforts to educate the public on not feeding wildlife, long-term, negligible to minor, adverse effects on wildlife would

likely occur from these activities in localized areas.

The continuation of hunting and trapping would not be expected to adversely affect the preserve's wildlife populations, assuming that harvests stay at about existing levels and there was careful monitoring and enforcement of federal and state regulations by preserve staff and the State of Texas. No changes would be expected in the wildlife population levels in the preserve.

Overall, alternative 1 would have a long-term, negligible, adverse impact on fish and wildlife populations in the preserve, primarily due to continuing visitor use and the establishment of a few small facilities.

Cumulative Impacts. Like vegetation, several actions, independent of this general management plan, could affect the preserve's wildlife. Past uses such as logging have impacted wildlife habitat by eliminating the presence of old growth forests. Current and future development on lands adjacent to the preserve, including new oil and gas exploration and development, and construction of new roads and homes, could affect the behavior of some wildlife, displace some wildlife, and result in the loss and modification of wildlife habitat in these areas. In addition, noise generated by human activities in the vicinity of the preserve such as from off-road vehicles and traffic, could also disturb or displace some wildlife, particularly if these uses were to increase. These actions would likely have a long-term, moderate to major, adverse impact on wildlife populations in or near the preserve. When the negligible adverse effects of alternative 1 are added to the effects of actions occurring independent of this general management plan, there could be a moderate, adverse cumulative impact on wildlife populations in the area. However, alternative 1 would add a very small increment to the overall adverse cumulative impact.

Conclusion. Most wildlife populations in the preserve would not change as a result of the

actions in this alternative. No actions would affect areas known to be important for breeding, nesting, foraging, or key migration routes. No actions would interfere with feeding, reproduction, or other activities necessary for the survival of wildlife species. Long-term, negligible to minor, adverse impacts would continue to occur to wildlife due to continuing visitor use of the preserve. Past, present, and future actions independent of alternative 1 would likely result in a long-term, moderate to major, adverse cumulative impact on wildlife populations in or near the preserve. The increment added by alternative 1 to the overall cumulative impact would be very small.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. New facility construction under alternative 2 would be somewhat minimal. To minimize impacts on fish and wildlife, proposed occupied facilities would be developed outside preserve boundaries to the extent possible, as well as sited in areas that have already been altered by human activities.

Under alternative 2, additional roads and land trails would be developed where appropriate, and new trailheads with visitor parking would be constructed, while minor improvements to existing parking facilities would be made. The construction and improvement activities of these new trails and trailheads (e.g., Beaumont, Lance Rosier, and Canyonlands units) would result in some habitat disturbance. This alternative also explores the possible reuse of abandoned roadbeds as trails (e.g., Lance Rosier and Beech Creek units). New trails in the Lance Rosier and Neches Bottom and Jack Gore Baygall units would increase access to sand mounds, which are identified as special management areas. Trail expansions would also provide increased opportunities for mountain biking on an existing administrative road in the Beech Creek unit and the northeast portion of the Lance Rosier unit, and horseback riding on trails in the Beech

Creek unit, the Oxbow area of the Beaumont unit, and the northeast portion of the Lance Rosier unit. A hardened accessible hunting trail would also be built. All of these activities would contribute to habitat alteration or loss. Animals could flush from human presence or noise, thus interrupting foraging, mating, or nesting activities. Assuming the use of best management practices (such as placement of trails as close to existing sources of disturbance as possible, minimization of facility footprints, and timing of construction outside peak breeding and nesting seasons) the overall impacts would likely be short term, negligible to minor, and adverse during construction, and long term, negligible to minor, and adverse after construction from visitor use.

The development of 20 backcountry campsites (10 feet by 10 feet each) could contribute to increases in habitat alteration and introduction and spread of invasive species. Development and use of these campsites could lead to the disturbance or displacement of wildlife in the surrounding areas, resulting in long-term, negligible to minor, adverse impacts.

The improvement and subsequent use of water trails, such as the Village Creek Paddle Trail and the Cook's Lake / Scatterman Lake area, would disturb or temporarily displace some fish and wildlife, resulting in a long-term, negligible, adverse effect. The use of motorized boats in the preserve, other than personal watercraft, would be allowed in the Neches River and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook's and Scatterman lakes and would result in habitat alteration. The use of motorized boats could lead to the introduction and spread of invasive species, and noise could disturb or temporarily displace some wildlife. Overall, the changes in use of motorized boats under alternative 2 would result in long-term, negligible to minor, adverse effects on fish and wildlife.

Visitor access and promotion of low-impact use would be expanded under alternative 2, potentially resulting in additional impacts on fish and wildlife through disturbance along land and water trails and at primary visitor use areas. The impact would be long term, negligible, adverse, and localized.

In alternative 2, implementation of a nonmotorized boating area upstream from Village Creek's confluence with the Highway 96 bridge would restrict boat traffic and landings, benefiting fish and wildlife in these areas.

In this alternative, fire management activities would be expanded for the purpose of ecological restoration. These management efforts would temporarily disturb vegetation and the environment of the wetland pine savanna and longleaf pine communities that provide food and shelter for wildlife species. However, species adapted to these communities prosper from the effect of fires, contributing a long-term, minor to moderate, beneficial impact on wildlife.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to fish and wildlife in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 2 would result in a negligible to minor, long-term, adverse impact to wildlife populations and habitats in localized areas in the preserve, primarily due

to increased visitor use and the development of some new facilities.

Cumulative Impacts. Like vegetation, several actions, independent of this general management plan, could affect the preserve's wildlife. Past uses such as logging have impacted wildlife habitat by eliminating the presence of old growth forests. Current and future development on lands adjacent to the preserve, including oil and gas exploration and development and construction of new homes and roads, could affect the behavior of wildlife, displace some wildlife, and result in the loss and modification of wildlife habitat in these areas. In addition, noise generated by human activities in the vicinity of the preserve such as from off-road vehicles and traffic could also disturb or displace some wildlife, particularly if these uses were to increase. These actions would likely have a long-term, moderate, adverse impact on wildlife populations in or near the preserve.

When the effects of the actions in alternative 2, including the negligible to minor, long-term adverse effects of increased visitor use and the development of new facilities and the beneficial effects of new fire management activities, are added to the past, current, and future actions independent of this general management plan, there could be a moderate, long-term, adverse cumulative impact to the preserve's wildlife populations, depending on several outside factors. However, the increment added by the alternatives would be relatively small compared to the impact from actions outside the preserve boundary.

Conclusion. Most wildlife populations in the preserve would not change as a result of the actions in this alternative. No actions would affect areas known to be important for breeding, nesting, foraging, or key migration routes. No actions would interfere with feeding, reproduction, or other activities necessary for the survival of wildlife species. Long-term, negligible to minor, adverse impacts would occur to wildlife in localized areas due to visitor use and the construction of a few new facilities. When the effects of

past, present, and future actions independent of this general management plan are added to the effects of alternative 2, there could be a long-term, moderate, adverse cumulative impact on wildlife populations in the preserve. But the increment added by alternative 2 to the overall adverse cumulative impact would be very small.

Alternative 3

Analysis. New facility construction under alternative 3 would be minimal. To minimize impacts on fish and wildlife, proposed facilities would be developed outside the preserve boundaries, as well as sited in areas that have already been altered by human activities. Under alternative 3, boat ramps would be built at Johns Lake, the Lower Cypress area of the Beaumont unit, and in association with Lamar University. These developments could result in habitat loss and degradation, both of which could be reduced by strategic location and design. These developments could have a long-term, negligible adverse effect on fish and wildlife in these areas.

Under alternative 3, additional roads and land trails would be developed where appropriate, and new trailheads with visitor parking would be constructed, while minor improvements to existing parking facilities would be made. The construction and improvement activities of these new trails and trailheads (e.g., Beaumont, Lance Rosier, and Canyonlands units) would result in habitat disturbance. This alternative also explores the possible reuse of abandoned roadbeds as trails (e.g., Lance Rosier and Beech Creek units). New trails in the Lance Rosier and Neches Bottom and Jack Gore Baygall units would increase access to sand mounds, which have been identified as special management areas. Trail expansions on a multiuse trail in the Beech Creek unit would also provide increased opportunities for mountain biking and horseback riding. All of these activities would contribute to habitat alteration or loss. Animals could flush from human presence or noise, thus interrupting foraging, mating, or

nesting activities. Assuming the use of best management practices (such as placement of trails as close to existing sources of disturbances as possible, minimization of facility footprints, and timing of construction outside peak breeding and nesting seasons) the overall impacts from visitor use would likely be short term, negligible to minor, and adverse during construction, and long term, negligible to minor, and adverse after construction.

The improvement and subsequent use of water trails, such as the Village Creek Paddle Trail, and the Cook's Lake / Scatterman Lake and Johns Lake/Franklin Lake areas, would disturb or temporarily displace some fish and wildlife, resulting in a negligible, adverse, long-term effect. The use of motorized boats in the preserve, other than personal watercraft, would result in habitat alteration, could lead to the introduction and spread of invasive species, and noise could disturb or temporarily displace some wildlife. Overall, the changes in use of motorized boats would result in long-term, negligible to minor, adverse effects on fish and wildlife.

Visitor access and promotion of low-impact use would be expanded under alternative 3, potentially resulting in additional impacts on fish and wildlife through disturbance along land and water trails and at primary visitor use areas. The impact would be long-term, negligible, adverse, and localized.

Alternative 3 would have some beneficial effects on fish and wildlife. The implementation of a nonmotorized boating area upstream from Village Creek's confluence with the Neches River, on the Cook's Lake to Scatterman Lake loop, and in the Johns Lake to Franklin Lake waters would restrict boat traffic and landings. This action would benefit fish and wildlife in these areas by reducing disturbance by people. Likewise, the prohibition of houseboats in the preserve would benefit fish and wildlife by reducing disturbances. These actions would have a long-term, minor to moderate, beneficial effect on fish and wildlife. If

feasible, the Lily Bunkhouse would be designated for demolition; this action would result in a short-term, negligible, adverse, and localized effect during demolition and a long-term, negligible to minor, beneficial effect on wildlife once the area is restored.

In alternative 3, fire management activities would be expanded for the purpose of ecological restoration. These management efforts would temporarily disturb the vegetation and environment of the wetland pine savanna and longleaf pine communities that provide food and shelter for wildlife species. However, species adapted to these communities prosper from the effect of fires, contributing a long-term, minor to moderate, beneficial impact on wildlife.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to fish and wildlife in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 3 would result in a negligible to minor, beneficial effect on wildlife populations in the preserve, primarily due to reductions in disturbance by visitors and enhancement of vegetative communities through fire management activities.

Cumulative Impacts. Several actions, independent of this general management plan, could affect the preserve's wildlife. Past uses such as logging have impacted wildlife habitat by eliminating the presence of old growth forests. Current and future

development on lands adjacent to the preserve, including oil and gas exploration and development and construction of new homes and roads, could result in the displacement of some wildlife and the loss and modification of wildlife habitat in these areas. In addition, noise generated by human activities in the vicinity of the preserve such as from off-road vehicles and traffic could also disturb or displace some wildlife, particularly if these uses were to increase. These actions would likely have a long-term, moderate, adverse impact on wildlife populations in or near the preserve.

Past, present, and future impacts independent of this general management plan could have a long-term, moderate adverse cumulative impact on area wildlife.

When the effects of the actions in alternative 3, including the negligible to minor, long-term, adverse effects of increased visitor use and the development of new facilities and the beneficial effects of restricting motorized boats, and new fire management activities, are added to the effects of past, current, and future actions independent of this general management plan there could be a moderate, long-term, adverse cumulative impact to the preserve's wildlife, depending on a number of outside factors. However, the increment added by alternative 3 would be relatively small compared to the impact from actions outside the preserve boundary.

Conclusion. Most wildlife populations in the preserve would not change as a result of the actions in this alternative. No actions would affect areas known to be important for breeding, nesting, foraging, or key migration routes. No actions would interfere with feeding, reproduction, or other activities necessary for the survival of wildlife species. Alternative 3 would result in some long-term, negligible to minor, adverse impacts to fish and wildlife due to visitor use and some new developments in the preserve. But overall, alternative 3 would have a long-term, negligible to minor, beneficial effect on wildlife populations in the preserve, primarily

due to reductions in disturbance by visitors and enhancement of vegetative communities through fire management activities. When the effects of past, present, and future actions independent of this general management plan are added to the effects of alternative 3, there could be a long-term, moderate, adverse cumulative impact on wildlife populations in the preserve. But the increment added by alternative 3 to the overall cumulative impact would be very small.

Alternative 4

Analysis. New facility construction under alternative 4 would be minimal and more dispersed. To minimize impacts on fish and wildlife, proposed facilities would be sited in areas that have already been altered by human activities. Several new facilities in alternative 4 would result in the loss of some wildlife habitat. A small floating boat dock would be built in the Canyonlands unit. These developments could result in habitat degradation or loss, and would have a long-term, negligible to minor, adverse effect on fish and wildlife.

Under alternative 4, additional roads and land trails could be developed for new or improved visitor access into units including undeveloped areas, and new trailheads with visitor parking would be constructed, while minor improvements to existing parking facilities would be made. New trails in the Lance Rosier and Neches Bottom and Jack Gore Baygall units would increase access to sand mounds, which are protected as special management areas. Trail expansions would also provide increased opportunities for mountain biking and horseback riding in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the Lance Rosier unit. All of these activities would contribute to habitat alteration or loss. Animals could flush from human presence or noise, thus interrupting foraging, mating, or nesting activities. Assuming the use of best management practices (such as placement of trails as close to existing sources of disturbances as possible, minimization of facility footprints,

and the timing of construction to occur outside peak breeding and nesting seasons) the overall adverse impacts from visitor use would likely be short term, negligible to minor during construction, and long term, negligible to minor after construction.

The development of 20 backcountry campsites (10 feet by 10 feet each) could contribute to increases in habitat alteration and introduction and spread of invasive species. The development and use of these campsites could result in the disturbance or displacement of wildlife in the surrounding areas, resulting in short- and long-term, negligible to minor, adverse impacts.

The improvement and subsequent use of water trails, such as the Village Creek Paddle Trail, and in the Cook's Lake-Scatterman Lake and the Johns Lake-Franklin Lake areas, would disturb or temporarily displace some fish and wildlife, resulting in a long-term, negligible, adverse effect. The use of motorized boats in the preserve, other than personal watercraft, would result in habitat alteration, and could lead to the introduction and spread of invasive species; noise could disturb or temporarily displace some wildlife. In alternative 4, motorized boats would be prohibited due to conflicting uses in some areas, reducing disturbance of wildlife and resulting in a minor, long-term benefit to wildlife in these areas. Overall, the use of motorized boats would result in long-term, negligible to minor, adverse effect on fish and wildlife.

Visitor access and promotion of low-impact use would be expanded under alternative 4, potentially resulting in additional impacts on fish and wildlife through disturbance along land and water trails and at primary visitor use areas. The impact would be long term, negligible, adverse, and localized.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding,

houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to fish and wildlife in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 4 would result in a negligible to minor, long-term adverse impact to wildlife populations and habitats in localized areas in the preserve, primarily due to increased visitor use and the development of some new facilities.

Cumulative Impacts. Like vegetation, several actions, independent of this general management plan, could affect the preserve's wildlife. Past uses such as logging have impacted wildlife habitat by eliminating the presence of old growth forests. Current and future developments on lands adjacent to the preserve, including oil and gas exploration and development and construction of new homes and roads, could affect the behavior of wildlife, displace some wildlife, and result in the loss and modification of wildlife habitat in these areas. In addition, noise generated by human activities in the vicinity of the preserve such as from off-road vehicles and traffic could also disturb or displace some wildlife, particularly if these uses were to increase. These actions would likely have a long-term, moderate, adverse impact on wildlife populations in or near the preserve. When the short- and long-term, negligible to minor, adverse effects from the development of new facilities; parking lots; new trails for hiking, horseback riding, and mountain biking; new motorboating zones; and new backcountry campsites in alternative 4 are added to the past and future impacts external to the preserve, there would be a long-term, minor to moderate, adverse cumulative impact on area wildlife.

When the short- and long-term, negligible to minor, adverse effects from increased visitation and the installation of new signs and wayside exhibits in the preserve, as well as utilization of existing roadbeds for trails in alternative 4 are added to the past and future impacts external to the preserve, there would be a long-term, negligible to minor, adverse cumulative impact on area wildlife.

When the effects of the actions in alternative 4, including the negligible to minor, long-term adverse effects of increased visitor use and the development of new facilities, are added to the effects of past, current, and future actions independent of the general management plan, there could be a moderate, long-term, adverse cumulative impact to the preserve's wildlife populations, depending on a number of outside factors. However, the increment added by the alternatives would be relatively small compared to the impact from actions outside the preserve boundary.

Conclusion. Most wildlife populations in the preserve would not change as a result of the actions in this alternative. No actions would affect areas known to be important for breeding, nesting, foraging, or key migration routes. No actions would interfere with feeding, reproduction, or other activities necessary for the survival of wildlife species. Long-term, negligible to minor, adverse impacts would occur to wildlife in localized areas due to visitor use and the construction of a few new facilities in the preserve. When the effects of past, present, and future actions independent of this general management plan are added to the effects of alternative 4, there could be a long-term, moderate, adverse cumulative impact on wildlife populations in the preserve. However, the increment added by alternative 4 to the overall cumulative impact would be very small.

ENDANGERED AND THREATENED SPECIES AND SPECIES OF CONCERN

The federal-listed or candidate species considered within the preserve are the Texas

trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague's pipit, Louisiana pine snake, and Louisiana black bear.

For projects proposed in alternative 2, the National Park Service would implement measures to ensure that adverse effects on listed species do not occur. These avoidance measures might include, but are not limited to, the following:

- safeguarding the known locations and critical habitats of listed species
- providing education about the listed species and their habitats
- designating alternate access points away from areas occupied by listed species

The Endangered Species Act terminology used to assess impacts to listed species is as follows:

- **No effect:** When a proposed action would not impact a listed species or designated critical habitat.
- **May affect but not likely to adversely affect:** Effects on special status species or designated critical habitat are discountable (i.e., extremely unlikely to occur and not able to be meaningfully measured, detected, or evaluated) or completely beneficial.
- **May affect but likely to adversely affect:** When an adverse effect to a listed species or designated critical habitat may occur as a direct or indirect result of proposed actions and the effect is either not discountable or completely beneficial.
- **Is likely to jeopardize proposed species or adversely modify proposed critical habitat:** The

appropriate conclusion when the National Park Service or the U.S. Fish and Wildlife Service identify situations that could jeopardize the continued existence of a proposed species or adversely modify critical habitat to a species within or outside park boundaries.

The National Park Service has developed the following threshold definitions under the NEPA guidelines. Each definition corresponds to the USFWS definitions used to assess impacts to federal-listed species under the Endangered Species Act.

Methodology

The methodology and intensity levels used to evaluate impacts on endangered and threatened species and species of concern are provided below.

- **Negligible:** No state or federal-listed species would be impacted or the alternative would impact an individual of a listed species or its critical habitat, but the change would be so slight that it would not be of any measurable or perceptible consequence to the protected individual or its population. A negligible effect would equate to a "no effect" determination under section 7 of the Endangered Species Act.
- **Minor:** An individual or population of a listed species or its critical habitat would be impacted, but the change would be small and of little consequence and would be expected to be localized. A minor effect would equate to a "may affect but not likely to adversely affect" determination under section 7 of the Endangered Species Act. Mitigation measures, if needed to address adverse effects, would be simple and successful.

- **Moderate:** An individual or population of a listed species or its critical habitat would be noticeably impacted. The effect could have long-standing consequences to the individual, population, or critical habitat. A moderate effect would equate to a “may affect but likely to adversely affect” for adverse effects, or “may affect but not likely to adversely affect” determination for beneficial effects under section 7 of the Endangered Species Act. Mitigation measures, if needed to address adverse effects, could be extensive, but would likely be successful.
- **Major:** An individual or population of a listed species, or its critical habitat, would be noticeably impacted with a substantial consequence to the individual, population, or habitat. A major effect would equate to a “likely to adversely affect” determination for adverse effects, or a “may affect but not likely to adversely affect” determination for beneficial effects under section 7 of the Endangered Species Act. Extensive mitigation measures would be needed to address any adverse effects, and their success would not be guaranteed.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. No substantial facility developments would occur under alternative 1 that would have the potential to affect federal- and state-listed species in the preserve. Construction of the small primitive boat ramps and launches would occur in areas that do not have the listed species and are outside known critical habitat for these species. Maintenance of existing facilities, roads, and trails would not be expected to affect the listed plant species.

Visitor use, including camping in the backcountry in designated areas, is not known to be measurably affecting any of the listed species in the preserve. The effects would be long-term, negligible, and adverse.

Overall, alternative 1 would have a negligible, long-term, adverse effect on all of the federal- and state-listed and candidate species in the preserve.

Cumulative Impacts. Past logging activities, ongoing commercial and residential development, ongoing oil and gas operations, and fire suppression have resulted in habitat modification and loss.

Contaminants, pollution, and noise from human activities outside the preserve may also be affecting species, although this is unknown. While actions are being taken to actively restore habitat for the red-cockaded woodpecker, Louisiana pine snake, and the Louisiana black bear, these and other federal and state species are likely to continue to be imperiled during the life of this general management plan.

Adding the effects of past, current, and future actions occurring outside the preserve to the effects of alternative 1 would result in long-term, minor to moderate, adverse cumulative effects on federal- and state-listed species populations in or near the preserve. However, the effects of alternative 1 would add a very small increment to the overall cumulative impact.

Conclusion. No new major developments or actions would occur under alternative 1 that would have the potential to affect the Texas trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague's pipit, Louisiana pine snake, and Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Thus, alternative 1 would be expected to have

no effect on the listed species. The effects of alternative 1 added to the effects of past, present, and future actions occurring independent of the general management plan would have the potential to result in a long-term, minor to moderate, adverse cumulative impact on the listed species, although alternative 1 would add a very small increment to the overall cumulative impact.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. The minor changes in preserve development from implementing alternative 2, including new boat ramps, picnic and day use areas, and backcountry campsites, would not occur in habitat critical to or known to be used by federal- and state-listed species.

Trail construction activities in this alternative would be spread throughout the units of the preserve. These construction activities and trail uses would not affect the cavity trees and associated habitat remaining in the preserve that could be recolonized by red-cockaded woodpeckers in the future. With careful siting of the trails, any adverse impacts on federal- and state-listed species from construction and use of the trails would be negligible and short-term.

Visitor use, including camping in the backcountry in designated areas, would not be expected to measurably affect any of the listed species in the preserve. The effects would be long-term, negligible, and adverse.

In this alternative, fire management activities would be expanded for the purpose of ecological restoration. These management efforts would create more favorable habitat for the red-cockaded woodpecker in the uplands throughout the preserve, contributing a long-term, minor, beneficial impact on this species. These management efforts would also create more favorable habitat for the Texas trailing phlox by allowing more light to reach the ground and influence nutrient availability, contributing a

long-term, minor, beneficial impact on this species.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to threatened and endangered species in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 2 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to new fire management actions. Alternative 2 would have a short-term, negligible, adverse impact on the other state- and federal- listed species.

Cumulative Impacts. Past logging activities, ongoing commercial and residential development, ongoing oil and gas operations, and fire suppression have resulted in habitat modification and loss.

Contaminants, pollution, and noise from human activities within and outside the preserve may also be affecting species, although this is unknown. Although actions are being taken to actively restore habitat for the red-cockaded woodpecker, Louisiana pine snake, and the Louisiana black bear, these and other federal and state species are likely to continue to be imperiled during the life of this general management plan.

Adding the effects of past, current, and future actions occurring outside the preserve to the long-term, negligible to minor, adverse

effects and the long-term, minor, beneficial effects of alternative 2 would result in long-term, minor to moderate, adverse cumulative effects on federal- and state-listed species populations in or near the preserve. However, the effects of alternative 2 would add a very small increment to the overall cumulative impact.

Conclusion. Most of the developments or actions that would occur under alternative 2 would not have the potential to affect the Texas trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague's pipit, Louisiana pine snake, and Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Overall, alternative 2 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to new fire management actions. Alternative 2 would have a short-term, negligible, adverse impact on the other state- and federal- listed species. This would equate to a "may affect but not likely to adversely affect" determination for the red-cockaded woodpecker and Texas trailing phlox, and a "no effect" determination on the other listed species. The effects of alternative 2 added to the effects of past, current, and future actions occurring independent of the general management plan would have the potential to result in a long-term, minor to moderate, adverse cumulative impact on the listed species, although alternative 2 would add a very small increment to the overall cumulative impact.

Alternative 3

Analysis. The minor changes in preserve development from implementing alternative 2, including new boat ramps, picnic and day use areas, and backcountry campsites, would not occur in habitat critical to or known to be used by federal- and state-listed species.

Trail construction activities in this alternative would be spread throughout the units of the preserve. These construction activities and trail uses would not affect the cavity trees and associated habitat remaining in the preserve that could be recolonized by red-cockaded woodpeckers in the future. With careful siting of the trails, any adverse impacts on federal- and state-listed species from construction and use of the trails would be negligible and short-term,

Visitor use, including camping in the backcountry in designated areas, would not be expected to measurably affect any of the listed species in the preserve. The effects would be long-term, negligible, and adverse.

In this alternative, fire management activities would be expanded for the purpose of ecological restoration. These management efforts would create more favorable habitat for the red-cockaded woodpecker in the uplands throughout the preserve, contributing a long-term, minor, beneficial impact on this species. These management efforts would also create more favorable habitat for the Texas trailing phlox by allowing more light to reach the ground and influence nutrient availability, contributing a long-term, minor, beneficial impact on this species. The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to threatened and endangered species in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 3 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to new fire management actions, and it would have a short-term, negligible, adverse impact on the other state- and federal- listed species.

Cumulative Impacts. Past logging activities, ongoing commercial and residential development, and ongoing oil and gas operation, and fire suppression have resulted in habitat modification and loss.

Contaminants, pollution, and noise from human activities within and outside the preserve may also be affecting species, although this is unknown. Although actions are being taken to actively restore habitat for the red-cockaded woodpecker, Louisiana pine snake, and the Louisiana black bear, these and other federal and state species are likely to continue to be imperiled during the life of this general management plan.

Adding the effects of past, current, and future actions occurring outside the preserve to the long-term, negligible to minor, adverse effects and the long-term, minor, beneficial effects of alternative 3 would result in long-term, minor to moderate, adverse cumulative effects on federal- and state-listed species populations in or near the preserve. However, the effects of alternative 3 would add a very small increment to the overall cumulative impact.

Conclusion. Most of the developments or actions that would occur under alternative 3 would not have the potential to affect the Texas trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague's pipit, Louisiana pine snake, and Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long-term and negligible. Overall, alternative 3 would have a long-term, minor, beneficial impact on the red-cockaded woodpecker and Texas trailing phlox, due to

new fire management actions, and it would have a short-term, negligible, adverse impact on the other state- and federal-listed species. This would equate to a "may affect but not likely to adversely affect" determination for the red-cockaded woodpecker and Texas trailing phlox, and a "no effect" determination on the other listed species. The effects of alternative 3 added to the effects of past, current, and future actions occurring independent of the general management plan would have the potential to result in a long-term, minor to moderate, adverse cumulative impact on the listed species, although alternative 3 would add a very small increment to the overall cumulative impact.

Alternative 4

Analysis. The minor changes in preserve development from implementing alternative 4, including new boat ramps, picnic and day use areas, and backcountry campsites, would not occur in habitat critical to, or known to be used by, federal- and state-listed species.

Trail construction activities in this alternative would be spread throughout the units of the preserve. These construction activities and trail uses would not affect the cavity trees and associated habitat remaining in the unit that could be recolonized in the future. With careful siting of the trails, any adverse impacts on federal- and state-listed species from construction and use of the trails would be negligible and short term.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for impacts on resources compared to alternative 1, and thus result in a long-term, minor, beneficial impact to threatened and endangered species in the preserve. Specific actions that may be taken if

standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Overall, alternative 4 would have a negligible, long-term, adverse effect on all of the federal- and state-listed and candidate species in the preserve.

Cumulative Impacts. Past logging activities, ongoing commercial and residential development, and ongoing oil and gas operations, and fire suppression have resulted in habitat modification and loss.

Contaminants, pollution, and noise from human activities within and outside the preserve may also be affecting species, although this is unknown. Although actions are being taken to actively restore habitat for the red-cockaded woodpecker, Louisiana pine snake, and the Louisiana black bear, these and other federal- and state-listed species are likely to continue to be imperiled during the life of this general management plan.

Adding the effects of past, current, and future actions to the long-term, negligible to minor, adverse effects and the long-term, minor,

beneficial effects of alternative 4 would result in long-term, minor to moderate, adverse cumulative effects on federal- and state-listed species populations in or near the preserve. However, the effects of alternative 4 would add a very small increment to the overall cumulative impact.

Conclusion. Most of the developments or actions that would occur under alternative 4 would not have the potential to affect the Texas trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, red-cockaded woodpecker, Sprague's pipit, Louisiana pine snake, and the Louisiana black bear in the preserve. Visitor use in the preserve would continue to have the potential to disturb these species, but with current protection measures, adverse impacts would be expected to be long term and negligible. Overall, alternative 4 would have a long-term, negligible, adverse impact on the state- and federal-listed species. This would equate to a "no effect" determination on the listed species. The effects of alternative 4, added to the effects of past, current, and future actions occurring independent of the general management plan would have the potential to result in a long-term, minor to moderate, adverse cumulative impact on the listed species. However, alternative 4 would add a very small increment to the overall cumulative impact.

CULTURAL RESOURCES

In this environmental impact statement, impacts to cultural resources are described in terms of type, context, duration, and intensity, which is consistent with the regulations of the Council on Environmental Quality that implement the National Environmental Policy Act. Impact intensity thresholds have been provided to characterize the adverse and beneficial impacts of actions on archeological resources, historic structures and cultural landscapes, and ethnographic resources.

DEFINITIONS

Duration. The following definitions of duration apply to all cultural resources topics:

- **Short-term:** Impacts occur during project implementation.
- **Long-term:** Impacts occur after (and extend beyond) project completion.

Context

- **Localized Impacts:** Effects would occur in areas within the boundaries of Big Thicket National Preserve.
- **Regional or Preservewide Impacts:** Effects would occur to other areas of Big Thicket National Preserve or in areas of cultural significance beyond the preserve.

ARCHEOLOGICAL RESOURCES

Methodology

Negligible

- Impacts would be at the lowest levels of detection—barely perceptible and measurable.

Minor

- **Adverse:** Disturbance of a site(s) results in little loss of integrity.
- **Beneficial:** Efforts are undertaken to maintain and preserve a site(s) in situ.

Moderate

- **Adverse:** Site(s) is disturbed with a noticeable loss of integrity, but is not obliterated.
- **Beneficial:** More extensive efforts are undertaken to stabilize a site(s) in situ.

Major

- **Adverse:** Site(s) is disturbed to the extent that most or all of its informational potential is lost or obliterated.
- **Beneficial:** Substantial measures are undertaken to preserve a site(s) in situ by extensive or active intervention.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. Under alternative 1, no major changes to preserve operations, facilities, or visitor use activities would be anticipated, and the National Park Service would continue to limit new construction for public

use and administrative facilities. Consequently, there would be little potential for impacts to archeological resources as a result of ground-disturbing construction activities. Archeological assessments and investigations would be carried out as necessary if ground-disturbing construction is proposed for new facility development and utility upgrades. As staffing and funding priorities permit, the condition of known archeological sites would be monitored and appropriate protection and stabilization measures would be implemented to reduce or avoid site impacts possibly occurring from erosion, visitor use, or other factors.

In fulfillment of section 106 compliance requirements, the preserve would continue to carry out surveys to identify and document archeological resources within areas proposed for oil and gas operations and other activities having the potential for ground disturbance. The anticipated effects on identified resources would continue to be assessed in consultation with the Texas SHPO, associated tribes, and other concerned parties. Potential adverse impacts on significant archeological resources would be avoided or adequately mitigated. Continuation of archeological resource management actions under existing laws and policies would have long-term or permanent, localized negligible to minor, adverse impacts on archeological resources.

Cumulative Impacts. Other past, present, and reasonably foreseeable projects have adversely impacted, or have the potential to impact, archeological resources at Big Thicket National Preserve. Past clear-cut logging practices, oil and gas development, and other extractive and industrial activities have likely contributed the greatest impacts on these resources as a result of soil disturbance, compaction, and erosion. Currently, approved oil and gas activities and other preserve undertakings are assessed by NPS cultural resources staff to ensure that significant sites, if identified in project areas, are avoided by project redesign or are clearly identified for avoidance during construction.

In the rare instances that sites could not be avoided, data recovery measures or other mitigation would be carried out in accordance with section 106 requirements to ensure the recovery of significant archeological information. Past, present, and reasonably foreseeable actions have had (or are likely to have) long-term or permanent, minor to moderate, adverse impacts on archeological resources.

The impacts associated with implementation of alternative 1 would have long-term or permanent, negligible to minor, adverse impacts on the preserve's archeological resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 1, would cumulatively result in long-term or permanent, minor to moderate, adverse impacts on archeological resources. The impacts associated with alternative 1 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, negligible to minor, adverse impacts on the preserve's prehistoric and historic archeological resources would occur from ongoing visitor use and other factors. There would also be long-term or permanent, minor to moderate, adverse cumulative impacts on archeological resources from implementation of alternative 1 in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Under alternative 2, all continuing and proposed actions that potentially entail ground disturbance (e.g., oil and gas operations; fire management; maintenance of existing roads, trails, utilities, structures, and other facilities), or limited new construction (e.g., additional development in the headquarters area, new backcountry camping

areas, additional trails and parking areas) would be assessed to ensure that archeological resources, if identified in project areas, are avoided or adequately mitigated in accordance with section 106 requirements. Long-term or permanent, localized, minor, adverse impacts to archeological resources are anticipated from alternative 2, provided that archeological resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures.

To the extent feasible, new facilities would be placed outside the preserve boundaries, in previously disturbed areas, or in areas with little potential for intact archeological resources. As part of expanded educational outreach, NPS staff would inform visitors of the importance of protecting archeological resources. Partnerships with outside groups and agencies would assist and expand NPS efforts to conduct surveys and monitor site conditions. These measures would result in long-term, localized, minor beneficial impacts to the preserve's archeological resources.

Cumulative Impacts. Other past, present, and reasonably foreseeable projects have adversely impacted, or have the potential to impact, archeological resources at Big Thicket National Preserve. Past clear-cut logging practices, oil and gas development, and other extractive and industrial activities have likely contributed the greatest impacts on these resources as a result of soil disturbance, compaction, and erosion. Currently approved oil and gas activities and other preserve undertakings are assessed by NPS cultural resources staff to ensure that significant sites, if identified in project areas, are avoided by project redesign or are clearly identified for avoidance during construction. In the rare instances that sites could not be avoided, data recovery measures or other mitigation would be carried out in accordance with section 106 requirements to ensure the recovery of significant archeological information. Past, present, and reasonably foreseeable actions have had (or

are likely to have) long-term or permanent, minor to moderate, adverse impacts on archeological resources.

The impacts associated with implementation of alternative 2 would have long-term or permanent, minor, adverse and beneficial impacts on the preserve's archeological resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, adverse impacts of the other actions described above, in combination with the impacts of alternative 2, would cumulatively result in long-term or permanent, minor to moderate, adverse impacts on archeological resources. The impacts associated with alternative 2 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse and beneficial impacts on the preserve's prehistoric and historic archeological resources could be expected from ongoing visitor use, proposed NPS development and management actions, and other factors. There would also be long-term or permanent, minor to moderate, adverse cumulative impacts on archeological resources from implementation of alternative 2, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 3

Analysis. The impacts of alternative 3 on archeological resources would generally be the same as those described for alternative 2. Long-term or permanent, localized, minor, adverse impacts would be anticipated provided that archeological resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures. Long-term, localized, minor, beneficial impacts to the preserve's archeological resources would also result from educational outreach, partnership assistance, and efforts to establish new development outside the preserve to the extent possible.

Cumulative Impacts. The cumulative impacts on archeological resources would be the same as those described under alternative 1. The impacts associated with implementation of alternative 3 would have long-term or permanent, minor, adverse and beneficial impacts on the preserve's archeological resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, adverse impacts of the other actions described above, in combination with the impacts of alternative 3, would cumulatively result in long-term, minor to moderate, adverse impacts on archeological resources. The impacts associated with alternative 3 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse, and beneficial impacts on the preserve's prehistoric and historic archeological resources would occur from ongoing visitor use, proposed NPS development and management actions, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on archeological resources from implementation of alternative 3, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 4

Analysis. The impacts of alternative 4 on archeological resources would generally be the same as those described for alternatives 2 and 3. Long-term or permanent, localized, minor, adverse impacts would be anticipated provided that archeological resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures. Long-term, localized, minor, beneficial impacts to the preserve's archeological resources would also result from educational outreach and partnership assistance with other groups and agencies.

Cumulative Impacts. The cumulative impacts on archeological resources would be the same as those described under alternative 1. The impacts associated with implementation of alternative 4 would have long-term or permanent, minor, adverse, and beneficial impacts on the preserve's archeological resources. Other past, present, and reasonably foreseeable actions would result in long-term or permanent, minor to moderate, adverse impacts. Consequently, adverse impacts of the other actions described above, in combination with the impacts of alternative 4, would cumulatively result in long-term or permanent, minor to moderate, adverse impacts on archeological resources. The impacts associated with alternative 4 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse, and beneficial impacts on the preserve's prehistoric and historic archeological resources would occur from ongoing visitor use, proposed NPS development and management actions, and other factors. There would also be long-term, cumulative impacts on archeological resources from implementation of alternative 4, in conjunction with other past, present, or reasonably foreseeable actions.

HISTORIC STRUCTURES, SITES, AND CULTURAL LANDSCAPES

Methodology

Impacts are described in terms of the potential to diminish or protect the integrity or character-defining features of historic structures, sites, and cultural landscapes.

Negligible

- Impacts would be at the lowest levels of detection—barely perceptible and measurable.

Minor

- **Adverse:** Impacts would affect a character-defining feature(s) but would not diminish the overall integrity of the structure, site, or cultural landscape.
- **Beneficial:** Stabilization or preservation of character-defining features is conducted in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Moderate

- **Adverse:** Impacts would alter a character-defining feature(s), diminishing the overall integrity of the structure, site, or cultural landscape to the extent that its NRHP eligibility could be jeopardized.
- **Beneficial:** Rehabilitation is conducted in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Major

- **Adverse:** Impacts would alter a character-defining feature(s), diminishing the integrity of the structure, site, or cultural landscape to the extent that it would no longer be eligible to be listed in the national register.
- **Beneficial:** Restoration is conducted in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. Under alternative 1, the preserve would continue to carry out surveys and

investigations as needed to identify, document, and assess the condition and national register eligibility of potential historic structures and cultural landscapes. All ongoing actions that could potentially affect the integrity of historic structures and cultural landscapes (e.g., oil and gas operations, fire management, routine maintenance, visitor use) would be assessed to ensure that character-defining features and architectural elements are avoided or adequately mitigated. Although there are few remaining historic structures in the preserve, without ongoing preservation maintenance and stabilization, some structures (e.g., tram roads, remnants of homestead structures) and associated cultural landscape elements may be obscured or face deterioration by vegetation growth, erosion or weathering, and visitor-related impacts. These impacts would be long term, minor to moderate, and adverse.

NPS staff would, as needed, stabilize, preserve, and possibly rehabilitate selected historic structures and buildings (e.g., the Staley Cabin), and contributing cultural landscape features. Preservation management actions could entail necessary repairs, minor alterations, or replacement of deteriorated historic fabric and contributing landscape elements. All preservation undertakings would be carried out in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. With particular regard to the standards and guidelines for preservation, the existing form, features, and architectural detailing of historic buildings, structures, and landscape features would be retained. Stabilization measures would be carried out to structurally reinforce, weatherize, and correct unsafe conditions. Selected historic buildings would continue to be adaptively used, such as use of Staley Cabin for the preserve's environmental education center. Adaptive use of historic structures and buildings would be carried out in accordance with the *Secretary's Standards* with particular attention to the standards and guidelines for rehabilitation. Under the rehabilitation treatment, historic building

materials and character-defining features would be protected and maintained to the extent possible, although extensively deteriorated, damaged, or missing features would be replaced with traditional or substitute materials. These preservation actions would have long-term, localized, minor to moderate, beneficial impacts on historic buildings and structures.

NPS staff would also continue to preserve, research, and document cultural landscapes that are often associated with the preserve's historic homesteads and other sites. The patterns of farm fields, vegetation, circulation, and other contributing cultural landscape features that reflect the period of historic settlement would be preserved. Cultural landscape information would continue to be updated and included in the preserve's *Cultural Landscape Inventory* database. As needed, cultural landscape reports would be completed for selected properties with recommendations for appropriate treatment in accordance with *The Secretary's Standards (with Guidelines for the Treatment of Cultural Landscapes)*. Implementation of these preservation and documentation measures would have long-term, localized, minor, beneficial impacts on cultural landscapes.

Cumulative Impacts. Other primarily past actions have adversely affected historic buildings, structures, and cultural landscape features at Big Thicket National Preserve. Past actions have diminished the historical integrity of several properties such as modifications to the Staley Cabin, dismantling of the Voth Mill by the former mill operator, and the structural deterioration and loss of homestead structures. Contributing cultural landscape elements (e.g., patterns of circulation, spatial organization, and land use) have also likely sustained localized loss or alteration primarily by disturbances associated with past development actions. These actions have resulted in long-term or permanent, moderate to major adverse impacts. However, present and future undertakings

would be carried out by NPS cultural resources staff in accordance with the secretary's standards and other guidance documentation as necessary (e.g., historic structure reports) to ensure the long-term preservation of historic properties in a manner that protects contributing architectural and cultural landscape elements. Therefore, project actions conducted in accordance with NPS *Management Policies 2006* and standards would likely result in minor beneficial impacts on historic building fabric and character-defining features.

The impacts associated with implementation of alternative 1 would have long-term, minor to moderate adverse, and minor to moderate beneficial impacts on the preserve's historic buildings, structures, and cultural landscapes. Other primarily past actions have resulted in long-term or permanent, moderate to major, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 1, would cumulatively result in long-term, moderate, adverse impacts on historic buildings, structures, and cultural landscapes. The impacts associated with alternative 1 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term, localized, minor to moderate adverse, and minor to moderate beneficial impacts on historic buildings, structures, and cultural landscape features would occur from ongoing visitor use, routine preserve operations, preservation undertakings, and other factors. There would also be long-term, moderate, adverse, cumulative impacts on historic buildings, structures, and cultural landscape features from implementation of alternative 1, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Under alternative 2, as under alternative 1, all ongoing actions that could

potentially affect the integrity of historic structures and cultural landscapes (e.g., oil and gas operations, fire management, trail development, and routine maintenance) would be assessed to ensure that character-defining features and architectural elements are avoided or adequately mitigated. Proposed new development (e.g., construction of trails and trailheads, parking areas, backcountry camping sites, boat ramps or launches) would minimally affect the scale and visual relationships among potential cultural landscape features that could be affected by project undertakings. Patterns of native vegetation, land use, topography, and other cultural landscape elements would remain largely unaltered. To the extent feasible, new facilities would be positioned outside the preserve boundaries, which would assist efforts to minimize potential impacts of new construction on historic viewsheds, historic structures, and cultural landscapes. Careful design would ensure that establishment of visitor contact facilities, such as a proposed visitor contact facility in the Beaumont area, would neither detract from nor appreciably alter character-defining cultural landscape features. Any adverse impacts would be long-term and minor in intensity. Construction activities would temporarily introduce nonhistoric visual, audible, and atmospheric elements into the landscape settings. However, such intrusions would be short-term (lasting only as long as construction) and of negligible to minor intensity.

Without ongoing preservation maintenance and stabilization, the few remaining historic structures in the preserve (e.g., tram roads, remnants of homestead structures) and associated cultural landscape elements may be obscured or face deterioration by vegetation growth, erosion or weathering, and visitor-related impacts. NPS staff would increase efforts to stabilize, preserve, and rehabilitate selected historic structures and buildings (e.g., Staley Cabin, Rosier homestead site), and contributing cultural landscape features. Preservation management actions could entail necessary repairs, minor

alterations or replacement of deteriorated historic fabric, and contributing landscape elements. All preservation undertakings would be carried out in accordance with *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. With particular regard to the standards and guidelines for preservation, the existing form, features, and architectural detailing of historic buildings, structures, and landscape features would be retained. Stabilization measures would be carried out to structurally reinforce, weatherize, and correct unsafe conditions. Selected historic buildings would continue to be adaptively used, such as use of the Staley Cabin for the preserve's environmental education center. Adaptive use of historic structures and buildings would be carried out in accordance with the secretary's standards with particular attention to the standards and guidelines for rehabilitation. Under the rehabilitation treatment, historic building materials and character-defining features would be protected and maintained to the extent possible, although extensively deteriorated, damaged, or missing features would be replaced with traditional or substitute materials. These preservation actions would have long-term, localized, minor to moderate, beneficial impacts on historic buildings and structures.

NPS staff would also continue to preserve, research, and document cultural landscapes that are often associated with the preserve's historic homesteads and other sites. The patterns of farm fields, vegetation, circulation, and other contributing cultural landscape features that reflect the period of historic settlement would be preserved. Cultural landscape information would continue to be updated and included in the preserve's cultural landscape inventory (CLI) database. As needed, cultural landscape reports would be completed for selected properties with recommendations for appropriate treatment in accordance with *The Secretary's Standards (with Guidelines for the Treatment of Cultural Landscapes)*. Implementation of these preservation and documentation measures would have long-

term, localized, minor, beneficial impacts on cultural landscapes.

As part of expanded educational outreach, preserve staff would inform visitors, school groups, and others of the importance of protecting historic structures and cultural landscapes. Partnership with outside groups and agencies could also assist NPS cultural resources staff with preservation management activities such as conducting surveys, monitoring site conditions, and carrying out preservation treatments. These measures would have long-term, localized, minor, beneficial impacts on historic structures and cultural landscapes.

Cumulative Impacts. Other primarily past actions have adversely affected historic buildings, structures, and cultural landscape features at Big Thicket National Preserve. Past actions have diminished the historical integrity of several properties such as modifications to the Staley Cabin, dismantling the Voth Mill by the former mill operator, and the structural deterioration and loss of homestead structures. Contributing cultural landscape elements (e.g., patterns of circulation, spatial organization, and land use) have also likely sustained localized loss or alteration primarily by disturbances associated with past development actions. These actions have resulted in long-term or permanent, moderate to major, adverse impacts. However, present and future undertakings would be carried out by NPS cultural resources staff in accordance with the *Secretary's Standards* and other guidance documentation as necessary (e.g., historic structure reports) to ensure the long-term preservation of historic properties in a manner that protects contributing architectural and cultural landscape elements. Therefore, project actions conducted in accordance with NPS *Management Policies 2006* and standards would likely result in minor beneficial impacts on historic building fabric and character-defining features.

The impacts associated with implementation of alternative 2 would have long-term, minor, adverse, and minor to moderate, beneficial impacts on the preserve's historic buildings, structures, and cultural landscapes. Other primarily past actions have resulted in long-term or permanent moderate to major, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 2, would cumulatively result in long-term, moderate, adverse impacts on historic buildings, structures, and cultural landscapes. The impacts associated with alternative 2 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term, localized, minor, adverse, and minor to moderate, beneficial impacts on historic buildings, structures, and cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors. There would also be long-term, moderate, adverse, cumulative impacts on historic buildings, structures, and cultural landscape features from implementation of alternative 2 in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 3

Analysis. The impacts of alternative 3 on historic buildings, structures, and cultural landscapes would generally be the same as those described for alternative 2. The Lily Bunkhouse is proposed for demolition under this alternative; the building is nonhistoric and its demolition would have no effect on historic properties. Long-term, localized, minor, adverse, and minor to moderate beneficial impacts would be anticipated provided that historic buildings, structures, and cultural landscapes continue to be identified, assessed, and treated in accordance with NPS *Management Policies 2006* and *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Long-term, localized, minor, beneficial impacts to the preserve's historic

buildings, structures, and cultural landscapes would also result from educational outreach and the partnership assistance provided by other groups and agencies.

Cumulative Impacts. The cumulative impacts on historic buildings, structures, and cultural landscapes would be the same as those described under alternative 1. The impacts associated with implementation of alternative 3 would have long-term, minor, adverse and minor to moderate beneficial impacts on the preserve's historic buildings, structures, and cultural landscapes. Other primarily past actions have resulted in long-term or permanent, moderate to major, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 3, would cumulatively result in long-term, moderate, adverse impacts on historic buildings, structures, and cultural landscapes. The impacts associated with alternative 3 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term, localized, minor, adverse, and minor to moderate beneficial impacts on historic buildings, structures, and cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors. There would also be long-term, moderate, adverse, cumulative impacts on historic buildings, structures and cultural landscape features from implementation of alternative 3 in conjunction with other past, present or reasonably foreseeable actions.

Alternative 4

Analysis. The impacts of alternative 4 on historic buildings, structures and cultural landscapes would generally be the same as those described for alternative 2. Long-term, localized, minor, adverse, and minor to moderate beneficial impacts would be anticipated provided that historic buildings, structures and cultural landscapes continue to be identified, assessed and treated in

accordance with NPS *Management Policies 2006* and *The Secretary of the Interior's Standards for the Treatment of Historic Properties*. Long-term, localized, minor, beneficial impacts to the preserve's historic buildings, structures, and cultural landscapes would also result from educational outreach and the partnership assistance provided by other groups and agencies.

Under alternative 4, visitors would have greater opportunities to access and visit selected historic sites and structures as part of efforts to increase understanding and appreciation for the Big Thicket history and heritage. The National Park Service would not promote visitor access to sensitive sites, and would increase monitoring and resource protection efforts of structures and sites selected for enhanced interpretation to ensure they are sufficiently protected from damage by inadvertent visitor use or vandalism. These measures would result in long-term, localized, minor, adverse impacts on historic buildings, structures, and cultural landscapes.

Cumulative Impacts. The cumulative impacts on historic buildings, structures, and cultural landscapes would be the same as those described under alternative 1. The impacts associated with implementation of alternative 4 would have long-term, minor, adverse, and minor to moderate beneficial impacts on the preserve's historic buildings, structures and cultural landscapes. Other primarily past actions have resulted in long-term or permanent, moderate to major, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 4, would cumulatively result in long-term, moderate, adverse impacts on historic buildings, structures, and cultural landscapes. The impacts associated with alternative 4 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term, localized, minor, adverse, and minor to moderate beneficial impacts on historic buildings, structures, and

cultural landscape features would occur from ongoing visitor use, new construction, routine preserve operations, preservation undertakings, and other factors. There would also be long-term, moderate, adverse cumulative impacts on historic buildings, structures, and cultural landscape features from implementation of alternative 4, in conjunction with other past, present, or reasonably foreseeable actions.

ETHNOGRAPHIC RESOURCES

Methodology

Impacts are described in terms of the potential to diminish or protect the integrity of (and access to) resources and places having particular importance and value to culturally associated groups.

Negligible

- Impacts would be at the lowest levels of detection—barely perceptible and measurable.

Minor

- **Adverse:** Impacts would be slight but noticeable and would neither appreciably alter resource conditions, such as traditional access or site preservation, nor alter the relationship between the resource and the associated group's body of beliefs and practices.
- **Beneficial:** Impacts would allow access to and would accommodate a group's traditional practices or beliefs.

Moderate

- **Adverse:** Impacts would be apparent and would alter resource conditions or interfere with traditional access, site preservation, or the relationship between the resource and the

associated group's beliefs and practices, even though the group's practices and beliefs would survive.

- **Beneficial:** Impacts would facilitate traditional access to and would accommodate a group's practices or beliefs.

Major

- **Adverse:** Impacts would alter resource conditions. Proposed actions would block or greatly affect traditional access, site preservation, or the relationship between the resource and the associated group's body of beliefs and practices to the extent that the survival of a group's beliefs or practices would be jeopardized.
- **Beneficial:** Impacts would encourage traditional access and would accommodate a group's practices or beliefs.

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. Some archeological sites and places within the preserve retain ethnographic or cultural importance for the Alabama-Coushatta Tribe of Texas and other tribal groups. Sites associated with 19th and early 20th century homesteading and other activities are also likely to be culturally important to the descendants of the early European American settlers. Because no substantial changes to preserve operations, facilities, or visitor use activities are anticipated under alternative 1, there would be little potential for impacts to archeological or ethnographic resources as a result of ground-disturbing construction activities. As staffing and funding priorities permit, the condition of known archeological or ethnographic sites would be monitored, and appropriate protection and stabilization measures would be implemented to reduce or

avoid site impacts possibly occurring from erosion, visitor use, or other factors. Implementation of these measures would have long-term, negligible to minor, adverse impacts on ethnographic resources. The preserve would also ensure that access is maintained to places and sites having traditional importance for tribal and other culturally associated groups. This would have a long-term, minor, beneficial impact.

In fulfillment of section 106 compliance requirements, the preserve staff would continue to carry out surveys to identify and document ethnographic resources potentially existing within areas proposed for oil and gas operations, fire management, and other activities having the potential for ground disturbance or to restrict traditional access. The anticipated effects on identified resources would continue to be assessed in consultation with the Texas SHPO, associated tribes, and other concerned parties. Adverse impacts on significant ethnographic resources would be avoided or adequately mitigated. Continuation of ethnographic resource management actions under existing laws and policies would have long-term or permanent, localized, minor, adverse impacts on ethnographic resources.

Cumulative Impacts. Other past, present, and reasonably foreseeable projects have adversely impacted, or have the potential to impact, ethnographic resources at Big Thicket National Preserve. Past clear-cut logging practices, oil and gas development, and other extractive or industrial activities have likely contributed the greatest impacts on these resources as a result of soil disturbance, compaction, and erosion. Currently approved oil and gas activities and other preserve undertakings are assessed by NPS cultural resources staff to ensure that significant sites and resources, if identified in project areas, are avoided by project redesign or are clearly identified for avoidance during construction. In the rare instances that sites could not be avoided, data recovery measures or other mitigation would be carried out in accordance with section 106 requirements to

ensure the recovery of significant archeological or ethnographic information. Past, present, and reasonably foreseeable actions have had (or are likely to have) long-term or permanent, minor to moderate, adverse impacts on ethnographic resources.

The impacts associated with implementation of alternative 1 would have long-term or permanent, negligible to minor, adverse and beneficial impacts on the preserve's ethnographic resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 1, would cumulatively result in long-term or permanent, minor to moderate, adverse impacts on ethnographic resources. The impacts associated with alternative 1 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse and beneficial impacts on preserve ethnographic resources would occur from ongoing visitor use, routine preserve operations, and other factors. There would also be long-term, minor to moderate, adverse, cumulative impacts on ethnographic resources from implementation of alternative 1, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Under alternative 2, all continuing and proposed actions that potentially entail ground disturbance (e.g., oil and gas operations; fire management; maintenance of existing roads, trails, utilities, structures, and other facilities), or limited new construction (e.g., additional development in the headquarters area, additional trails and parking areas) would be assessed to ensure that archeological or ethnographic resources, if identified in project areas, are avoided or adequately mitigated in accordance with

section 106 requirements. Long-term or permanent, localized, minor, adverse impacts to ethnographic resources are anticipated from alternative 2, provided that resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures.

To the extent feasible, new facilities would be positioned outside the preserve boundaries, in previously disturbed areas, or in areas with little potential for intact ethnographic resources. As part of expanded educational outreach, NPS staff would inform visitors of the importance of protecting ethnographic resources. As appropriate, partnerships with outside groups and agencies would assist and expand NPS efforts to conduct surveys and monitor site conditions. These measures would result in long-term, localized, minor, beneficial impacts to the preserve's ethnographic resources.

Cumulative Impacts. Other past, present, and reasonably foreseeable projects have adversely impacted, or have the potential to impact, ethnographic resources at Big Thicket National Preserve. Past clear-cut logging practices, oil and gas development, and other extractive or industrial activities have likely contributed the greatest impacts on these resources as a result of soil disturbance, compaction, and erosion. Currently approved oil and gas activities and other preserve undertakings are assessed by NPS cultural resources staff to ensure that significant sites and resources, if identified in project areas, are avoided by project redesign or are clearly identified for avoidance during construction. In the rare instances that sites could not be avoided, data recovery measures or other mitigation would be carried out in accordance with section 106 requirements to ensure the recovery of significant archeological or ethnographic information. Past, present, and reasonably foreseeable actions have had (or are likely to have) long-term or permanent, minor to moderate, adverse impacts on ethnographic resources.

The impacts associated with implementation of alternative 2 would have long-term or permanent, minor, adverse, and beneficial impacts on the preserve's ethnographic resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 2, would cumulatively result in long-term or permanent, minor to moderate, adverse impacts on ethnographic resources. The impacts associated with alternative 2 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse, and beneficial impacts on the preserve's ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities and other factors. There would also be long-term, minor to moderate, adverse, cumulative impacts on ethnographic resources from implementation of alternative 2, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 3

Analysis. The impacts of alternative 3 on ethnographic resources would generally be the same as those described for alternative 2. Long-term or permanent, localized, minor, adverse impacts would be anticipated provided that ethnographic resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures. Long-term, localized, minor, beneficial impacts to the preserve's ethnographic resources would also result from educational outreach, partnership assistance, and efforts to establish new development outside the preserve to the extent possible.

Cumulative Impacts. The cumulative impacts on ethnographic resources would be the same as those described under alternative

1. The impacts associated with implementation of alternative 3 would have long-term or permanent, minor, adverse, and beneficial impacts on the preserve's ethnographic resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 3, would cumulatively result in long-term, minor to moderate, adverse impacts on ethnographic resources. The impacts associated with alternative 3 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse, and beneficial impacts on the preserve's ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on ethnographic resources from implementation of alternative 3, in conjunction with other past, present, or reasonably foreseeable actions.

Alternative 4

Analysis. The impacts of alternative 4 on ethnographic resources would generally be the same as those described for alternatives 2 and 3. Long-term or permanent, localized, minor, adverse impacts would be anticipated provided that ethnographic resources continue to be identified, assessed, and managed in accordance with NPS *Management Policies 2006* and procedures. Long-term, localized, minor, beneficial impacts to the preserve's ethnographic resources would also result from educational outreach and partnership assistance with other groups and agencies.

Under alternative 4, visitors would have greater opportunities to access and visit selected historic sites as part of efforts to

increase understanding and appreciation for the history and heritage of Big Thicket National Preserve. The National Park Service would not promote access to sensitive sites by the general visiting public, and would ensure that visitor use does not interfere with the traditional use and access of tribal members or other culturally associated groups. The preserve would also increase monitoring and resource protection efforts of historic sites selected for enhanced interpretation to ensure that potentially associated ethnographic resources and values are protected from inadvertent visitor use impacts or vandalism. These measures would result in long-term, localized, minor, adverse impacts on ethnographic resources.

Cumulative Impacts. The cumulative impacts on ethnographic resources would be the same as those described under alternative 1. The impacts associated with implementation of alternative 4 would have long-term or permanent, minor, adverse, and beneficial impacts on the preserve's ethnographic resources. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, adverse impacts of the other actions described above, in combination with the impacts of alternative 4, would cumulatively result in long-term, minor to moderate, adverse impacts on ethnographic resources. The impacts associated with the alternative 4 would represent a small component of the adverse cumulative impact.

Conclusion. Long-term or permanent, localized, minor, adverse, and beneficial impacts on the preserve's ethnographic resources would occur from ongoing visitor use, routine preserve operations, proposed NPS development activities, and other factors. There would also be long-term, minor to moderate, adverse, cumulative impacts on ethnographic resources from implementation of alternative 4, in conjunction with other past, present, or reasonably foreseeable actions

VISITOR USE AND EXPERIENCE

Annual visitation in the preserve is generally increasing before the implementation of any of the action alternatives. During public scoping, most respondents expressed the need for more access, land and water trails, interpretation, and wayfinding and informational signs throughout the preserve. There were also comments in direct opposition to each other in regard to the presence or removal of houseboats, road development, or whether certain uses should be allowed such as off-road vehicles, personal watercraft, auto tours, motorized boating, horseback riding, mountain biking, and GPS (global positioning system) recreational activities.

DEFINITIONS

Duration. The following definitions of duration apply to all visitor use and experience topics:

- **Short term:** A short-term impact would last less than one year and would affect only one season's use by visitors.
- **Long term:** A long-term impact would last more than one year and would be more permanent in nature.

Methodology

To determine the degree of impact as a result of implementing each alternative, the following scale of magnitude was used:

- **Negligible:** Visitors would likely be unaware of any effects associated with implementation of the alternative. There would be no noticeable changes in visitor use or experience or in any defined indicators of visitor satisfaction or behavior.

- **Minor:** Changes in visitor use and experience would be slightly detectable, but would not appreciably diminish or enhance critical characteristics of the visitor experience. Visitor satisfaction would remain stable.
- **Moderate:** Few critical characteristics of the desired visitor experience would change or the number of participants engaging in an activity would change somewhat. The visitor would be aware of the effects associated with implementation of the alternative. Visitor satisfaction would begin to either decline or increase as a direct result of the effect.
- **Major:** Multiple critical characteristics of the desired visitor experience would change or the number of participants engaging in an activity would be greatly reduced or increased. The visitor would be aware of the effects associated with implementation of the alternative. Visitor satisfaction would markedly decline or increase.

VISITOR OPPORTUNITIES

Alternative 1: Continuation of Current Management (No-Action Alternative)

Road-based Recreation. Under alternative 1, because there would be no new development of roads in the preserve and access would continue to be limited. For visitors who want to access the preserve for road-based recreation there would continue to be a long-term, negligible to minor, adverse impact because of these limitations

and because some areas of the preserve may not be accessible.

Trail-based Recreation. For this alternative, no additional land trails for hiking, mountain biking, or horseback riding would be developed. Visitor access into the preserve for these activities would remain extremely limited; some units in the preserve would continue to have no formal access. Because access would continue to be limited, there would be a long-term, minor to moderate, adverse impact on visitors wanting to access the interior of the preserve. Some visitors may not want to share a trail with mountain bike riders or horses. For these visitors the presence of mountain bikes and horses on trails in the preserve would be a long-term, adverse impact; however, because access for mountain bikes and horses is so limited, the impact would be negligible.

Water-based Recreation. In alternative 1, there would be no change to water trails in the preserve. There would continue to be a limited number of trails, minimal trail markers, and the potential for conflicts between visitors in motorboats and paddlers. For visitors interested in experiences on the water trails, this would be a long-term, minor to moderate, adverse impact.

Under this alternative, there would be no change in motorboat use within the preserve. Visitors traveling in boats would continue to access areas of the preserve subject to existing rules and water conditions. For visitors not in motorboats there would continue to be long-term, minor to moderate, adverse impacts to their experience. On the water, the adverse impacts could include conflicts between those in motorboats and other visitors on the river. On land, visitors who are interested in a more contemplative type of experience could be disturbed by the sounds of motorboats on the river.

Consistent with NPS policy, personal watercraft would continue to be prohibited within the preserve. For visitors who would like to use personal watercraft in the waters

of the preserve, the impact would be long term and adverse. However, because personal watercraft have not been allowed within the preserve for some time, the impact would be negligible.

Houseboats would continue to be allowed in the preserve, subject to local, state, and federal regulatory standards. For visitors with houseboats that conform to the regulatory standards, the impacts would continue to be negligible, beneficial, and long term. For visitors with houseboats that do not conform to the regulatory standards, the impacts could be adverse, short term or long term, and minor to moderate. The impacts would be short term and minor to moderate if the owner of the houseboat could correct the deficiencies and the impact would be long term and moderate to major if the owner of the houseboat is unable to correct the deficiencies and the houseboat would not be eligible to return to the preserve. For the visitors who believe houseboats do not belong in the preserve because of impacts to the viewshed, resources, and water quality, the continued presence of houseboats would be a long-term, minor to moderate, adverse impact to their experience.

Other Recreation. In alternative 1, there would continue to be backcountry camping opportunities in the preserve, but no additional opportunities would be provided. Visitors who are interested in a different type of camping opportunity would continue to experience a long-term, adverse, minor impact because other camping opportunities are available only at some distance from the preserve.

Opportunities to hunt, fish, and trap in the preserve would continue as currently defined and would not be expanded into new areas. For visitors who hunt, fish, or trap in the preserve and would like to conduct these activities in other areas of the preserve, this would result in a long-term, adverse impact. The impact would be negligible because these visitors still have the opportunity to hunt in the preserve. For visitors who oppose

hunting, fishing, and trapping in the preserve, the continued presence of these activities would adversely impact their experience; especially during hunting season when some areas of the preserve are closed to other uses for safety reasons. These impacts would be long-term and minor to moderate because the only area open to mountain biking in the preserve is one of the areas that is closed during hunting season.

Off-road vehicles would continue to be prohibited in the preserve. This would result in a long-term, negligible, adverse impact on visitor experience because there is no change in the existing opportunities.

Access and Orientation. In alternative 1, the visitor center would continue to provide orientation and introductory information to visitors, and the research station would continue to accommodate researchers who want access to the preserve. If determined necessary and appropriate, commercial visitor services, such as canoe or kayak rentals, guide services, and boat launches, could be authorized. These visitor services would continue to result in a long-term, minor to moderate, beneficial impact on visitor experience.

In this alternative, no access to cultural resources would be provided. This would continue to be a long-term, negligible to minor, adverse impact on visitor experience because visitors would continue to lack access to these resources.

Existing facilities that provide water access would be maintained; new public facilities would not be anticipated. The cooperative maintenance of existing public boat ramps would continue. Because opportunities to access the water in the preserve would continue to be limited, the impact on visitor experience would continue to be long term, negligible to minor, and adverse.

Crowding and Solitude. Some crowding and visitor conflicts would continue to occur, especially at popular destinations in the

preserve. For example, encounters with large groups at White Sands Beach would continue, as would occasional encounters with large school groups at the visitor center. For crowding in developed areas, the impact to visitor experience would be long-term and adverse but negligible because the crowding in these areas is to be expected. In locations outside a developed area, the impacts of crowding would also continue to be long term and adverse. The impacts would be minor for popular destinations because visitors do not go there with the expectation of an uncrowded or solitary experience. There would continue to be opportunities for solitude in the remote and less developed areas of the preserve. Thus, the impacts to those who seek solitude in the preserve would be long term and beneficial. The impact would be negligible because there would be no change from current conditions.

Cumulative Impacts. Orientation in and around the preserve has been an ongoing issue. Boundary encroachments such as bulldozing illegal trails and roads have confused areas of official access with areas of illegally created access. Also, signs identifying the preserve boundary have often been, and continue to be, defaced or removed, adversely impacting visitor orientation.

Past and current issues likely to continue into the future that affect the water-based visitor experience include pollution from industry outfalls and discharge from improperly constructed private septic tanks.

Increased development in the region could lead to an increase in visitation over the next 20 years; this could have an adverse impact on future crowding and opportunities for solitude. The intensity of this future impact is anticipated to be minor.

When the effects of alternative 1 are added to the effects of other past, present, and reasonably foreseeable actions as described above, the cumulative effect would be a long-term, minor to moderate, adverse impact on road- and trail-based visitor experiences; a

long-term, negligible to minor, adverse impact on water-based and other recreational opportunities; and a long-term, negligible to minor, adverse impact on visitor access and orientation, crowding, and solitude. The actions in alternative 1 would not contribute to the overall cumulative impact because alternative 1 does not include any changes.

Conclusion. Under alternative 1, there would continue to be long-term, adverse, negligible to minor impacts on visitor experience because road-based recreation, access to cultural resources, and access to water in the preserve would continue to be limited. For visitors who cannot camp in the preserve and those who experience crowding unexpectedly, there would be a long-term, adverse, and minor impact to their experience.

Trail-based recreation would continue to be limited. Recreational opportunities on water trails would continue to have minimal wayfinding signs and be subject to conflicts between users. These impacts would be long term, adverse, and minor to moderate. The impacts to visitors who are disturbed by motorboats or displaced during hunting season would be long term, adverse, and minor or moderate.

Opportunities to hunt, fish, and trap in the preserve would not change, resulting in a long-term adverse negligible impact to visitors who would like to pursue these activities in the preserve. For visitors hiking and sharing a trail with mountain bikes and horses, the impact would be long term, adverse, and negligible. For visitors experiencing crowding in developed areas, the impacts on their experience would be long term, adverse, and negligible.

The impacts to visitors because personal watercraft and off-road vehicles would not be allowed in the preserve would be long term, adverse, and negligible because these uses are not currently allowed in the preserve.

The continued availability of visitor services including necessary and appropriate commercial visitor services would result in long-term, beneficial, and minor to moderate impacts. Continued opportunities for solitude in the preserve would result in a long-term, beneficial, and negligible impact.

The impacts of management of houseboats in the preserve would be long term, beneficial, and negligible for visitors who are able to comply with the requirements. For visitors unable to comply with the requirements, the impacts on their experience would be short term, adverse, and minor to moderate if changes could be made to the houseboat so that it is in compliance. For visitors unable to modify their houseboat to meet the requirements, the impact would be long term, adverse, and moderate to major.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Road-based Recreation. In alternative 2, opportunities would be available for visitors to experience the fundamental resources and values of the preserve through auto tours linking the units in the preserve. These tours would allow visitors a previously unavailable opportunity for educational recreation from their vehicle, providing a long-term, minor to moderate, beneficial effect on visitor experience. Visitors not in favor of providing auto tours would experience a long-term, minor, adverse impact. This alternative also includes improved parking areas and trailheads, resulting in long-term, minor to moderate beneficial impacts on visitor experience.

Trail-based Recreation. This alternative also includes specific strategies to improve mainland recreational opportunities. In alternative 2, additional land trails for hiking would be developed where appropriate, and abandoned roadbeds would be assessed for reuse as trails. New backcountry trails in alternative 2 include the Canal-Saltwater Barrier Trail, the Magnolia Trail and Loblolly Loop, the Fern Hollow Trail, the Yellow

Bluff Ferry Trail, and the Oxbow Trail. The Lance Rosier unit would include a new primitive trail, and a new frontcountry trail would connect the visitor center to Village Creek and the Turkey Creek trail (Village Creek Trail). Previously unavailable trail-based interpretive programs, such as ranger-led tours or opportunities for self-guiding tours, would be available to visitors, with a long-term, minor to moderate, beneficial impact on visitor experience. In this alternative, new trails could be developed through partnerships with neighbors, linking areas of the preserve to existing trails. These development and partnership efforts would contribute a long-term, minor to moderate, beneficial impact on visitor experience.

Opportunities for horseback riding would be expanded to include a multiuse trail in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the northeast portion of the Lance Rosier unit. New areas would be designated appropriate for mountain bike use on the Magnolia Trail and Loblolly Loop in the Beech Creek unit and the northeast portion of the Lance Rosier unit. The expansion of areas appropriate for these activities would provide for increased recreation opportunities for visitors, and would have long-term, minor to moderate, beneficial effects on the visitor experience. However, multiuse trails could create user conflicts, resulting in long-term, minor to moderate, adverse impacts on visitor experience. Some visitors might oppose the expansion of recreational activities; these visitors would experience a long-term, minor to moderate, adverse impact.

Water-based Recreation. In alternative 2, designated water trails would be provided with a sign plan developed to help visitors navigate to day use areas and other destinations, contributing a long-term, negligible to minor, beneficial impact on visitor experience by expanding opportunities for low-impact visitor recreation.

Motorized boats, other than personal watercraft, would be in the Neches River and Pine Island Bayou from Highway 326 to the confluence with the Neches River including Cook's Lake and Scatterman Lake. To minimize conflicts between uses, many areas would be designated as just paddling trails, while trolling motors would be allowed in all waters of the preserve. Establishing nonmotorized zones would contribute a long-term, minor to moderate, beneficial impact on visitor experience for paddlers. Motorboat opportunities in the preserve could increase, contributing a long-term, minor to moderate, beneficial impact on visitor experience for some. The noise, speed, and wakes created from motorboats may be disruptive to other visitors seeking solitude or an uninterrupted canoe or kayak experience, resulting in a long-term, negligible to minor, adverse impact on these visitors.

Houseboats would continue to be allowed, but would be subject to increased regulation. Houseboats meeting regulatory standards could have a long-term, negligible to minor, beneficial impact on visitor experience. However, those visitors who oppose houseboats for any number of reasons may experience a long-term, minor to moderate, adverse impact to their visitor experience.

Other Recreation. In alternative 2, 20 backcountry sites (10 feet by 10 feet) would be developed along land and water trails. These increased camping opportunities would provide a long-term, minor to moderate, beneficial impact on visitor experience for those in favor of increased camping opportunities, and a long-term, minor to moderate, adverse effect on the experience of those visitors who oppose increased camping opportunities.

Hunting, fishing, and trapping would continue as currently authorized. The development of an accessible trail would be the sole deviation regarding hunting, fishing, and trapping from alternative 1, and is discussed in more detail in the Access and

Orientation section. Providing this opportunity within existing authorized areas would result in a long-term, minor to moderate, beneficial impact on those visitors with mobility issues.

Some additional activities and new uses could be allowed in the preserve to encourage visitors to travel to and experience the preserve. New technologies such as GPS-based recreational activities, mobile phone applications, and virtual field trips may be developed to extend the range of low impact visitor activities. These expanded opportunities for activities and uses might enable some visitors who might not be able to physically travel to the preserve to experience the preserve remotely. This would contribute a long-term, minor to moderate, beneficial impact on visitor experience.

Access and Orientation. As in alternative 1, the visitor center would continue to provide orientation and introductory information to preserve visitors, and a research station would continue to allow preserve access for researchers. Additionally, a new visitor contact facility intended for initial contact and visitor orientation would be developed in Beaumont through a GSA lease. If determined necessary and appropriate, commercial visitor services could be authorized. These visitor service expansions would create additional opportunities for visitors to become oriented, gain a more in-depth understanding of the preserve, and make a stronger connection between the interpretive themes and the preserve's natural and cultural resources, providing a long-term, moderate, beneficial impact on visitor experience.

Similar to alternative 1, aside from the Staley Cabin, no access to cultural resources would be provided. This lack of access would result in a long-term, negligible to minor, adverse impact to those visitors who seek access to the preserve's cultural resources. In alternative 2, existing trails would be maintained, new trails would be established, and access points would be developed.

Hiking trails would be created as links to areas within and outside the preserve, with an improved sign plan to help visitors navigate to use areas and other destinations. All these important pieces of the alternative contribute a long-term, minor to moderate, beneficial impact on visitor experience by allowing clearer visitor orientation and wider opportunities for connectivity while recreating on trails.

Under alternative 2, an accessible hunting trail would be provided for access by only wheelchairs and other mobility devices. Visitors who desire the opportunity to recreate through the provision of an accessible hunting area in the preserve would experience a long-term, moderate, beneficial impact on visitor experience. Those who are opposed to expanding hunting opportunities in the preserve would experience a long-term, negligible to minor, adverse effect to their visitor experience.

Improved water access points and trails would be developed, including boat ramps for sections of the upper river. A small floating dock on the Neches River in the Canyonlands unit would be established. In this alternative, formal agreements could be sought with existing partner who have ramps that straddle the preserve boundary. All of these improvements to visitor water access would have long-term, moderate, beneficial impacts on visitor experience by allowing visitors increased opportunities for access to water-based recreation with a wider range of put-in locations.

Many of the above actions would help connect a larger audience to preserve sites, better connect visits between sites and reduce use conflicts. Further, some of the improvements would allow for easier access to busy sites, reducing visitor frustration and improving the quality of preserve visits.

Crowding and Solitude. In alternative 2, different activities would have designated areas. In some areas, multiple uses would use the same trails; in other areas, certain uses

would have their own designated trails or zones: For example, there would be zones designated as nonmotorized and motorized and there would be trails designated as horse trails, hiking trails, or multiuse trails. These designations would limit crowding and disturbance to solitude in particular areas, as well as increase safety in some areas, providing a long-term, minor to moderate, beneficial impact on visitor experience. However, some visitors may have to change the way they access their favorite site, because of changes in designation; this would result in a long-term, minor to moderate, adverse impact on their experience.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for visitor impacts compared to alternative 1, and thus result in a long-term, minor, beneficial impact to visitor experience in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Cumulative Impacts. Orientation in and around the preserve has been an ongoing issue. Boundary encroachments such as bulldozing illegal trails and roads confuse official access with illegally created access. Also, signs identifying the preserve boundary have often been defaced or removed, adversely impacting visitor orientation. Currently, there are unofficial, private boat docks or launches in various locations along the waterways within the preserve that are being used by visitors. Past and current issues likely to continue into the future that affect the water-based visitor experience include pollution from industry

outfalls and discharge from improperly constructed private septic tanks.

When the effects of alternative 2 are added to the effects of other past, present, and reasonably foreseeable actions as described above, the cumulative effect would be long term, minor to moderate, and adverse on road-, trail-, and water-based visitor experiences, and long-term, negligible to minor, and adverse on visitor access and orientation. The actions in alternative 2 would contribute only a relatively small part of the overall cumulative impact.

Conclusion. Alternative 2 would be expected to have a long-term, minor to moderate, beneficial effect on road-based visitor experience for those visitors seeking road-based opportunities. There could be a long-term, minor, adverse impact on the road-based visitor experience for those visitors who would prefer to limit the amount of traffic and resource impacts that could result if auto tours were implemented.

Because of the development of new land and water trails and the expansions of services in this alternative, there would be long-term, minor to moderate, adverse impacts visitor experience for those visitors who would prefer to limit the amount of use and resource impacts that could result if new trails were developed and uses were expanded.

Alternative 2 would be expected to have a long-term, negligible to minor, beneficial effect on visitor access and orientation due to providing new accessible hunting access.

Alternative 2 would be expected to have a long-term, minor to moderate, beneficial effect on trail-based, water-based, and other recreation; on visitor access and orientation; and on crowding, and solitude.

Alternative 3: Leadership in Biodiversity and Sustainability

Road-based Recreation. In alternative 3, no change to road-based recreation would be implemented and road-based access would continue to be limited. For visitors who want to access the preserve for road-based recreation, there would continue to be a long-term, negligible to minor, adverse impact

This alternative also includes improved parking areas and trailheads, resulting in long-term, minor to moderate beneficial impacts on visitor experience.

Trail-based Recreation. This alternative also includes specific strategies to improve trail-based recreational opportunities. In alternative 3, some trails would be developed to allow for shared pedestrian access, including backcountry, frontcountry, and some partnership trails. New backcountry trails in alternative 3 include the Magnolia Trail and Loblolly Loop, Fern Hollow Trail, Fire Tower Trail, and the Village Creek Trail. The Neches Bottom and Jack Gore Baygall unit would include a new primitive trail. The expansion of areas appropriate for these activities would provide for increased recreation opportunities for visitors, and would have long-term, minor to moderate, beneficial effects on the visitor experience. However, multiuse trails could create user conflicts, resulting in long-term, minor to moderate, adverse impacts on visitor experience. Some visitors may oppose the expansion of recreational activities; these visitors would experience a long-term, minor to moderate, adverse impact.

Self-guiding tours would be available to visitors, providing a long-term, minor to moderate, beneficial impact to visitor experience through the availability of self-education opportunities. Trail development would focus on promoting sustainable modes of transportation as well as linking areas of the preserve to alternative transportation methods. These development and

sustainability efforts would contribute a long-term, minor to moderate, beneficial impact to visitor experience.

Opportunities for horseback riding and mountain biking would be expanded to the Magnolia Trail and Loblolly Loop in the Beech Creek unit. Bike route connections to trails outside the preserve and to public transit points would be encouraged. The expansion of these activities would have largely long-term, minor to moderate, beneficial impacts on the visitor experience by providing improved public transportation opportunities that would help connect a larger audience to preserve sites, better connect sites within the preserve, and reduce use conflicts. Some visitors might oppose the expansion of these activities—these visitors would experience a long-term, minor to moderate, adverse impact

Water-based Recreation. In alternative 3, the establishment of nonmotorized water-recreation opportunities, such as canoe and kayak trails, would contribute a long-term, negligible to minor, beneficial impact on visitor experience by expanding opportunities for low-impact visitor recreation.

Motorized boats, other than personal watercraft would be allowed in the Neches River and Pine Island Bayou from the end of Carpenter Road to the confluence with the Neches River, including Cook's Lake. To minimize conflicts between uses, many areas would be designated as paddling trails only, while trolling motors (no wake speed) would be allowed on all waters of the preserve. These nonmotorized zones would result in a long-term, minor to moderate, beneficial impact on visitor experience for paddlers. Motorboat use in the preserve could increase access for some visitors, contributing a long-term, minor to moderate, beneficial impact on visitor experience.

While this alternative offers fewer areas accessible to motorboats, the noise, speed, and wakes created from motorboats may be

disruptive to other visitors seeking solitude or an uninterrupted canoe or kayak experience. This would result in a long-term, minor to moderate, adverse impact on these visitors.

Houseboats would be prohibited in alternative 3, contributing a long-term, minor to moderate, beneficial impact to visitor experience through the enhanced viewsheds, sanitation, and visitor safety that would result from this prohibition. However, those visitors who enjoy the use of houseboats in the preserve may experience a long-term, minor to moderate, adverse impact on their visitor experience.

Other Recreation. In alternative 3, primitive backcountry camping would continue to be allowed in areas that are designated for camping. Visitors in favor of not expanding backcountry camping opportunities would experience a long-term, negligible to minor, beneficial impact on visitor experience. Those visitors who would like to see additional backcountry camping opportunities would experience a long-term, minor, adverse impact on visitor experience. Low-impact and nondamaging camping practices would be required to protect resources.

Hunting, fishing, and trapping would continue as currently authorized. Visitors who are opposed to the expansion of hunting in the preserve would experience a long-term, negligible to minor, beneficial impact on visitor experience, while those who wish to see additional areas open for hunting opportunities would experience a long-term, negligible to minor, adverse effect to their visitor experience.

No new activities or visitor uses would be developed within the preserve; this would have a long-term, negligible to minor, adverse impact on visitor experience.

Access and Orientation. In alternative 3, as in alternative 1, the visitor center would continue to provide orientation and

introductory information to preserve visitors and a research station would continue to allow preserve access for researchers. Additionally, a new visitor contact and multiuse facility intended for initial contact and visitor orientation would be developed in Beaumont in partnership with Lamar University. Additional field sampling stations, with stream gauges and other monitoring devices, could be constructed as necessary in the preserve and offsite stations could be developed in partnership with research organizations. If determined necessary and appropriate, commercial visitor services could also be authorized. These expanded visitor services would create additional opportunities for visitors to become oriented, gain a more in-depth understanding of the preserve, and make a stronger connection between the interpretive themes and the preserve's natural and cultural resources, thus resulting in a long-term, minor to moderate, beneficial impact on visitor experience.

Similar to alternative 1, access to cultural resources would not be provided. This lack of access would result in a long-term, negligible to minor, adverse impact to those visitors who focus on cultural resources. However, it places appropriate resources studies as a priority, and expects them to continue to be undertaken as staffing and funding allow. These studies would include surveys related to compliance activities and synthesis of survey information in spatial databases. This focus would contribute a long-term, negligible, beneficial impact on visitor experience for potential future interpretive opportunities.

In alternative 3, portions of certain trails and abandoned roads would be restored, including one designated for administrative use only and another one reclaimed as a hiking trail. However, no new roads would be built except for minor improvements necessary for trailhead and boat ramp access, resulting in long-term, negligible to minor, adverse impacts. New trails would be built to provide access for low-impact recreation,

such as numerous hiking trails to link areas within and outside the preserve. This trail system would include an improved sign plan to help visitors navigate to day use areas and other destinations, and along paddle trails. All these actions would result in a long-term, minor to moderate, beneficial impact to visitor experience by providing clearer visitor orientation and wider opportunities for connectivity while recreating on trails.

Consistent with alternative 1, hunting would continue as currently authorized. Visitors who are opposed to the expansion of hunting access in the preserve would experience a long-term, negligible, beneficial visitor experience impact, while those who wish to see additional areas open for hunting would experience a long-term, negligible to minor, adverse effect to their visitor experience.

Improved boat ramps would be added for small motorboats in a few areas, including a boat ramp and dock built in association with the facility shared with Lamar University in Beaumont. A boat dock would be added in the Beaumont unit in connection with the trailhead for the new boardwalk trail. In this alternative, primitive canoe trails would also be established. All of these improvements to water access would have long-term, minor to moderate, beneficial impacts on visitor experience by allowing visitors increased opportunities for access to water-based recreation with a wider range of put-in locations.

Many of the above actions would help connect a larger audience to preserve sites, better connect between sites, and reduce use conflicts. Further, some of the improvements would allow for easier access to busy sites, reducing visitor frustration and improving the quality of preserve visits.

Crowding and Solitude. In alternative 3, different activities would have designated areas. In some areas, multiple uses would occur on the same trails; in other areas, certain uses would have their own designated trails or zones. For example, there would be

designation of nonmotorized and motorized zones and horse trails and multiuse trails. These designations would limit crowding and disturbance to solitude in particular areas, as well as increase safety in some areas, providing a long-term, minor to moderate, beneficial impact on visitor experience.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for visitor impacts compared to alternative 1, and thus, result in a long-term, minor, beneficial impact to visitor experience in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Cumulative Impacts. Increased development in the region could lead to an increase in visitation over the next 20 years; this could have an adverse impact on future crowding and opportunities for solitude. The intensity of this future impact is anticipated to be minor.

Orientation in and around the preserve has been an ongoing issue. Boundary encroachments, such as bulldozing illegal trails and roads, continue to be confused with areas of official access. Also, signs identifying the preserve boundary have been defaced or removed, adversely impacting visitor orientation. Currently, there are unofficial, private boat docks or launches in various locations along the waterways within the preserve that are being used by visitors.

Past and current issues likely to continue into the future that affect the water-based visitor experience include pollution from industry

outfalls and discharge from improperly constructed private septic tanks.

When the effects of alternative 3 are added to the effects of other past, present, and reasonably foreseeable actions as described above, the cumulative effect would be long-term, minor to moderate, and adverse on road-, trail-, water-based recreation, as well as on other visitor experiences. The actions in alternative 3 would not contribute to the overall cumulative impact because alternative 3 does not include the development of roads or auto tours.

Also, when the effects of alternative 3 are added to the effects of other past, present, and reasonably foreseeable actions as described above, the cumulative effect would be long-term, negligible to minor, and adverse on visitor access and orientation. The actions in alternative 3 would contribute only a relatively small part of the overall cumulative impact.

Conclusion. Alternative 3 would be expected to have a long-term, negligible to minor, adverse impact on road-based visitor experiences, as well as on visitor access and orientation because this alternative does not implement auto tours for visitors seeking road-based opportunities, does not provide access to cultural resources, does not provide new roads, and does not provide additional hunting access.

There could be long-term, minor to moderate, adverse impact on the trail- and water-based recreation, as well as on other visitor experiences under alternative 3 due to the development of new trails and expanded uses, the establishment of motorized and nonmotorized use zones, and the prohibition of houseboats because some visitors do not want to see these changes.

There could be long-term, negligible to minor, beneficial impact on road-based, other land-based, and water-based opportunities under alternative 3 due to lack of auto tours; development of more

backcountry campsites; increase in hunting, fishing, and trapping opportunities; possible commercial visitor services; installation of additional field sampling stations for researchers and partners; addition of further cultural resource studies and surveys; establishment of a visitor contact station and multiuse facility in Beaumont; development of new hiking trails to increase community and preserve connectivity; development of a new sign plan to help visitor navigation and orientation; and improved water access and trails.

Alternative 3 would be expected to have a long-term, minor to moderate, beneficial effect on trail- and water-based visitor opportunities, as well as on crowding and solitude due to the development of new trails and expanded uses, designated and signed water trails and waterways that would minimize visitor conflicts, designated nonmotorized areas for paddlers, designated motorized areas for other boaters, and the prohibition of houseboats.

Alternative 4: Connecting People to the Preserve

Road-based Recreation. In alternative 4, opportunities would be available for visitors to experience the fundamental resources and values of the preserve through auto tours linking the preserve units. These tours would provide a long-term, minor to moderate, beneficial impact on visitor experience for those who desire these opportunities. Visitors not in favor of providing auto tours would experience a long-term, minor, adverse impact.

Roads could be developed to allow for new or improved visitor access into the preserve units, including into undeveloped areas. For the visitors preferring limited access within the preserve, this would provide a long-term, minor to moderate, adverse impact. For those who desired improved access or access into new areas, this would provide a long-term, minor to moderate, beneficial impact on visitor experience.

Trail-based Recreation. This alternative includes specific strategies to improve mainland recreational opportunities. In alternative 4, there would be opportunities for self-guiding tours that would provide an introduction to inaccessible areas of the preserve, providing a long-term, minor to moderate, beneficial impact on visitor experience. In this alternative, partnerships could be used to develop regional trail connections linking to the preserve. New backcountry trails in alternative 4 would include the Magnolia Trail and Loblolly Loop, Alabama Trace Trail, Yellow Bluff Ferry Trail, and a multiuse trail in the Lance Rosier unit. New frontcountry trails would include a hiking trail linking the visitor center to Village Creek and the Turkey Creek Trail (Village Creek Trail), the Fern Hollow Trail, and a multiuse trail in the Lower Neches River corridor unit. These development and partnership efforts would result in a long-term, minor to moderate, beneficial impact on visitor experience.

Horseback riding and mountain biking would be allowed on designated routes within the preserve including new areas deemed as appropriate such as areas in the Beech Creek unit, the Oxbow area of the Beaumont unit, and the Lance Rosier unit. The continued allowance and possible expansion of these activities would provide for increased recreational opportunities for visitors and would result in a largely long-term, minor to moderate beneficial impact on the visitor experience. However, multiuse trails could create user conflicts, resulting in long-term, minor to moderate, adverse impacts on visitor experience. Some visitors may oppose the expansion of recreational activities; these visitors would experience a long-term, minor to moderate, adverse impact. Some visitors may oppose the expansion of these activities. These visitors would experience a long-term, minor to moderate, adverse impact.

Water-based Recreation. In alternative 4, designated water trails could be developed and maintained to guide visitors to resources that can be reached only by water,

contributing a long-term, minor to moderate, beneficial impact on visitor experience by expanding opportunities for low-impact visitor recreation. These trails would be suitable for a wide range of paddling expertise, with a minimal number of portages required.

Motorized boats, other than personal watercraft, would be allowed in all navigable water except where prohibited by conditions and for conflicting uses. To minimize conflicts between uses, many areas would be designated for just paddling, while trolling motors (no wake speed) would be allowed in all waters of the preserve. These nonmotorized zones would result in a long-term, minor to moderate, beneficial impact on visitor experience for paddlers. Motorboat use in the preserve could increase access, contributing a long-term, minor to moderate, beneficial impact on visitor experience for some. The noise, speed, and wakes created from motorboats may be disruptive to other visitors seeking solitude or an uninterrupted canoe or kayak experience. Because other water-based recreation opportunities are available, this would contribute to a long-term, negligible to minor, adverse impact on these visitors.

Houseboats would continue to be allowed in alternative 4, but would be subject to increased regulation. This could have a long-term, negligible to minor, beneficial impact on visitor experience. However, those visitors who oppose houseboats for a variety of reasons might experience a long-term, minor to moderate, adverse impact on their visitor experience.

Other Recreation. In alternative 4, primitive backcountry camping would continue to be allowed in designated areas with the designation of new backcountry campsites along land and water trails. Twenty designated backcountry camping sites (10 ft. by 10 ft.) could be developed along land and water trails. These increased camping opportunities would provide a long-term, minor to moderate, beneficial impact on

visitor experience for those visitors who seek a wide variety of camping experiences. Visitors opposed to providing further camping opportunities in the preserve would experience a long-term, minor to moderate, adverse impact.

Hunting, fishing, and trapping would continue as currently authorized. Visitors who are opposed to the expansion of hunting in the preserve would experience a long-term, negligible, beneficial impact, while those who wish to see additional areas open for hunting opportunities would experience a long-term, negligible to minor, adverse effect to their visitor experience.

Some additional activities and new uses could be allowed in the preserve to encourage visitors to travel to and experience the preserve. New technologies, such as GPS-based recreational activities or canoe trails, might be developed to extend the range of low impact visitor activities. These activities and uses would contribute a long-term, minor to moderate, beneficial impact on visitor experience, and enable some visitors who may not be able to physically travel to the preserve to experience the preserve remotely.

Access and Orientation. As in alternative 1, the visitor center would continue to provide orientation and introductory information to preserve visitors and a research station would continue to allow preserve access for researchers. Additionally, a new visitor contact facility intended for initial contact and visitor orientation would also be developed in Beaumont. A multiuse facility could be developed with Lamar University including a visitor contact station, education, and a ranger station. If determined necessary and appropriate, commercial visitor services could also be authorized. Under this alternative, the commercial services would be encouraged to provide greater access and opportunities for visitors such as guides and tours. The expansion of these visitor services would create additional opportunities for visitors to get oriented, gain a more in-depth

understanding about the preserve, and make a stronger connection between the interpretive themes and the preserve's natural and cultural resources, resulting in a long-term, minor to moderate, beneficial impact by expanding and improving visitor experience.

Unlike alternative 1, cultural resources would be interpreted and guided tours would provide visitors greater opportunities for access to cultural resources. This alternative also would promote more extensive research efforts to document the area's history and resources. These actions would result in a long-term, minor to moderate, beneficial impact to visitor experience, particularly to those visitors that seek access to the preserve's cultural resources.

In alternative 4, roads and trails could be developed to allow for new or improved visitor access into units, including undeveloped areas. These new roads and facilities would be sited to increase visitor access. These roads and trails would have a long-term, minor to moderate, beneficial impact for those visitors wanting improved access or access into new areas, but may have a long-term, negligible to minor, adverse impact for those who want to allow only limited access. Hiking trails could include self-guiding nature trails that provide an introduction to inaccessible areas of the preserve, with an improved sign plan to help visitors navigate to day use areas and other destinations. The preserve boundary would be marked. These important pieces of the alternative contribute a long-term, minor to moderate, beneficial impact on visitor experience by allowing clearer visitor orientation and wider opportunities for unique routes while recreating on trails.

Hunting would continue to be as currently authorized. Visitors who are opposed to the expansion of hunting access in the preserve would experience a long-term, negligible, beneficial visitor experience impact for safety and resource protection, while those who wish to see additional areas open for hunting

opportunities would experience a long-term, negligible to minor, adverse effect on their visitor experience.

Boat ramps, launches, and docks would be designed and located for improved visitor access in certain areas, such as a small floating dock built on the Neches River in the Canyonlands unit to provide access to hiking trails. Unauthorized private boat launches would be removed. All of these improvements to visitor water access would have long-term, minor to moderate, beneficial impacts on visitor experience by allowing visitors increased opportunities for access to water-based recreation with a wider range of put-in locations.

Many of the above actions would help connect a larger audience to preserve sites, better connect between sites, and reduce use conflicts. Further, some of the improvements would allow for easier access to busy sites, reducing visitor frustration and improving the quality of preserve visits.

Crowding and Solitude. In alternative 4, different user activities would have designated areas acceptable for use. In some areas, multiple uses would use the same trails; in other areas, certain uses would have their own designated trails or zones. For example, there would be designated nonmotorized and motorized zones or designated horse trails and multiuse trails. These designations would limit crowding and disturbance to solitude in particular areas, as well as increase safety in some areas, providing a long-term, minor to moderate, beneficial impact on visitor experience.

The implementation of user capacity indicators and standards to guide visitor use management in the preserve and increased monitoring of certain visitor activities (e.g., dumping, vandalism, poaching, crowding, houseboat use, illegal ORV use, conflicts between user groups, hunting, and water quality in high use areas) would help reduce the potential for visitor impacts compared to alternative 1, and thus result in a long-term,

minor, beneficial impact to visitor experience in the preserve. Specific actions that may be taken if standards identified in this plan were to be approached or exceeded would be evaluated under the requirements of the National Environmental Policy Act, the National Historic Preservation Act, and other applicable laws and policies.

Cumulative Impacts. Orientation in and around the preserve has been an ongoing issue. Boundary encroachments such as bulldozing illegal trails and roads have confused areas of official access with areas of illegally created access. Also, signs identifying the preserve boundary have often been, and continue to be, defaced or removed, adversely impacting visitor orientation. Past and current issues likely to continue into the future that affect the water-based visitor experience include pollution from industry outfalls and discharge from improperly constructed private septic tanks.

Increased development in the region could lead to an increase in visitation over the next 20 years; this could have an adverse impact on future crowding and opportunities for solitude. The intensity of this future impact is anticipated to be minor.

When the effects of alternative 4 are added to the effects of other past, present, and reasonably foreseeable actions as described above, the cumulative impact would be long-term, minor to moderate, and adverse on road-, trail-, water-based, and other visitor experiences. The cumulative effect also would be long-term, negligible to minor, adverse impact on visitor access and orientation. The actions in alternative 4 would contribute only a relatively small part of the overall cumulative impact.

Conclusion. There could be a long-term, minor to moderate, adverse impact on the road- and water-based visitor experience under alternative 4 due to implementation of auto tours and development of new roads and trails, the establishment of motorized and nonmotorized use zones, enforcement of

houseboat regulations or the continued presence of houseboats, and expanded uses. There would also be no changes to current uses such as backcountry primitive camping and hunting, fishing, and trapping.

There could also be a long-term, negligible to minor, adverse impact on visitor access and orientation under alternative 4 due to the development of new roads and the lack of additional hunting access.

Alternative 4 would be expected to have a long-term, minor to moderate, beneficial effect on road-, trail-, and water-based experiences, as well as on other visitor experiences and on visitor access and orientation. This beneficial effect would be due to the implementation of auto tours; the development of new roads, land trails and signed water trails; designated nonmotorized areas for paddlers and motorized areas for other boaters; and the enforcement of houseboat regulations. Beneficial effects would also be due to the possibility of allowing some commercial visitor services; more extensive cultural resources research to enhance interpretation; greater access to selected cultural resources; the establishment of a new visitor contact station and multiuse facility in Beaumont; and a new sign plan to help visitor navigation and orientation.

INTERPRETATION AND EDUCATION

Alternative 1

In alternative 1, existing interpretive activities and programs would continue with few changes. Visitors who desire the availability of more interpretive activities would experience a long-term, negligible to minor, adverse effect on visitor education.

Education programs would continue to be an effective collaboration with educators, addressing preserve interpretive themes and meeting the audiences' curriculum objectives. These programs would continue to be offered based on available staffing; however,

because of limited staffing, this would result in a long-term, negligible to minor, beneficial effect on visitor experiences for those visitors who desire educational opportunities to be offered in and outside the preserve.

In alternative 1, use of current partnerships would continue, with no new outreach efforts anticipated. These continuing partnerships, which help the National Park Service to provide greater education and interpretation opportunities, would result in a long-term, negligible to minor, beneficial impact on visitor education.

Under this alternative, no new trails would be created specifically for interpretation or educational purposes, resulting in a long-term, negligible to minor, adverse impact on visitor education for those who desire a greater range of interpretation in the preserve.

Under this alternative, there would be increased focus on appropriate resource studies and investigations of cultural resources, as staffing and funding allow. These actions would include surveys related to compliance activities and the synthesis of survey information in spatial databases. This focus would contribute a long-term, negligible to minor, beneficial impact on interpretation and education in the preserve because when compiled, the results of this research could be used for future interpretive opportunities.

Cumulative Impacts. There are no past, present, or reasonably foreseeable actions that would have impacts on interpretive activities, education programs, partnerships, or outreach. Therefore, there are no cumulative impacts.

Conclusion. Alternative 1 would be expected to have a long-term, negligible to minor, adverse impact on visitor education and interpretation, because there would be no changes in interpretive activities, education programs, partnerships, or outreach, and there would be no development of new trails

for educational and interpretive purposes. There could be long-term, minor to moderate beneficial impacts on future interpretive activities based on the results of cultural resource studies. Therefore, the impacts of alternative 1 would be long-term, negligible to minor, and both beneficial and adverse.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

In alternative 2, a wide variety of additional interpretive activities and programs would be provided. These could include self-guiding or ranger-led tours and interpretive wayside exhibits, displays, and demonstrations that highlight the preserve's natural and cultural resources. These activities and programs would provide a long-term, minor to moderate, beneficial impact on visitor education, allowing visitors to explore the full array of interpretive themes in the preserve.

Expansion of curriculum-based presentations would be designed to encourage lifelong learning and stewardship. Educational programs would be tied to state curriculum requirements, the national education standards, and presidential goals for education and fitness, as well as broader education goals of communities and schools. As resources allow, these interdisciplinary presentations could be expanded to every school in the preserve's region, providing a long-term, moderate, beneficial impact on visitor education.

In alternative 2, collaborative interpretive activities in partnership with other entities or organizations would be encouraged and developed. Efforts to enhance community outreach and educational initiatives would be increased. Partnerships could be used to provide facilities and support for educational programs, as well as to integrate research and interpretive programs into the broader educational goals of communities and schools. These partnerships would create a long-term, moderate, beneficial impact on visitor experience by creating a valuable link

between the preserve and the broader community.

While alternative 2 does not focus on cultural resources, it seeks partnerships to carry out resource surveys, document and assess resources, and monitor them. These activities would result a long-term, negligible to minor, beneficial impact on visitor education because it would be compiled for potential future interpretive opportunities.

Under this alternative, no new trails would be created specifically for interpretative or educational purposes; however, interpretive and educational goals could be realized on existing preserve trails, creating a long-term, minor, beneficial impact on visitor education.

All of the interpretive activities in this alternative would allow the preserve staff to engage a wider audience and to better demonstrate the unique and interesting resources found throughout the preserve. By educating visitors about the ecological and cultural significance and national uniqueness of the preserve, the National Park Service could generate community interest in resource stewardship of these sites, as well as provide the visitors with a comprehensive understanding of Big Thicket history. These results could contribute to an improved quality of life for residents of the area and a better visitor education for visitors to the preserve.

Cumulative Impacts. There are no past, present, or reasonably foreseeable actions that would have impacts on interpretive activities, education programs, partnerships, or outreach. Therefore, there are no cumulative impacts.

Conclusion. Alternative 2 would be expected to have a long-term, minor to moderate, beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and

outreach efforts, and new interpretive opportunities provided on current trails.

Alternative 3

In alternative 3, the preserve staff would provide interpretive programs and workshops related specifically to sustainability and natural resources. These activities and programs would provide a long-term, negligible to minor, beneficial impact to visitor education, allowing visitors to explore the full array of interpretive themes in the preserve.

Expansion of curriculum-based presentations would be designed to encourage lifelong learning and stewardship. Educational programs would be tied to state curriculum requirements, the national education standards, and presidential goals for education and fitness, as well as broader education goals of communities and schools. As resources allow, these interdisciplinary presentations could be expanded to every school in the preserve's region, providing a long-term, minor to moderate, beneficial impact on visitor education.

In alternative 3, opportunities for visitor learning and participation in scientific research and restoration projects would be developed through partnerships. Efforts would be increased to enhance community outreach and educational initiatives, such as citizen science programs. Partnerships could be used to provide facilities and support for educational programs, as well as to integrate research and interpretive programs into the broader educational goals of communities and schools. These partnerships would provide a long-term, minor to moderate, beneficial impact on visitor education. Under this alternative, while no new trails would be created specifically for interpretation or educational purposes, existing preserve trails could be used for these purposes, resulting in a long-term, minor, beneficial impact to visitor education.

All these important interpretive activities would allow the preserve staff to engage a wider audience and better demonstrate the unique and interesting resources found throughout the preserve. By educating visitors about the ecological and cultural significance and national uniqueness of the preserve, the National Park Service could generate community interest in resource stewardship of these sites, as well as provide the visitors with a comprehensive understanding of Big Thicket history. These results could contribute to an improved quality of life for residents of the area and a better visitor experience for visitors to the preserve.

Cumulative Impacts. There are no past, present, or reasonably foreseeable actions that would have impacts on interpretive activities, education programs, partnerships, or outreach. Therefore, there are no cumulative impacts.

Conclusion. Alternative 3 would be expected to have a long-term, minor to moderate, and beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and outreach efforts, and new interpretive opportunities provided on existing trails.

Alternative 4

In alternative 4, the new and expanded interpretive and education programming would emphasize the preserve's natural and cultural resources. The preserve staff would sponsor workshops highlighting the biological, historical, and cultural resources in the preserve, and experts would be invited to present programs on topics of interest in the preserve. These activities and programs would provide a long-term, negligible to minor, beneficial impact on visitor education, allowing visitors to explore the full array of interpretive themes in the preserve.

Expansion of curriculum-based presentations would be designed to encourage lifelong learning and stewardship. Educational programs would be tied to state curriculum requirements, the national education standards, and presidential goals for education and fitness, as well as broader education goals of communities and schools. As resources allow, these interdisciplinary presentations could be expanded to every school in the preserve's region, providing a long-term, minor to moderate, beneficial impact on visitor education.

In alternative 4, partnerships would be sought through designated affiliations such as UNESCO Biosphere Research and Globally Important Birding Area. Partnerships would be used to provide facilities and support for educational programs, as well as to integrate research and interpretive programs into the broader educational goals of communities and schools. These partnerships would provide a long-term, minor to moderate, beneficial impact on visitor experience.

Under this alternative, trails could be developed to link resources that highlight the history of habitation in and around the thicket. Both old and new trails could include self-guiding interpretive information on waysides on in a brochure. Ranger-led interpretive programs, both on and off the water, would be expanded as well. These trails would provide a long-term, minor to moderate, beneficial impact to visitor experience.

All of these important interpretive and educational activities would allow the preserve staff to engage a wider audience and better demonstrate the unique and interesting resources found throughout the preserve. By educating the visitors about the ecological and cultural significance and national uniqueness of the preserve, the National Park Service could generate community interest in resource stewardship of these sites, as well as provide the visitors with a comprehensive understanding of Big Thicket history. These results could contribute to an improved quality of life for residents of the area and a better visitor experience for visitors to the preserve.

Cumulative Impacts. There are no past, present, or reasonably foreseeable actions that would have impacts on interpretive activities, education programs, partnerships, or outreach. Therefore, there are no cumulative impacts.

Conclusion. Alternative 4 would be expected to have a long-term, minor to moderate, and beneficial impact on visitor education and interpretation due to increased visitor interpretation activities and programs, the expansion of curriculum-based presentations, increased partnership and outreach efforts, and new interpretive opportunities provided on new and current trails.

SOCIOECONOMICS

DEFINITIONS

The National Park Service applied logic, experience, professional expertise, and professional judgment to analyze the impacts on socioeconomic situation resulting from each alternative. Economic data, expected future visitor use and future developments of the preserve were all considered in identifying, discussion and evaluating expected impacts.

Impact Type

- **Adverse Impact:** Adverse impacts would diminish the established social and economic environment.
- **Beneficial Impact:** Beneficial impacts would improve the established social and economic environment.

Methodology

To determine the degree of impact as a result of implementing each alternative, the following scale of magnitude was used:

- **Negligible:** Negligible impacts would be below detectable levels or detectable only through direct means with no discernible effect on the character of the social and economic environment.
- **Minor:** Minor impacts would be detectable, but localized in geographic extent or size of population affected and not expected to alter the character of the established social and economic environment.

- **Moderate:** Moderate impacts would be readily detectable across a broad geographic area or segment of the community and could have an appreciable effect on the social and economic environment.
- **Major:** Major impacts would be readily apparent, affect a large segment of the population across the entire community and region and would have substantial effect on the social and economic environment.

ECONOMY AND EMPLOYMENT

Alternative 1: Continuation of Current Management (No-Action Alternative)

Analysis. Under this alternative, the impact on socioeconomic conditions in the area would change only slightly to reflect very small changes in visitor spending and direct and indirect employment generation. As the preserve continues to evolve and interpretive programs, especially with schools continue, this could result in an increased understanding and pride in the Big Thicket National Preserve's importance in protecting biodiversity and connections to local history. Consequently, impacts to socioeconomic conditions would continue to be beneficial, long term, and negligible.

Cumulative Impacts. Activities associated with other past, present or reasonably foreseeable actions such as limited planning and development control in the region, combined with industrial expansions in the Beaumont-Port Arthur region as well as continued long-term pressure to subdivide undeveloped land for housing development could result in job creation and increased

economic activity in the region, contributing to beneficial, long-term, minor to moderate impacts to socioeconomic conditions. Under alternative 1, impacts on the local socioeconomic environment from ongoing preserve actions in conjunction with other past, present or reasonably foreseeable actions, would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Conclusion. Under alternative 1, impacts on the local socioeconomic environment would be beneficial, long term, and minor to moderate. Cumulative impacts would be beneficial, long term and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

Analysis. Under alternative 2, management direction would focus on using partnerships and collaboration to support a broad ecosystem perspective for preserve management. The impact on socioeconomic conditions in the area would change a small amount to reflect changes in visitor spending and direct and indirect employment generation. As the preserve expands partnerships with the outside community and expands community outreach and interpretive programs, this could result in an increased understanding and pride in the Big Thicket National Preserve's importance in protecting biodiversity and connections to local history. National Park Service engagement in regional planning efforts could also result in beneficial effects in the local area. Also small increases in preserve staffing and construction relative to alternative 1 would have positive multiplier effects in the local area. Consequently, impacts to socioeconomic conditions would be beneficial, long term, and minor.

Cumulative Impacts. Activities associated with other past, present, or reasonably foreseeable actions such as limited planning and development control in the region, combined with industrial expansions in the Beaumont-Port Arthur region as well as continued long-term pressure to subdivide undeveloped land for housing development could result in job creation and increased economic activity in the region, contributing to beneficial, long-term, minor to moderate impacts to socioeconomic conditions.

Under alternative 2, impacts from preserve actions would represent only a small portion of the impact on socioeconomic conditions, but the area could benefit from the National Park Service engaging in local planning efforts. Therefore, impacts on the local socioeconomic environment from preserve actions in conjunction with other past, present, or reasonably foreseeable actions would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Conclusion. Under alternative 2, impacts on the local socioeconomic environment would be beneficial, long term, and minor to moderate. Cumulative impacts would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Alternative 3: Leadership in Biodiversity and Sustainability

Analysis. Under alternative 3, management direction would emphasize natural resource preservation and research while providing self-reliant recreational opportunities and the impact on socioeconomic conditions in the area would change slightly to reflect small changes in visitor spending and direct and indirect employment generation from increased preserve employment. As the preserve focuses on biodiversity and more rugged recreational opportunities, visitors

and residents could have an increasing appreciation for and pride in the biodiversity of the preserve. Also small increases in preserve staffing (higher than alternative 2) and some limited construction would have positive multiplier effects in the local area. Consequently, impacts to socioeconomic conditions would continue to be beneficial, long term, and minor.

Cumulative Impacts. Activities associated with other past, present, or reasonably foreseeable actions outside the preserve such as limited planning and development control in the region, combined with industrial expansions in the Beaumont-Port Arthur region as well as continued long-term pressure to subdivide undeveloped land for housing development would result in job creation and increased economic activity in the region, contributing to beneficial, long-term, minor to moderate impacts to socioeconomic conditions.

For alternative 3, impacts from preserve actions would represent a small portion of the impact on socioeconomic conditions, but the area could benefit from NPS hiring and limited construction. Therefore, impacts on the local socioeconomic environment from preserve actions in conjunction with other past, present, or reasonably foreseeable actions would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Conclusion. Under alternative 3, impacts on the local socioeconomic environment would be beneficial, long-term and minor to moderate. Cumulative impacts would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

Alternative 4: Connecting People to the Preserve

Analysis. Under alternative 4, management direction would increase the relevancy of the preserve and the National Park Service to the people in the communities of southeast Texas and to visitors from all over the world. Nature, history, and recreational opportunities would encourage people to connect to and support the purpose of the preserve. Increased visitor opportunities and the impact on socioeconomic conditions in the area would change appreciably to reflect modest increases in visitor spending. Also small increases in preserve staffing (higher than alternative 3) and some construction would have positive multiplier effects in the local area. As the preserve emphasizes personal connections to the preserve through family and cultural history, recreational opportunities, and personal experiences, visitors and residents could have an increasing connection with and pride in the history of the preserve. Consequently, impacts to socioeconomic conditions would be beneficial, long term, and moderate.

Cumulative Impacts. Activities associated with other past, present, or reasonably foreseeable actions such as limited planning and development control in the region, combined with industrial expansions in the Beaumont-Port Arthur region as well as continued long-term pressure to subdivide undeveloped land for housing development could result in job creation and increased economic activity in the region, contributing to beneficial, long-term, minor to moderate impacts to socioeconomic conditions. Because alternative 4 includes more hiring and construction than the other alternatives, the impacts on local socioeconomic conditions from actions taken by the preserve staff would be greater, but overall regional actions would still predominate. Impacts on the local socioeconomic environment from preserve actions in conjunction with other past, present, or reasonably foreseeable actions would be beneficial, long term, and minor to moderate. Impacts from preserve

actions would represent only a small portion of the cumulative impact.

Conclusion. Under alternative 4, impacts on the local socioeconomic environment would be beneficial, long term, and minor to

moderate. Cumulative impacts would be beneficial, long term, and minor to moderate. Impacts from preserve actions would represent only a small portion of the cumulative impact.

OPERATIONS AND FACILITIES

DEFINITIONS

Duration. The following definitions of duration apply to all operations and facilities topics:

- **Short Term:** Impacts would be less than one year.
- **Long Term:** Impacts would extend beyond one year and have a permanent effect on operations.
- **Moderate:** The effects would be readily apparent and would result in a substantial change in NPS operations in a manner noticeable to staff and the public.
- **Major:** The effect would be readily apparent and would result in a substantial change in NPS operations in a manner noticeable to staff and the public and be markedly different from existing operations.

Impact Type

- **Beneficial Impact:** Beneficial impacts would improve NPS operations or facilities.
- **Adverse Impacts:** Adverse impacts would negatively affect NPS operations or facilities and could hinder the preserve's ability to provide adequate services facilities to visitors and NPS staff. Some impacts could be beneficial for some operations or facilities and adverse or neutral for others.

Methodology

To determine the degree of impact as a result of implementing each alternative, the following scale of magnitude was used:

- **Negligible:** NPS operations would not be affected or the effect would be at or below the lower levels of detection and would not have an appreciable effect on NPS operations.
- **Minor:** The effects would be detectable, but would be of a magnitude that would not have an appreciable effect on NPS operations.

ALTERNATIVE 1: CONTINUATION OF CURRENT MANAGEMENT (NO-ACTION ALTERNATIVE)

Analysis

Under alternative 1, limited changes to NPS operations and facilities would occur although new construction would continue to be limited for public use and administrative facilities. District ranger stations would be maintained or established in the north, central, and southern portions of the preserve as necessary. In some instances, visitor contact stations would be jointly located with existing facilities, possibly in Beaumont, Woodville, Saratoga, and Silsbee. The headquarters building and visitor center would remain at the current location near Kountze. The preserve staff would undertake work in the parking lot of the visitor center to improve visitor safety and would undertake work around the headquarters complex to address maintenance and drainage issues. A visitor contact station would be reestablished in Beaumont under a GSA lease. Newer preserve units (i.e., Big Sandy Creek corridor unit, Village Creek corridor unit, and Canyonlands unit) would be managed in a manner compatible with other units.

Limited NPS funding and staffing levels would continue to pose logistical challenges particularly in fulfillment of ongoing facility management and maintenance responsibilities and resource or law enforcement protection. It would remain difficult for the existing staff to adequately provide resource protection for the preserve's extensive and noncontiguous land and water-based units, maintain facilities, and provide for appropriate visitor use activities and services in a safe and efficient manner. Limited NPS funding and staffing levels at the preserve would continue to pose logistical challenges particularly in fulfillment of ongoing facility management and maintenance responsibilities and resource or law enforcement protection.

Preserve staff would continue to maintain existing administrative and visitor use facilities and infrastructure (e.g., roads, trails, parking areas and trailheads); no new roads and trails would be anticipated in the newly acquired lands. The preserve staff would also continue to maintain existing boat ramps and launches as well as paved roads. There would be an impact on preserve staff associated with ongoing maintenance activities.

Improvements to the grounds at the headquarters and visitor center area would cause a short-term increase in staff actions; however, once the projects were completed there would be a reduction in maintenance required at the site. Taken together, these actions would have short-term and long-term, minor to moderate, adverse impacts on preserve operations, primarily because of the expenses and staff time associated with ongoing maintenance and proposed development actions.

Long-term minor to moderate beneficial impacts to preserve operations would also be expected as a result of the operational efficiencies and improved staff response times if the district ranger stations were established. Preserve operations would also benefit from establishment of a new visitor contact facility near Beaumont that would

increase the Park Service's regional presence and provide initial orientation for visitors traveling to the preserve primarily from the south. Operations would also benefit from marking or improved delineation of the preserve's boundaries in efforts to reduce boundary incursions and other illegal activity. Long-term, minor, beneficial impacts on operations would also occur from continuing to provide housing for seasonal workers (a critical element in staff recruitment), and ongoing use of the field research station near Saratoga for research purposes and temporary housing for researchers.

The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction and would build to the highest achievable LEED standards. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would continue, including recycling and green purchasing. Minor, short-term, adverse impacts on preserve operations would occur from implementation of (or conversion to) environmentally responsible design and construction measures. However, in the long term, minor to moderate, beneficial impacts to operations would result from the reduced costs and energy savings anticipated from conversion to alternative energy sources and adoption of other energy-conservation measures.

The preserve staff would continue to collaborate with other organizations and agencies to assist with resource management, visitor protection services, research, and other activities. Among these, staff would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Preserve staff would also continue to partner with the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program for biological inventories, monitoring, and biodiversity research. Partnership with neighboring local

and county law enforcement agencies would also continue to assist the preserve's visitor and resource protection objectives. Continuance of these and other partnerships and cooperative management agreements would enhance resource management and visitor or resource protection efforts, resulting in long-term, minor to moderate, beneficial impacts on preserve operations.

Cumulative Impacts

National Park Service operations at Big Thicket National Preserve have been (or have the potential to be) affected by other past, present and reasonably foreseeable projects or management actions. Past, present, and reasonably foreseeable actions include industrial development (oil and gas production, timber harvesting), dumping, suburban expansion, and other development activities. These and other actions have adversely impacted or have the potential to contribute adverse impacts to preserve resources, ecological functions, and visitor experiences because of air and water pollution, degradation and fragmentation of wildlife habitat, and other factors. To address these issues, preserve staff are often required to negotiate with other government, community, and industry officials to seek ways to avoid or mitigate adverse impacts on preserve resources and visitor experiences. Because of the limited numbers and availability of preserve staff, the requirements to engage outside parties in these types of management negotiations and agreements place additional demands on staff workloads resulting in long-term, minor to moderate, adverse impacts on preserve operations.

The impacts associated with implementation of alternative 1 would have short-term and long-term, minor to moderate, adverse and beneficial impacts on preserve operations. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative

1, would result in long-term, minor to moderate, adverse cumulative impacts on preserve operations. The impacts associated with alternative 1 would represent a substantial component of the adverse cumulative impact.

Conclusion

Short-term and long-term, localized, minor to moderate, adverse and beneficial impacts on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor activities, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on preserve operations from implementing alternative 1 in conjunction with other past, present, or reasonably foreseeable actions.

ALTERNATIVE 2: PARTNERSHIPS AND COLLABORATION (PREFERRED ALTERNATIVE)

Analysis

Under alternative 2, the proposed development actions and operational improvements identified under alternative 1 would be carried out as well as additional limited construction for public use and administrative facilities. Facilities would be minimal, sustainably built, and developed outside the preserve boundaries to the extent possible to minimize impacts on preserve resources. District ranger stations (staffed with law enforcement and interpretive rangers) could be established as necessary either inside or outside the preserve. The types of development that would be appropriate in the preserve include facilities that support resource protection and visitor recreational or ecotourism activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events), picnic and day use areas, and land and water recreational trails. Where possible, existing

and new trails would be designed to link with trails outside the preserve boundary, and abandoned roadbeds would be used as feasible to minimize resource impacts. A new visitor contact facility could be established through a GSA lease. This facility would replace the facility reestablished under alternative 1, so no change to expenses or maintenance activities would be anticipated. Management of the visitor contact facility could be shared among various partner agencies and organizations. Implementation of the actions identified above would be expected to have both short-term and long-term, minor to moderate, adverse impacts on preserve operations in large part because of the added expenses associated with construction costs and ongoing maintenance.

Long-term, minor to moderate, beneficial impacts to preserve operations would also be expected as a result of the operational efficiencies and improved staff response that would result from the establishment of district ranger stations. Preserve operations would also benefit from establishment of a new visitor contact facility near Beaumont that would increase the Park Service's regional presence and provide initial orientation for visitors traveling to the preserve from the south. Long-term, minor beneficial impacts on operations would also occur from continued provision of housing for seasonal workers (a critical element in efforts to promote staff recruitment), and ongoing use of the expanded field research station near Saratoga for research purposes and temporary housing for researchers.

The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction and would adopt LEED Platinum construction standards. The preserve management would also pursue "climate-friendly" designation and seek inclusion and recognition for leadership efforts in environmental management. Alternative energy sources would be used where possible for facilities and utility vehicles. Other energy conservation measures would continue,

including recycling and green purchasing. Minor, short-term, adverse impacts on preserve operations would occur from implementing (or converting to) environmentally responsible design and construction measures. However, in the long term, minor to moderate, beneficial impacts to operations would result from the reduced costs and energy savings anticipated from conversion to alternative energy sources and adoption of other energy conservation measures.

The preserve staff would strengthen efforts to collaborate with other organizations and agencies to assist with resource management, visitor protection services, research, and other activities. Among these, staff would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Preserve staff would also continue to partner with the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program to complete biological inventories, monitoring and biodiversity research. Partnerships with neighboring local and county law enforcement agencies would also continue to benefit the preserve's visitor and resource protection objectives. Additional boat launch facilities and opportunities with partners such as Lamar University would be sought out and encouraged. Continuance of these and other partnerships and cooperative management agreements would enhance resource management and visitor or resource protection efforts, resulting in long-term, minor to moderate, beneficial impacts on preserve operations. To fully implement this alternative, an additional 11 FTE staff would be required primarily for science, data management, and resource protection activities. These additional staff would result in a long-term, minor to moderate, beneficial impact on operations in the preserve.

Cumulative Impacts

National Park Service operations at Big Thicket National Preserve have been (or have the potential to be) affected by other past, present, and reasonably foreseeable projects or management actions. These actions include industrial development (oil and gas production, timber harvesting), dumping, suburban growth, and other development activities. These and other actions have adversely impacted, or have the potential to contribute adverse impacts to preserve resources, ecological functions, and visitor experiences because of air and water pollution, degradation and fragmentation of wildlife habitat, and other factors. To address these issues, preserve staff are often required to negotiate with other government, community, and industry officials to seek ways to avoid or mitigate adverse impacts on preserve resources and visitor experiences. Because of the limited numbers and availability of preserve staff, the requirements to engage outside parties in these types of management negotiations and agreements place additional demands on staff workloads, resulting in long-term, minor to moderate, adverse impacts on preserve operations.

The impacts associated with implementation of alternative 2 would have short-term and long-term, minor to moderate, adverse and beneficial impacts on preserve operations. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 2, would cumulatively result in long-term, minor to moderate, adverse impacts on preserve operations. The impacts associated with alternative 2 would represent a substantial component of the adverse cumulative impact.

Conclusion

Short-term and long-term, localized, minor to moderate, adverse and beneficial impacts

on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on preserve operations from implementing alternative 2 in conjunction with other past, present, or reasonably foreseeable actions.

ALTERNATIVE 3: LEADERSHIP IN BIODIVERSITY AND SUSTAINABILITY

Analysis

Under alternative 3, the proposed development actions and operational improvements identified under alternative 1 would be carried out as well as additional limited construction of public use and administrative facilities. Facilities would be minimal, sustainably built, and developed outside the preserve boundaries to the extent possible to minimize impacts on preserve resources. Existing facilities in areas of prior development in the preserve could be retrofitted, redesigned, or rebuilt as necessary for administrative purposes. In partnership with Lamar University in Beaumont, the National Park Service would consider developing a multiuse facility that could include a visitor contact station, education facility, and a ranger station. Additional field research stations could be constructed in the preserve for environmental monitoring and data collection. Off-site research stations could also be developed in partnership with research organizations.

The types of development that would be appropriate in the preserve include facilities that support resource protection and visitor recreational or ecotourism activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events), picnic and day use areas, and land and water recreational trails. Where possible, existing and new trails would be designed to link with trails outside the preserve boundary, and

abandoned roadbeds would be used as feasible to minimize resource impacts. No new roads would be built except for minor improvements, and portions of existing roads and trails would be removed and the land restored. To assist resource protection efforts, trailheads, parking areas, and associated facilities could be reduced or limited in certain areas, and restrictions could be placed on approved camping locations. Implementation of the actions identified above would be expected to have both short-term and long-term, minor to moderate, adverse impacts on preserve operations, in large part because of the added expenses associated with construction costs and ongoing maintenance.

Long-term, minor to moderate, beneficial impacts to preserve operations would also be expected as a result of the operational efficiencies and improved staff response times if the district ranger stations are established. Preserve operations would also benefit from establishment of a new visitor contact facility near Beaumont that would increase the National Park Service's regional presence. Long-term, minor, beneficial impacts on operations would also occur from provisioning housing for seasonal workers in neighboring communities (a critical element in efforts to recruit staff), and ongoing use of the expanded field research station near Saratoga for research purposes and temporary housing for researchers.

The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction, and would adopt LEED construction standards. The preserve management would also pursue "climate-friendly" designation and seek inclusion and recognition for leadership efforts in environmental management. Opportunities to support alternative transportation within and to the preserve would be evaluated and implemented where feasible (e.g., support of bike lanes from nearby towns and cities, and connections to public transportation in Beaumont). Alternative energy sources would

be used where possible for facilities and utility vehicles. Other energy conservation measures would continue, including recycling and green purchasing. Minor, short-term, adverse impacts on preserve operations would occur from implementation of (or conversion to) environmentally responsible design and construction measures. However, in the long-term, minor to moderate, beneficial impacts to operations would result from the reduced costs and energy savings anticipated from conversion to alternative energy sources and adoption of other energy-conservation measures.

The preserve staff would strengthen efforts to collaborate with other organizations and agencies having similar mission objectives for resource protection, science, and stewardship. Among these, staff would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Preserve staff would also continue to partner with the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program to complete biological inventories, monitoring, and biodiversity research. Partnership with neighboring local and county law enforcement agencies would also continue to benefit the preserve's visitor and resource protection objectives. Additional boat launch facilities and opportunities with partners such as Lamar University would be sought out and encouraged. The preserve staff would increase patrols, improve signs, and engage communities in neighborhood partnership programs. Continuance and expansion of outreach efforts, partnerships, and cooperative management agreements would enhance resource management and visitor or resource protection, resulting in long-term, minor to moderate beneficial impacts on preserve operations. To fully implement this alternative, an additional 12.5 FTE staff would be required primarily for science, data management, and resource protection activities. These additional staff would have a

long-term, minor to moderate, beneficial impact on operations in the preserve.

Cumulative Impacts

National Park Service operations at Big Thicket National Preserve have been (or have the potential to be) affected by other past, present, and reasonably foreseeable projects or management actions. These actions include industrial development (oil and gas production, timber harvesting), dumping, and suburban growth. These and other actions have adversely impacted the preserve, or have the potential to contribute to air and water pollution and degradation and fragmentation of wildlife habitat, resulting in adverse impacts to preserve resources, ecological functions, and visitor experiences. To address these issues, National Park Service staff are often required to negotiate with other government, community, and industry officials to seek ways to avoid or mitigate potential adverse impacts. Because of the limited number and availability of preserve staff, the requirement to engage in these types of management negotiations places additional demands on staff workloads, resulting in long-term, minor to moderate, adverse impacts on preserve operations.

The impacts associated with implementing alternative 3 would have short-term and long-term, minor to moderate, adverse and beneficial impacts on preserve operations. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 3, would cumulatively result in long-term, minor to moderate, adverse impacts on preserve operations. The impacts associated with alternative 3 would represent a substantial component of the adverse cumulative impact.

Conclusion

Short-term and long-term, localized, minor to moderate, adverse and beneficial impacts on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on preserve operations from implementing alternative 3 in conjunction with other past, present, or reasonably foreseeable actions.

ALTERNATIVE 4: CONNECTING PEOPLE TO THE PRESERVE

Analysis

Under alternative 4, the proposed development actions and operational improvements identified under alternative 1 would be carried out as well as limited construction for public and administrative use. Facilities would be minimal, sustainably built, and more widely dispersed throughout the preserve to enhance the visitor experience. District ranger stations could be maintained or established in the north, central, and southern portions of the preserve as necessary. In some instances, visitor contact stations would be jointly located with existing facilities. The National Park Service would consider developing a multiuse facility in partnership with Lamar University in or near Beaumont, which could include a visitor contact station, education facility, and a ranger station. The facility would provide access into the preserve and interpretive opportunities.

The types of development that would be appropriate in the preserve include facilities that support resource protection and visitor recreational or ecotourism activities: boat ramps, parking areas (e.g., trailhead parking for hikers and hunters, additional parking at the visitor center for special events), picnic and day use areas, and land and water recreational trails. Backcountry primitive

camping would continue and could be expanded to include backcountry campsites. Trails would be developed to allow for new or improved visitor access into undeveloped areas. Land trails and roads would provide a variety of motorized and nonmotorized visitor experiences. Water trails, suited for a wide range of visitor paddling skills, would be developed and maintained to guide visitors to resources that can be reached by only canoes or kayaks. Implementation of the actions identified above would be expected to have both short-term and long-term, minor to moderate, adverse impacts on preserve operations in large part because of the added expenses associated with construction costs and ongoing maintenance.

Long-term, minor to moderate, beneficial impacts to preserve operations would also be expected as a result of the operational efficiencies and improved staff response times if the district ranger stations were established. Preserve operations would also benefit from the establishment of a new visitor contact facility near Beaumont that would increase the Park Service's regional presence. Enhanced interpretive and educational programming would respond to increasing visitation, ecotourism, and engage new audiences. Long-term, minor, beneficial impacts on operations would occur from continued provision of housing for seasonal and volunteer workers in neighboring communities (a critical element in efforts to recruit staff), and ongoing use of the expanded field research station near Saratoga for research purposes and temporary housing for researchers.

The National Park Service would continue to demonstrate leadership in environmentally responsible facility design and construction, and would adopt LEED construction standards. The preserve staff would transition operations and facilities to become "climate friendly" over time, exhibiting leadership in sustainability by reducing the carbon footprint of preserve operations, encouraging recycling for visitors and expanding current recycling operations,

biomass use, and green purchasing. Alternative energy sources would be used where possible for facilities and utility vehicles. Minor, short-term, adverse impacts on preserve operations would occur from implementation of (or conversion to) environmentally responsible design and construction measures. However, in the long-term, minor to moderate beneficial impacts to operations would result from the reduced costs and energy savings anticipated from conversion to alternative energy sources and adoption of other energy-conservation measures.

The preserve staff would strengthen efforts to collaborate with other organizations and agencies to assist with resource management, visitor protection services, research and other activities. Regional partnerships would be encouraged to conserve rivers, preserve open space, and develop trails and greenways. Partnerships could be pursued to provide recreational opportunities, resource management activities, or operations functions. Staff would continue to partner with the Big Thicket Association for management of the field research station and for activities of the All Taxa Biological Inventory. Preserve staff would also continue to partner with the Gulf Coast Cooperative Ecosystems Study Unit and the Gulf Coast Inventory and Monitoring Program to complete biological inventories, monitoring, and biodiversity research. Partnership with neighboring local and county law enforcement and fire management agencies would also continue to benefit the preserve's visitor and resource protection objectives. The preserve staff would increase patrols, improve signs, and engage communities in neighborhood partnership programs to promote volunteer involvement and local stakeholder interest in the preserve. Continuation of these and other partnerships and cooperative management agreements would enhance resource management and visitor or resource protection efforts, resulting in long-term, minor to moderate beneficial impacts on preserve operations. To fully implement this alternative, an additional 14 FTE staff would

be required primarily for outreach, maintenance, and resource protection activities. These additional staff would have a long-term, minor to moderate, beneficial impact on operations in the preserve.

Cumulative Impacts

NPS operations at Big Thicket National Preserve have been (or have the potential to be) affected by other past, present, and reasonably foreseeable projects or management actions. These actions include industrial development (oil and gas production, timber harvesting), dumping, suburban growth, and other development activities. These and other actions have adversely impacted, or have the potential to contribute adverse impacts to preserve resources, ecological functions, and visitor experiences. To address these issues, preserve staff are often required to negotiate with other government, community, and industry officials to seek ways to avoid or mitigate adverse impacts on preserve resources and visitor experiences. Because of the limited numbers and availability of preserve staff, the requirements to engage outside parties in these types of management negotiations and agreements place additional demands on staff workloads, resulting in long-term, minor to moderate, adverse impacts on preserve operations.

The impacts associated with implementation of alternative 4 would have short-term and long-term, minor to moderate, adverse and beneficial impacts on preserve operations. Other past, present, and reasonably foreseeable actions would result in long-term, minor to moderate, adverse impacts. Consequently, the adverse impacts of the other actions described above, in combination with the impacts of alternative 4, would cumulatively result in long-term, minor to moderate, adverse impacts on preserve operations. The impacts associated with alternative 4 would represent a modest component of the adverse cumulative impact.

Conclusion

Under alternative 4, short-term and long-term, localized, minor to moderate, adverse and beneficial impacts on preserve operations would occur from ongoing and proposed facility development, maintenance activities, administrative activities, visitor use, and other factors. There would also be long-term, minor to moderate, adverse cumulative impacts on preserve operations from implementation of alternative 4 in conjunction with other past, present, or reasonably foreseeable actions.

OTHER REQUIRED ANALYSIS

UNAVOIDABLE ADVERSE IMPACTS

Under all of the alternatives, some negligible to minor impacts to soils, water quality, vegetation, wetlands, and fish and wildlife caused by recreational use and facilities would be unavoidable (e.g., soil compaction, vegetation trampling, and wildlife disturbances). Visitors also may inadvertently contribute to the introduction and spread of nonnative species and to water pollution in localized areas. In some areas, increases in visitor use may have low-level adverse impacts on visitor experience (e.g., higher visitor numbers on trails or at docks). Education, interpretation, and outreach efforts would help minimize, but not eliminate, the likelihood of these impacts.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible impacts are those effects that cannot be changed over the long term or are permanent. An effect to a resource is irreversible if it (the resource) cannot be reclaimed, restored, or otherwise returned to its condition prior to disturbance. An irretrievable commitment of resources is the effects to resources that, once gone, cannot be replaced.

Alternative 1: Continuation of Current Management (No-Action Alternative)

No new actions would be taken that would result in either the consumption of nonrenewable natural or cultural resources, or the use of renewable resources that would preclude other uses for a period. Because it takes so long for soils to form, the loss of soils due to visitor use in localized areas would be an irreversible commitment of resources.

Alternative 2: Partnerships and Collaboration (Preferred Alternative)

New actions would be taken in alternative 2 that would result in the consumption of nonrenewable natural resources and in the use of renewable resources that would preclude other uses for a period. In the construction of new facilities, including docks and trails, limited amounts of nonrenewable resources would be used and there would be a loss of vegetative productivity and wildlife habitat for as long as those facilities remain. These resources would be essentially irretrievable once they were committed. In addition, because it takes so long for soils to form, the loss of soils due to the construction of new facilities, visitor use in localized areas, and erosion of soils in places within Big Thicket National Preserve would be an irreversible commitment of resources.

Alternative 3

New actions would be taken in alternative 3 that would result in the consumption of nonrenewable natural resources and in the use of renewable resources that would preclude other uses for a period. In the construction of new facilities, including docks and trails, limited amounts of nonrenewable resources would be used and there would be a loss of vegetative productivity and wildlife habitat for as long as these facilities remain. These resources would be essentially irretrievable once they were committed. In addition, because it takes so long for soils to form, the loss of soils due to the construction of new facilities, visitor use in localized areas, and erosion of soils in places within Big Thicket National Preserve would be an irreversible commitment of resources.

Alternative 4

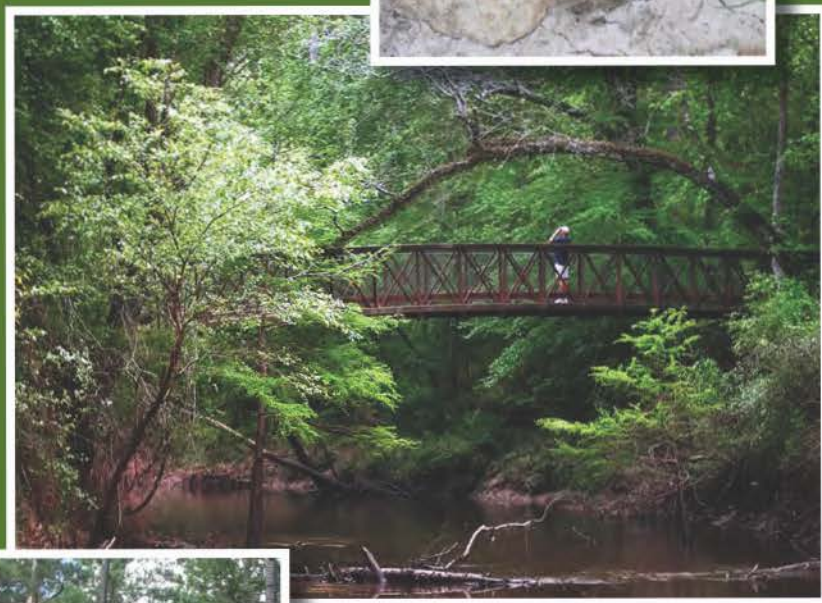
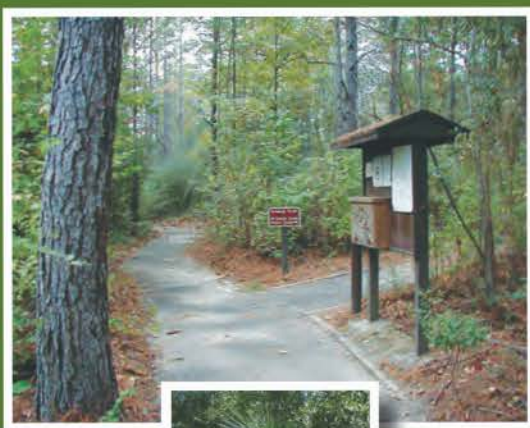
New actions would be taken in alternative 4 that would result in the consumption of nonrenewable natural resources and in the use of renewable resources that would preclude other uses for a period. In the construction of new facilities, including docks and trails, limited amounts of nonrenewable resources would be used and there would be a loss of vegetative productivity and wildlife habitat for as long as these facilities remain. These resources would be essentially irretrievable once there were committed. In addition, because it takes so long for soils to form, the loss of soils due to the construction of new facilities, visitor use in localized areas, and erosion of soils in places within Big Thicket National Preserve would be an irreversible commitment of resources.

RELATIONSHIP OF SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This question explores long-term effects of an alternative, and whether or not the productivity of preserve resources is being

traded for the immediate use of land. In all alternatives, the National Park Service would continue to manage the park to maintain ecological processes and native biological communities and to provide appropriate recreational opportunities consistent with preserving cultural and natural resources. The vast majority of Big Thicket National Preserve would continue to be protected in its current, relatively natural state and would maintain its long-term productivity. The primary short-term uses of the park would continue to be recreational use. Continuing adverse impacts on the area's soils, water quality, vegetation, wetlands, and fish and wildlife due to visitor use could reduce the productivity of natural resources in localized areas over time, although overall there would be no measurable effect on the park's long-term productivity.

On the other hand, heightened efforts in alternatives 2, 3, and 4 to restore native vegetation, protect endangered and threatened species and species of concern, and manage for natural hydrologic processes would increase long-term productivity of the environment in localized areas.



Chapter 5 CONSULTATION AND COORDINATION



PUBLIC AND AGENCY INVOLVEMENT

The *Big Thicket National Preserve Draft General Management Plan / Environmental Impact Statement* represents thoughts of the National Park Service, other agencies, American Indian tribes traditionally associated with the preserve, and the public. Consultation and coordination among these groups were vitally important throughout the planning process.

The public had three primary avenues through which to participate during the development of the general management plan. These included participating in public meetings, responding to newsletters, and submitting comments on the NPS planning website.

PUBLIC MEETINGS AND NEWSLETTERS

Public meetings and two newsletters were used to keep the public informed and involved in the planning process for Big Thicket National Preserve. A mailing list was compiled that consisted of members of government agencies, nongovernment groups, businesses, legislators, local governments, and interested citizens.

This GMP planning process focuses on a draft general management plan / environmental impact statement. The notice of intent to prepare an environmental impact statement was published in the *Federal Register* on January 15, 2009.

Several people responded to scoping for this management plan. The first newsletter (June 2009) received 384 comments in 32 correspondences and the second newsletter (October 2010) received 214 comments in 42 correspondences. In July 2009, four open houses were held so the public could learn more about the general management

planning process. These open houses were held at Wheat Elementary School in Woodville, Texas; the Silsbee Community Center in Silsbee, Texas; the Rogers Park Community Center in Beaumont, Texas; and the Forest Building in Houston, Texas. In November 2010, four open houses were held so the public could learn about the draft alternatives. These open houses were held at the Silsbee Community Center in Silsbee, Texas; the Community Resource Center in Houston, Texas; Wheat Elementary School in Woodville, Texas; and the Rogers Park Community Center in Beaumont, Texas. In total, 124 people attended these meetings.

A general management plan alternatives workshop was held at the preserve headquarters in November 2010. A total of 15 National Park Service employees from the preserve, Denver Service Center, and peer reviewers from Lyndon B. Johnson National Historical Park and Lake Meredith National Recreation Area and Alibates Flint Quarries National Monument attended.

Through these various venues, a variety of points of view about future visions for the preserve and preserve management issues were offered from neighbors, American Indian tribes traditionally associated with the preserve, community leaders, government agencies, conservation groups, local citizens, and other interested groups. Although each commenter may have had a different vision of the preserve, everyone had a common interest in its valuable resources.

Public comments received during the planning process covered a wide range of views, with few consistent themes:

- Most people value the biodiversity, natural resources, and wildlife in the preserve, as well as the scenery, quiet,

and recreation activities and opportunities.

- The most frequently mentioned topic of concern to be addressed as part of the general management plan included incompatible uses or development on lands adjacent to the preserve, and prior land uses including logging and oil and gas exploration and extraction activities.
- In regards to facilities within the preserve, many respondents stated the need to accommodate different user groups and recreational uses as well as to provide greater public access, while others want the preserve to be kept as wild and natural as possible.
- There was substantial support for the development of more hiking trails, canoe trails, bicycle trails, or trails that connect with existing bike trails.
- Respondents expressed the importance of the relationship between the preserve and the community and would like to have more educational and interpretive opportunities. Respondents supported increased outreach to schools, urban areas, and communities to promote environmental awareness and public support.
- Respondents supported the preservation, conservation, and restoration of natural resources and biodiversity and supported keeping the preserve as natural as possible. Interest was expressed for expanding scientific research.
- The majority of respondents were in support of significant increase in the size of the preserve in order to decrease habitat fragmentation, increase connectivity and public access, and provide buffering of sensitive areas. Potential boundary adjustments and designations were

suggested to be reviewed as part of the general management plan.

CONSULTATION WITH OTHER AGENCIES, OFFICIALS AND ORGANIZATIONS

U.S. Fish and Wildlife Service, Section 7 Consultation

The Endangered Species Act of 1973, as amended, requires in section 7(a)(2) that each federal agency, in consultation with the secretary of the interior, ensure that any action the agency authorizes, funds, or carries out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. During the preparation of this general management plan, NPS staff coordinated informally with the U.S. Fish and Wildlife Service's Ecological Services. A letter was sent to U.S. Fish and Wildlife Service on January 2009, informing the agency of the planning effort and requesting information on federally listed threatened and endangered species and designated critical habitats in the preserve and its vicinity (a copy of this letter is included in appendix C.) The National Park Service did not receive a written response to this letter from the U.S. Fish and Wildlife Service. A list of threatened and endangered species for Tyler, Hardin, Liberty, Polk, Jasper, Jefferson, and Orange counties was compiled using the U.S. Fish and Wildlife Service's website that can be accessed at <http://www.fws.gov/endangered/>.

In accordance with the Endangered Species Act and relevant regulations at 50 CFR Part 402, the National Park Service determined that this general management plan is not likely to adversely affect any threatened or endangered species, and sent a copy of the general management plan to the U.S. Fish and Wildlife Service with a request for written concurrence with that determination.

In addition, the National Park Service has committed to consult on future actions conducted under the framework described in this management plan to ensure that future actions are not likely to adversely affect threatened or endangered species. If a future NPS action in the park might potentially impact the red-cockaded woodpecker, Sprague's pipit, Louisiana black bear, Texas trailing phlox, Navasota ladies'-tresses, Neches River rose-mallow, Louisiana pine snake, or their habitat, then formal consultation with the U.S. Fish and Wildlife Service would be initiated.

Section 106 Consultation

Agencies that have direct or indirect jurisdiction over historic properties are required by section 106 of the National Historic Preservation Act to take into account the effect of any undertaking on properties eligible for listing or listed in the National Register of Historic Places. To meet the requirements of 36 CFR 800, the National Park Service sent a letter to the Texas SHPO on January 15, 2009, inviting their participation in the general management planning process for the preserve. The Texas SHPO did not send a response letter. The Texas SHPO was sent the two scoping newsletters as well. A copy of the general management plan would be provided to the SHPO for their review.

The preserve also notified the Advisory Council on Historic Preservation (letter dated May 25, 2010) about the general management plan and invited their participation. No response from the Council was received.

Before implementing any actions in this general management plan that have the potential to affect historic properties and cultural resources, Big Thicket National Preserve would notify and continue to consult as appropriate with the Texas SHPO, associated tribes, and other interested parties. Undertakings that may require section 106 consultation include ground-disturbing construction activities that could affect archeological resources, and proposed preservation and rehabilitation of selected historic structures and cultural landscapes.

Consultations with Traditionally Associated American Indian Tribes

The preserve staff consults on a government-to-government basis with the Alabama-Coushatta Tribe of Texas regarding a full range of issues and activities. Preserve staff aim for effective communication and the sharing of information and knowledge about mutual interests in the preserve, including concerns about preserve planning, operations, and the management of cultural and natural resources.

In a letter dated May 25, 2010, the National Park Service notified the Alabama-Coushatta Tribe of Texas about the general management plan and invited the tribe's participation in the planning process. The National Park Service subsequently sent copies of the alternatives newsletter to the tribe. The National Park Service did not receive responses from the tribe regarding the notification letter or newsletter. The preserve staff will provide the Alabama-Coushatta Tribe of Texas with a copy of the general management plan for their review and will continue to consult with the tribe to mutually address issues and concerns.

AGENCIES, ORGANIZATIONS, AND INDIVIDUALS RECEIVING A COPY OF THIS DOCUMENT

FEDERAL AGENCIES

National Park Service

Lyndon B. Johnson National Historical
Park
Lake Meredith National Recreation Area
and Alibates Flint Quarries National
Monument
National Park Service, Intermountain
Region
National Park Service, Rivers, Trails, and
Conservation Assistance

U.S. Army Corps of Engineers

Galveston District Engineer

U.S. Department of Agriculture

Natural Resources Conservation Service
Soil Conservation Service
Southern Research Station

U.S. Department of Homeland Security

U.S. Fish and Wildlife Service

Anahuac National Wildlife Refuge
McFaddin National Wildlife Refuge
Texas Point National Wildlife Refuge
Trinity River National Wildlife Refuge

U.S. Forest Service

Texas Forest Supervisor

U.S. Geological Survey

Texas District

U.S. SENATORS AND REPRESENTATIVES

Sen. Kay Bailey Hutchinson
Sen. John Cornyn
Rep. Kevin Brady
Rep. Ted Poe

STATE AGENCIES

Angelina and Neches River Authority
Lower Neches Valley Authority
Railroad Commission of Texas
Sabine River Authority
Texas Department of Public Safety
Texas Department of Transportation
Texas Travel Information Centers
Texas Forest Service
Texas Historical Commission
Texas Parks and Wildlife Department
Village Creek State Park
Texas State Office of Rural Community
Affairs
Texas State Soil and Water Conservation
Board
Lower Neches SWCD
Texas Water Development Board
Upper Neches River Municipal Water
Authority

STATE AND LOCAL ELECTED OFFICIALS

Governor Rick Perry
County Commissioners, Hardin County
County Commissioners, Jasper County
County Commissioners, Jefferson County
County Commissioners, Liberty County
County Commissioners, Orange County
County Commissioners, Polk County
County Commissioners, Tyler County
Judge, Hardin County
Judge, Jasper County
Judge, Jefferson County
Judge, Liberty County
Judge, Orange County
Judge, Polk County
Judge, Tyler County
Mayor, City of Beaumont
Mayor, City of Kountze
Mayor, City of Lumberton
Mayor, City of Orange

Mayor, City of Silsbee
Mayor, City of Sour Lake
Mayor, City of Vidor
Mayor, City of West Orange
Mayor, City of Woodville
Sheriff, Hardin County
Sheriff, Jasper County
Sheriff, Jefferson County
Sheriff, Liberty County
Sheriff, Orange County
Sheriff, Polk County
Sheriff, Tyler County
Texas House Member, Texas 11th District
Texas House Member, Texas 13th District
Texas House Member, Texas 21st District
Texas House Member, Texas 22nd District
Texas Senator, Texas 3rd District

LOCAL AND REGIONAL GOVERNMENT AGENCIES

Chamber of Commerce, Beaumont
Chamber of Commerce, Cleveland
Chamber of Commerce, Jasper
Chamber of Commerce, Kirbyville
Chamber of Commerce, Kountze
Chamber of Commerce, Liberty-Dayton
Chamber of Commerce, Lumberton
Chamber of Commerce, Newton
Chamber of Commerce, Orange County
Chamber of Commerce, Polk
Chamber of Commerce, Port Arthur
Chamber of Commerce, Silsbee
Chamber of Commerce, Sour Lake
Chamber of Commerce, Tyler County
Chamber of Commerce, Vidor

AMERICAN INDIAN TRIBES TRADITIONALLY ASSOCIATED WITH PARK LANDS

Alabama-Coushatta Tribe of Texas

LOCAL LIBRARIES

Kountze Public Library, Kountze

Allen Shivers Library, Woodville
Silsbee Public Library, Silsbee
Lumberton Public Library, Lumberton
Willard Library, Beaumont
T. Johns Library, Beaumont
R.C. Miller Library, Beaumont

ORGANIZATIONS AND BUSINESSES

Art Museum of Southeast Texas
Beaumont Convention and Visitor's Bureau
Beaumont Heritage Society
Beaumont Independent School District
Ben J. Rogers Regional Visitors' Center
Big Thicket Association
Big Thicket National Heritage Trust
Cleveco Construction Company, Inc.
Custom Flooring
Deep East Texas Council of Governments
Entergy Texas, Inc.
Environmental Learning and Research Center
Golden Triangle Audubon
Hancock Forest Management Inc.
Houston Advanced Research Center
Houston Audubon Society
John Jay French Museum
Lamar University
League of Women Voters of Texas
McFaddin-Ward House Historic House Museum
National Parks Conservation Association
National Trust for Historic Preservation
Nature Heritage Society
Partnership of Southeast Texas
Rice University
SEC Planning, LLC
Shine & Associates, Inc.
Sierra Club, Lone Star Chapter
Sierra Club, Golden Triangle Chapter
Southeast Texas Genealogical and Historical Society
Southeast Texas Regional Planning Commission
Southeast Texas Resource Conservation and Development Council
Texas A&M University
Texas Association of Regional Councils
Texas Conservation Alliance

Texas Energy Museum
Texas Folklore Society
Texas Travel Industry Association
The Conservation Fund
The Nature Conservancy
Tyler County Heritage Society
Wiley Mae Community Church

MEDIA

Newspapers

American Community Newspapers,
Dallas-Fort Worth Metroplex
Beaumont Enterprise
Guidry News
Hardin County News
Hearst Newspapers
Houston Chronicle, Houston, Texas
Houston Courier News Online, Houston
Community Newspapers
Houston County Courier, Houston
Metroplex
The Austin Statesman, Austin, Texas
The Buna Beacon, Buna, Texas
The County Record, Orange, Texas
The Eagle, Bryan-College Station, Texas
The Examiner, Beaumont, Texas
The Jasper Newsboy, Jasper, Texas
The Orange Leader, Orange, Texas
The Vidorian News, Vidor, Texas

Polk County News, Livingston, Texas
Pt. Arthur News, Pt. Arthur, Texas
The Silsbee Bee, Silsbee, Texas
Tyler County Booster, Woodville, Texas
Tyler County News, Woodville, Texas

Television Stations

KBMT 12, Beaumont, Texas
KBTB 4, Beaumont, Texas
KFDM 6, Beaumont, Texas

Radio Stations

KUHF 88.7 FM, University of Houston,
TX
KVLU 91.3 FM, Lamar University
Beaumont, TX
KYKR 95.1 FM, Beaumont, TX
KAYD 101.7 FM, Silsbee, TX
KLVI 560 AM, Beaumont, TX
Cumulus Radio, Beaumont
KTCC 102.5 FM
KQXY 94.1 FM
KAYD 101.7 FM

INDIVIDUALS

The list is available at preserve
headquarters.



**APPENDIXES, REFERENCES,
PREPARERS, AND INDEX**



APPENDIX A: LEGISLATION

ENABLING LEGISLATION FOR BIG THICKET NATIONAL PRESERVE PUBLIC LAW 93-439,

AS AMENDED BY: P. L. 94-578, P. L. 98-489, AND P. L. 103-46

An Act to authorize the establishment of the Big Thicket National Preserve in the State of Texas, and for other purposes. (88 Stat. 1254) (PL 93-439)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that

(a) in order to assure the preservation, conservation, and protection of the natural, scenic, and recreational values of a significant portion of the Big Thicket area in the State of Texas and to provide for the enhancement and public enjoyment thereof, the Big Thicket National Preserve is hereby established.

(b) the Big Thicket National Preserve (hereafter referred to as the "preserve") shall include the units generally depicted on the map numbered NBR-BT 91,027 which shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior, Washington, District of Columbia, and shall be filed with appropriate offices of Tyler, Hardin, Jasper, Polk, Liberty, Jefferson, and Orange Counties in the State of Texas. The Secretary of the Interior (hereinafter referred to as the "Secretary") shall, as soon as practicable, but no later than six months after the date of enactment of this Act, publish a detailed description of the boundaries of the preserve in the Federal Register. In establishing such boundaries, the Secretary shall locate stream corridor unit boundaries referenced from the stream bank on each side thereof and he shall further make every reasonable effort to exclude from the units hereafter described any improved year-round residential properties which he determines, in his discretion, are not necessary for the protection of the values of the area or for its proper administration. The preserve shall consist of the following units:

Big Sandy Creek unit, Polk County, Texas, comprising approximately fourteen thousand three hundred acres;

Menard Creek corridor unit, Polk, Hardin, and Liberty Counties, Texas, including a module at its confluence with the Trinity River, comprising approximately three thousand three hundred and fifty-nine acres;

Hickory Creek Savannah unit, Tyler County, Texas, comprising approximately six hundred and sixty-eight acres;

Turkey Creek unit, Tyler and Hardin Counties, Texas, comprising approximately seven thousand eight hundred acres;

Beech Creek unit, Tyler County, Texas, comprising approximately four thousand eight hundred and fifty-six acres;

Upper Neches River corridor unit, Jasper, Tyler, and Hardin Counties, Texas, including the Sally Withers Addition, comprising approximately three thousand seven hundred and seventy-five acres;

Neches Bottom and Jack Gore Baygall unit, Hardin and Jasper Counties, Texas, comprising approximately thirteen thousand three hundred acres;

Lower Neches River corridor unit, Hardin, Jasper, and Orange Counties, Texas, except for a one-mile segment on the east side of the river including the site of the papermill near Evadale, comprising approximately two thousand six hundred acres;

Beaumont unit, Orange, Hardin, and Jefferson Counties, Texas, comprising approximately six thousand two hundred and eighteen acres;

Loblolly unit, Liberty County, Texas, comprising approximately five hundred and fifty acres;

Little Pine Island-Pine Island Bayou corridor unit, Hardin and Jefferson Counties, Texas, comprising approximately two thousand one hundred acres;

Lance Rosier unit, Hardin County, Texas, comprising approximately twenty-five thousand and twenty-four acres;

(c) The Secretary is authorized to acquire by donation, purchase with donated or appropriated funds, transfer from any other Federal agency, or exchange, any lands, waters, or interests therein which are located within the boundaries of the preserve: *Provided*, That any lands owned or acquired by the State of Texas, or any of its political subdivisions, may be acquired by donation only. After notifying the Committees on Interior and Insular Affairs of the United States Congress, in writing, of his intention to do so and of the reasons therefor, the Secretary may, if he finds that such lands would make a significant contribution to the purposes for which the preserve was created, accept title to any lands, or interests in lands, located outside of the boundaries of the preserve which the State of Texas or its political subdivisions may acquire and offer to donate to the United States or which any private person, organization, or public or private corporation may offer to donate to the United States and he may administer such lands as a part of the preserve after publishing notice to that effect in the Federal Register. Notwithstanding any other provision of law, any federally owned lands within the preserve shall, with the concurrence of the head of the administering agency, be transferred to the administrative jurisdiction of the Secretary for the purposes of this

Act without transfer of funds.

Sec. 2. (a) The Secretary shall, immediately after the publication of the boundaries of the preserve, commence negotiations for the acquisition of the lands located therein: *Provided*, That he shall not acquire the mineral estate in any property or existing easements for public utilities, pipelines or railroads without the consent of the owner unless, in his judgment, he first determines that such property or estate is subject to, or threatened with, uses which are, or would be, detrimental to the purposes and objectives of this Act: *Provided further*, That the Secretary, insofar as is reasonably possible, may avoid the acquisition of improved properties, as defined in this Act, and shall make every effort to minimize the acquisition of land where he finds it necessary to acquire properties containing improvements.

(b) Within one year after the date of the enactment of this Act, the Secretary shall submit, in writing, to the Committee on Interior and Insular Affairs and to the Committees on Appropriations of the United States Congress a detailed plan which shall indicate:

- (i) the lands and areas which he deems essential to the protection and public enjoyment of this preserve,
- (ii) the lands which he has previously acquired by purchase, donation, exchange or transfer

for administration for the purpose of this preserve, and
(iii) the annual acquisition program (including the level of funding) which he recommends for the ensuing five fiscal years.

(c) It is the express intent of the Congress that the Secretary should substantially complete the land acquisition program contemplated by this Act within six years after the date its enactment.

Sec. 3. (a) The owner of an improved property on the date of its acquisition by the Secretary may, as a condition of such acquisition, retain for himself and his heirs and assigns a right of use and occupancy of the improved property for noncommercial residential purposes for a definite term of not more than twenty-five years or, in lieu thereof, for a term ending at the death of the owner or the death of his spouse, whichever is later. The owner shall elect the term to be reserved. Unless this property is wholly or partially donated to the United States, the Secretary shall pay the owner the fair market value of the property on the date of acquisition less the fair market value, on that date, of the right retained by the owner. A right retained pursuant to this Section shall be subject to termination by the Secretary upon his determination that it is being exercised in a manner inconsistent with the purposes of this Act, and it shall terminate by operation of law upon the Secretary's notifying the holder of the right of such determination and tendering to him an amount equal to the fair market value of that portion of the right which remains unexpired.

(b) As used in this Act, the term "improved property" means a detached, one family dwelling, construction of which was begun before July 1, 1973, which is used for noncommercial residential purposes, together with not to exceed three acres of land on, which the dwelling is situated and together with such additional lands or interests therein as the Secretary deems to be reasonably necessary for access thereto, such lands being in the same ownership as the dwelling, together with any structures accessory to the dwelling which are situated on such land.

(c) Whenever an owner of property elects to retain a right of use and occupancy as provided in this section, such owner shall be deemed to have waived any benefits or rights accruing under sections 203, 204, 205, and 206 of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (84 Statute [Stat.] 1894), and for the purposes of such sections such owner shall not be considered a displaced person as defined in section 101(6) of such Act.

Sec. 4.(a) The area within the boundaries depicted on the map referred to in section 1 shall be known as the Big Thicket National Preserve. Such lands shall be administered by the Secretary as a unit of the National Park System in a manner which will assure their natural and ecological integrity in perpetuity in accordance with the provisions of this Act and with the provisions of the Act of August 25, 1916 (39 Stat. 535; 16 USC 1-4), as amended and supplemented.

(b) In the interest of maintaining the ecological integrity of the preserve, the Secretary shall limit the construction of roads, vehicular campgrounds, employee housing, and other public use and administrative facilities and he shall promulgate and publish such rules and regulations in the Federal Register as he deems necessary and appropriate to limit and control the use of, and activities on, Federal lands and waters with respect to:

- (1) motorized land and water vehicles;
- (2) exploration for, and extraction of, oil, gas, and other minerals;
- (3) new construction of any kind;

(4) grazing and agriculture; and

(5) such other uses as the Secretary determines must be limited or controlled in order to carry out the purposes of this Act.

(c) The Secretary shall permit hunting, fishing, and trapping on lands and waters under his jurisdiction within the preserve in accordance with the applicable laws of the United States and the State of Texas, except that he may designate zones where and periods when, no hunting, fishing, trapping or entry may be permitted for reasons of public safety, administration, floral and faunal protection and management, or public use and enjoyment. Except in emergencies, any regulations prescribing such restrictions relating to hunting, fishing, or trapping shall be put into effect only after consultation with the appropriate State agency having jurisdiction over hunting, fishing, and trapping activities.

Sec. 5. Within five years from the date of enactment of this Act, the Secretary shall review the area within the preserve and shall report to the President, in accordance with section 3(c) and (d) of the Wilderness Act (78 Stat. 891; 16 USC 1132 [c] and [d]), his recommendations as to the suitability or unsuitability of any area within the preserve for preservation as wilderness, and any designation of any such areas as a wilderness shall be accomplished in accordance with said subsections of the Wilderness Act.

Sec. 6. There are authorized to be appropriated such sums as may be necessary to carry out the provisions of this Act, but not to exceed \$63,812,000 for the acquisition of lands and interests in lands and not to exceed 7,000,000 for development.

Approved October 11, 1974.

PUBLIC LAW 94-578

An Act to provide for increases in appropriation ceilings and boundary changes in certain units of the National Park System, and for other purposes. (90 Stat. 2732)

Be it enacted by the Senate and House of Representatives of the United States of American in Congress assembled,

TITLE III-MISCELLANEOUS PROVISIONS BIG THICKET NATIONAL PRESERVE

SEC. 322. Section 3(b) of the Act of October 11, 1974 (88 Stat. 1254); 16 USC 698[b]), is amended by deleting “detached, one-family dwelling,” and inserting in lieu thereof “detached, year-round one-family dwelling which serves as the owner’s permanent place of abode at the time of acquisition.”

Approved October 21, 1976.

PUBLIC LAW 98-489

An Act to provide for the acquisition of a visitor contact and administrative site for the Big Thicket National Preserve in the State of Texas. (98 Stat. 2267)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That (a) subsection (c) of the first section of the Act entitled “An Act to authorize the establishment of the Big Thicket National Preserve in the State of Texas, and for other purposes”, approved October 11, 1974 (16 USC 698), is amended by inserting after the first sentence the following new sentence: “The Secretary may also acquire, by any of the above methods, approximately 15 acres of land outside of the boundaries of the preserve in the vicinity of the intersection of United States Highway 69 and State Farm-Market Road 420, in Hardin County, Texas, for purposes of a visitor contact and administrative site.”

(b) Section 6 of such Act is amended by inserting at the end thereof the following new sentence: “Effective October 1, 1984, there is authorized to be appropriated such sums as may be necessary for the acquisition of the visitor contact and administrative site referred to in subsection (c) of the first section of this Act.”

Approved October 17, 1984.

PUBLIC LAW 103-46

JULY 1, 1993

An Act to increase the size of the Big Thicket National Preserve in the State of Texas by adding the Village Creek corridor unit, the Big Sandy corridor unit, and the Canyonlands unit. (107 Stat. 229)

Be it enacted by the Senate and House Representatives the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be referred to as the "Big Thicket National Preserve Addition Act of 1993".

SEC. 2. ADDITIONS TO THE BIG THICKET NATIONAL PRESERVE.

- (a) **ADDITIONS.**-Subsection (b) of the first section of the Act entitled "An Act to authorize the establishment of the Big Thicket National Preserve in the State of Texas, and for other purposes", approved October 11, 1974 (16 USC 698), hereafter referred to as the "Act", is amended as follows:

(1) Strike out “map entitled ‘Big Thicket National Preserve’” and all that follows through “Secretary of the Interior (hereafter referred to as the Secretary)” and insert in lieu thereof “map entitled ‘Big Thicket National Preserve’, dated October 1992, and numbered 175-0008, which shall be on file and available for public inspection in the offices of the National Park Service, Department of the Interior, and the offices of the Superintendent of the preserve.” After advising the Committee on Energy and Natural Resources of the United States Senate and the Committee on Natural Resources of the United States House of Representatives, in writing, the Secretary of the Interior (hereafter referred to as the “Secretary”) may make minor revisions of the boundaries of the preserve when necessary by publication of a revised drawing or other boundary description in the Federal Register. “The Secretary”.

(2) Strike out “and” at the end of the penultimate undesignated paragraph relating to Little Pine Island-Pine Island Bayou corridor unit.

(3) Strike out the period in the ultimate undesignated paragraph relating to Lance Rosier unit and insert in lieu thereof.

(4) Add at the end thereof the following:

“Village Creek Corridor unit, Hardin County, Texas, comprising approximately four thousand seven hundred and ninety-three acres;

“Big Sandy Corridor unit, Hardin, Polk, and Tyler Counties, Texas, comprising approximately four thousand four hundred and ninety-seven acres; and

“Canyonlands unit, Tyler County, Texas, comprising approximately one thousand four hundred and seventy-six acres.”

(b) ACQUISITION. (1) Subsection (c) of the first section of such Act is amended by striking out the first sentence and inserting in lieu thereof the following: "The Secretary is authorized to acquire by donation, purchase with donated or appropriated funds, transfer from any other Federal agency, or exchange, any lands, waters, or interests therein which are located within the boundaries of the preserve: *Provided*, That privately owned lands located within the Village Creek Corridor, Big Sandy Corridor, and Canyonlands units may be acquired only with the consent of the owner: *Provided further*, That the Secretary may acquire lands owned by commercial timber companies only by donation or exchange: *Provided further*, That any lands owned by the State of Texas, or any political subdivisions thereof may be acquired by donation only."

(2) Add at the end of the first section of such Act the following new subsections:

“(d) Within sixty days after the date of enactment of this subsection, the Secretary and the Secretary of Agriculture shall identify lands within their jurisdiction located within the vicinity of the preserve which may be suitable for exchange for commercial timber lands within the preserve. In so doing, the Secretary of Agriculture shall seek to identify for exchange National Forest lands that are near or adjacent to private lands that are already owned by the commercial timber companies. Such National Forest lands shall be located in the Sabine National Forest in Sabine County, Texas, in the Davy Crockett National Forest south of Texas State Highway 7, or in other sites deemed mutually agreeable, and within reasonable distance of the timber companies' existing mills. In exercising this exchange authority, the Secretary and the Secretary of Agriculture may utilize any authorities or procedures otherwise available to them in connection with land exchanges, and which are not inconsistent with the purposes of this Act. Land exchanges authorized pursuant to this subsection shall be of equal value and shall be completed as soon as possible, but no later than two years after date of enactment of this subsection.

“(e) With respect to the thirty-seven-acre area owned by the Louisiana-Pacific Corporation or its subsidiary, Kirby Forest Industries, Inc., on Big Sandy Creek in Hardin County, Texas, and now utilized as part of the Indian Springs Youth Camp (H.G. King Abstract

822), the Secretary shall not acquire such area without the consent of the owner so long as the area is used exclusively as a youth camp.”

(c) PUBLICATION OF BOUNDARY DESCRIPTION. Not later than six months after the date of enactment of this subsection, the Secretary shall publish in the Federal Register a detailed description of the boundary of the Village Creek Corridor unit, the Big Sandy Corridor unit, and the Canyonlands unit of the Big Thicket National Preserve.

(d) AUTHORIZATION OF APPROPRIATIONS. Section 6 of such Act is amended by adding at the end thereof the following new sentence: “Effective upon date of enactment of this sentence, there is authorized to be appropriated such sums as may be necessary to carry out the purposes of subsections (c) and (d) of the first section.”

Approved July 1, 1993.

APPENDIX B: RELEVANT LAWS AND POLICIES

NATIONAL PARK SERVICE LEGISLATION

Act of June 30, 1864, 13 Stat. 325, 16 USC 48

Act of March 1, 1872, 17 Stat. 32, 16 USC 21 et seq.

Lacey Act of 1900, as amended by PL 97-79, 18 USC 42-44, Title 50 CFR

Act of August 25, 1916 (National Park Service Organic Act), PL 64-235, 16 USC 1 et seq.

Act of June 5, 1920, 41 Stat. 917, 16 USC 6

Act of February 21, 1925, 43 Stat. 958, (temporary act, not classified)

Act of May 26, 1930, 16 USC 17-17j

Reorganization Act of March 3, 1933, 47 Stat. 1517

Parks, Parkways, and Recreational Programs Act, June 23, 1936, 49 Stat. 1894, 16 USC 17k-n

Act of August 8, 1953, 16 USC 1b-1c

Act to Improve the Administration of the National Park System, August 18, 1970; PL 91-383, 84 Stat. 825, as amended by PL 94-458, PL 95-250, and PL 95-625; 16 USC 1a1 et seq.

General Authorities Act, October 7, 1976, PL 94-458, 90 Stat. 1939, 16 USC 1a-1 et seq.

Act amending the Act of October 2, 1968 (commonly called Redwoods Act), March 27, 1978, PL 95-250, 92 Stat. 163, 16 USC 1a-1, 79a-q

National Parks and Recreation Act, November 10, 1978, PL 95-625, 92 Stat. 3467; 16 USC 1 et seq.

NPS Resources, Improve Ability to Manage, PL 101-337, 16 USC 19jj

National Parks Omnibus Management Act of 1998, PL 105-391, Title IV, National Park Service Concessions Management Improvement Act of 1998

OTHER LAWS AFFECTING THE NATIONAL PARK SERVICE

Accessibility

Americans with Disabilities Act, PL 101-336, 104 Stat. 327, 42 USC 12101

Architectural Barriers Act of 1968, PL 90-480, 82 Stat. 718, 42 USC 4151 et seq.

Rehabilitation Act of 1973, PL 93-112, 87 Stat. 357, 29 USC 701 et seq. as amended by the Rehabilitation Act Amendments of 1974, 88 Stat. 1617

Cultural Resources

Antiquities Act of 1906, PL 59-209, 34 Stat. 225, 16 USC 432 and 43 CFR 3

Historic Sites, Buildings and Antiquities Act, 16 USC 461 through 467; Aug. 21, 1935, ch. 593, 49 Stat. 666

National Trust Act of 1949, PL 81-408, 63 Stat. 927, 16 USC 468c-e

Management of Museum Properties Act of 1955, PL 84-127, 69 Stat. 242, 16 USC 18f

Executive Order (E.O.) 11593: Protection and Enhancement of the Cultural Environment, 3 CFR 1971

Protection of Historic and Cultural Properties, Executive Order. 11593; 36 CFR 60, 61, 63, 800; 44 Fed. Reg. 6068

Archaeological and Historic Preservation Act of 1974, PL 93-291, 88 Stat. 174, 16 USC 469

Archaeological Resources Protection Act of 1979, PL 96-95, 93 Stat. 712, 16 USC 470aa et seq. and 43 CFR 7, subparts A and B, 36 CFR 79

Historic Preservation Certifications Pursuant to the Tax Reform Act of 1976, Revenue Act of 1978, Tax Treatment Extension Act of 1980, and Economic Recovery Tax Act of 1981, 36 CFR 67

World Heritage Convention 1980, PL 96-515, 94 Stat. 3000

Native American Grave Protection and Repatriation Act, PL 101-601, 104 Stat. 3049, 25 USC 3001-3013

Presidential Memorandum of April 29, 1994 “Government-to-Government Relations with Native American Tribal Governments”, 59 Fed. Reg. 85

American Indian Religious Freedom Act, PL 95-341, 92 Stat. 469, 42 USC 1996

Executive Order 13007, “Indian Sacred Sites”, May 24, 1996

National Historic Preservation Act as amended, PL 89-665, 80 Stat. 915, 16 USC 470 et seq. and 36 CFR 18, 60, 61, 63, 68, 79, 800

Natural Resources

Migratory Bird Treaty Act of 1918, PL 186, 40 Stat. 755

Fish and Wildlife Coordination Act of 1958 as amended, PL 85-624, 72 Stat. 563, 16 USC 661 et seq.

Endangered Species Conservation Act of 1969

National Environmental Policy Act of 1969, PL 91-190, 83 Stat. 852, 42 USC 4321 et seq.

Protection and Enhancement of Environmental Quality, Executive Order 11514 as amended, 1970, Executive Order 11991, 35 Fed. Reg. 4247; 1977, 42 Fed. Reg. 26967)

Endangered Species Act of 1973, as amended, PL 93-205, 87 Stat. 884, 16 USC 1531 et seq.

Flood Disaster Protection Act of 1973, PL 93-234, 87 Stat. 975, 12 USC 24, 1709-1

Resource Conservation and Recovery Act, PL 94-580, 30 Stat. 1148, 42 USC 6901 et seq.

Executive Order 11988, “Floodplain Management,” May 24, 1977, 42 Fed. Reg. 26951, as amended by Executive Order 12148, July 20, 1979, 44 Fed. Reg. 43239 [42 USC 4321], 3 CFR 121 (Supplement (Supp) 177)

Executive Order 11990, “Protection of Wetlands,” May 24, 1977, 42 Fed. Reg. 26961, as amended by Executive Order 12608, Sept. 9, 1987, 52 Fed. Reg. 34617, [42 USC 4321], 3 CFR 121 (Supp 177)

Executive Order 11991, “Protection and Enhancement of Environmental Quality”

Soil and Water Resources Conservation Act of 1977

Bald and Golden Eagles Protection Act as amended, PL 28, 54 Stat 250, 16 USC 668-668d

Watershed Protection and Flood Prevention Act, PL 92-419, 68 Stat. 666, 16 USC 100186

Migratory Bird Conservation Act, PL 257, 45 Stat. 1222, 16 USC 715 et seq.

Clean Air Act as amended, PL 360, 69 Stat. 322, 42 USC 7401 et seq.

Federal Water Pollution Control Act (commonly referred to as Clean Water Act), PL 92-500, 33 USC 1251 et seq. as amended by the Clean Water Act, PL 95-217

Federal Insecticide, Fungicide, and Rodenticide Act, PL 92-516, 86 Stat. 973, 7 USC 136 et seq.

Safe Drinking Water Act, PL 93-523, 88 Stat. 1660, 42 USC 300f et seq., 42 USC 201 and 21 USC 349

Executive Order 13112, “Invasive Species,” February 3, 1999, 64 Fed. Reg. 6183

Executive Order 13123, “Greening the Government through Efficient Energy Management,” June 3, 1999, 64 Fed. Reg. 30851

Executive Order 13148, “Greening the Government through Leadership in Environmental Management,” April 21, 2000, 65 Fed. Reg. 24595

Executive Order 13175, “Consultation and Coordination with Indian Tribal Governments,” November 6, 2000, 65 Fed. Reg. 67249 [25 USC 450]

National Park System Final Procedures for Implementing Executive Order 11988 and 11990, 45 Fed. Reg. 35916 as revised by 47 Fed. Reg. 36718)

Wild and Scenic Rivers Act of 1968, PL 90-542, 82 Stat. 906, 16 USC 1271–1287

Other

Mineral Leasing Act of 1920, 30 USC 181 et seq., as amended

Administrative Procedures Act (APA), June 11, 1946, 5 USC 551-559, 701-706, 60 Stat. 237

Disposal of Materials on Public Lands (Material Act of 1947), 30 USC 601-604

Mineral Leasing Act for Acquired Lands of 1947, 30 USC 351 et seq.

Mineral Materials Disposal Act of 1947, 30 USC 601 et seq.

Surface Resources Use Act of 1955, 30 USC 601 et seq.

Outdoor Recreation Coordination Act of 1963, PL 88-29, 77 Stat. 49

Wilderness Act, PL 88-577, 78 Stat. 890, 16 USC 1131-1136

Concessions Policy Act of 1965, PL 89-249, 79 Stat. 969, 16 USC 20 et seq.

Land and Water Conservation Fund Act of 1965 as amended, PL 88-578, 78 Stat. 897, 16 USC 460l-4 to 460l-11

Department of Transportation Act of 1966, PL 89-670, 80 Stat. 931, 49 USC 303

Noise Control Act of 1972 as amended, PL 92-574, 42 USC 4901 et seq.

Energy Supply and Environmental Coordination Act of 1974

Federal Land Policy and Management Act, PL 94-579, 90 Stat. 199, 43 USC 1714 et seq.

Mining Activity within National Park Service Areas, PL 94-429, 90 Stat. 1342, 16 USC 1901 et seq.

Payment in Lieu of Taxes Act, PL 94-565, 90 Stat. 2662, 31 USC 6901 et seq.

Revised Statute 2477, Rights-of-way across Public Lands, Act of July 26, 1866, 43 USC 932 (1976), repealed by FLPMA 706(a) October 21, 1976

Executive Order 11987, “Exotic Organisms,” 42 Fed. Reg. 26407

Executive Order 11989 (42 Fed. Reg. 26959) and 11644, “Offroad Vehicles on Public Lands”

Executive Order 12003, “Energy Policy and Conservation,” 3 CFR 134 (Supp. 1977), 42 USC 2601

Executive Order 12088, “Federal Compliance with Pollution Control Standards”

Executive Order 12372, “Intergovernmental Review of Federal Programs,” 47 Fed. Reg. 30959

Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” 59 Fed. Reg. 7629

Wildfire Suppression Assistance Act, PL 101-11, 42 USC 1856m, 1856p

Wildfire Disaster Recovery Act, PL No
101-286

Energy Policy Act of 1992, 42 USC 13201-
13556; PL 102-486

Forest and Rangeland Renewable
Resources Planning Act, PL 95-307, 92
Stat. 353, 16 USC 1600 et seq.

Sikes Act, PL 86-797, 74 Stat. 1052, 16
USC 670a-670o, as amended.

National Trails System Act, PL 90-543, 82
Stat. 919, 16 USC 1241-1251

APPENDIX C: CONSULTATION LETTERS



United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

In reply refer to:
BITH

January 9, 2009

MEMORANDUM

TO: Field Biologist, Region 2 (Southwest), USFWS

FROM: Natural Resource Specialist, DSC, NPS

SUBJECT: Request for Species List

The National Park Service is starting development of a General Management Plan for Big Thicket National Preserve in Tyler, Hardin, Liberty, Polk, Jasper, Jefferson, and Orange counties in Texas.

This long-term, comprehensive plan will define overall management goals and objectives, identify resources that need protection and prescribe general management actions for the national preserve. Specific resources or areas are managed under separate, more detailed plans based on the General Management Plan.

As the Natural Resource Specialist for this project, I am requesting a current list of federally listed plant and animal species that might occur in the vicinity of Big Thicket National Preserve, and designated critical habitat, if any, for such species.

This letter will serve as a record that the National Park Service is initiating consultation with your agency pursuant to the requirements of the Endangered Species Act and National Park Service management policies.

I appreciate your attention to this inquiry and look forward to working with your office throughout this planning effort. Please direct any responses to:

Christina Miller
National Park Service (DSC-P)
P.O. Box 25287
Denver, CO 80225-0287

Phone: (303) 969-2457
Fax: (303) 969-2920
Email: christina_miller@nps.gov

Cc: Dave Roemer, Chief of Resource Management, Big Thicket National Preserve



United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

In reply refer to:
BITH

January 9, 2009

Texas Parks and Wildlife Department
4200 South School Road
Austin, TX 78744

Special Status Species Coordinator,

The National Park Service is starting development of a General Management Plan for Big Thicket National Preserve in Tyler, Hardin, Liberty, Polk, Jasper, Jefferson, and Orange counties in Texas.

This long-term, comprehensive plan will define overall management goals and objectives, identify resources that need protection and prescribe general management actions for the national preserve. Specific resources or areas are managed under separate, more detailed plans based on the General Management Plan.

As the Natural Resource Specialist for this project, I am requesting a current list of state-listed or any other special status species that might occur in the Big Thicket National Preserve vicinity, and designated critical habitat, if any, for such species.

This letter will serve as a record that the National Park Service is initiating consultation with your agency pursuant to the requirements of the Endangered Species Act and National Park Service management policies.

I appreciate your attention to this inquiry and look forward to working with your office throughout this planning effort. Please direct any responses to:

Christina Miller
National Park Service (DSC-P)
P.O. Box 25287
Denver, CO 80225-0287

Phone: (303) 969-2457
Fax: (303) 969-2920
Email: christina_miller@nps.gov

Cc: Dave Roemer, Chief of Resources Management, Big Thicket National Preserve



United States Department of the Interior

NATIONAL PARK SERVICE
DENVER SERVICE CENTER
12795 W. ALAMEDA PARKWAY
P.O. BOX 25287
DENVER, COLORADO 80225-0287

In reply refer to:
BITH

January 9, 2009

MEMORANDUM

TO: Project Leader, Southwestern Division, US Army Corps of Engineers

FROM: Natural Resource Specialist, DSC, NPS

SUBJECT: Request for Projects List

The National Park Service is starting development of a General Management Plan for Big Thicket National Preserve in Tyler, Hardin, Liberty, Polk, Jasper, Jefferson, and Orange counties in Texas.

This long-term, comprehensive plan will define overall management goals and objectives, identify resources that need protection and prescribe general management actions for the national preserve. Specific resources or areas are managed under separate, more detailed plans based on the General Management Plan.

As the Natural Resource Specialist for this project, I am requesting a list of any Army Corps of Engineers projects that are currently being conducted or planned to take place within the vicinity of Big Thicket National Preserve.

This letter will serve as a record that the National Park Service is initiating consultation with your agency pursuant to the requirements of the National Environmental Policy Act and National Park Service management policies.

I appreciate your attention to this inquiry and look forward to working with your office throughout this planning effort. Please direct any responses to:

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Cc: Dave Roemer, Chief of Resources Management, Big Thicket National Preserve

APPENDIX D:

DESIRED CONDITIONS TO BE ACHIEVED AT BIG THICKET NATIONAL PRESERVE BASED ON SERVICEWIDE MANDATES AND POLICIES

Development of this general management plan has proceeded within a complex legal framework. This appendix identifies actions to be taken at Big Thicket National Preserve to comply with federal laws and NPS *Management Policies 2006*. Many management directives are specified in laws and policies guiding the National Park Service and are, therefore, not subject to alternative approaches. For example, there are laws and policies about managing environmental quality (such as the Clean Air Act, the Endangered Species Act, and Executive Order 11990, “Protection of Wetlands”); laws governing the preservation of cultural resources (such as the National Historic Preservation Act and the Native American Graves Protection and Repatriation Act); and laws concerning public services (such as the Americans with Disabilities Act and the Architectural Barriers Act)—to name a few. A general management plan is not needed to decide, for instance, that it is appropriate to protect endangered species, control nonnative species, protect archeological sites, conserve artifacts, or provide access for visitors with disabilities. Laws and NPS *Management Policies 2006* have already decided those and many other issues.

This appendix discusses some of the pertinent servicewide laws and policies that guide management of Big Thicket National Preserve that the preserve must comply with regardless of this GMP planning effort. The table in this appendix enumerates the desired conditions and strategies based on these laws and policies the preserve must strive to meet. Regardless of which alternative is chosen to implement from this general management plan / environmental impact statement, Big Thicket National Preserve must comply with all of these laws and policies. The alternatives

in this general management plan address the desired future conditions that are not mandated by law and policy and must be determined through a planning process.

The table is constructed by topic, such as air quality, archeological resources, climate change, visitor use and experience, etc. Under each topic there is a (1) description of the desired conditions based on laws and policies that preserve staff strive to achieve for that topic; (2) a list of the strategies for achieving the desired conditions; and (3) the pertinent servicewide laws and policies the National Park Service complies with that apply to that particular topic.

Desired conditions articulate the ideal conditions the National Park Service is striving to attain. The term desired conditions is used interchangeably with goals. Desired conditions provide guidance for fulfilling the preserve’s purpose and for protecting the preserve’s fundamental resources and values.

The strategies describe actions that could be used by the National Park Service to achieve the desired conditions. Most of these strategies are already being implemented. Those not already being implemented are consistent with NPS policy, are not believed to be controversial, and require no analysis and documentation under the National Environmental Policy Act of 1969 (or analysis and documentation would be completed separately from this general management plan / environmental assessment). This is not an exhaustive list of management strategies. As new ideas, technologies, and opportunities arise, they would be considered if they further support the desired condition.

The desired conditions and management strategies in this appendix, combined with the management actions that are specific to

the management alternative ultimately selected for implementation (see chapter 2),

would form the complete general management plan for the preserve.

NATURAL RESOURCE MANAGEMENT

AIR QUALITY	
Desired Conditions	Pertinent Servicewide Laws and Policies
Good to excellent air quality is maintained. Scenic views, both day and night, are protected and unimpaired for the enjoyment of current and future preserve visitors. Indoor air quality at NPS facilities is healthy.	<ul style="list-style-type: none"> • Clean Air Act • NPS <i>Management Policies 2006</i> • Reference Manual 77: Natural Resource Management
Management Strategies	
<ul style="list-style-type: none"> • Air quality and air quality-related values in the preserve would be monitored to gain baseline information and to measure any significant changes to the preserve's airshed. Air pollution impacts would be identified and evaluated. • Air quality pollution emissions associated with preserve operations and recreational use would be reduced when possible (e.g., the use of zero and low-emission vehicles would be encouraged). Preserve operations would be conducted in compliance with appropriate federal, state, and local air quality regulations. • Although the National Park Service has little direct control over air quality in the preserve's airshed, NPS managers would continue to cooperate with the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency on air quality issues. • Preserve staff would participate in federal, regional, and local air pollution control plans and drafting of regulations and review permit applications for major new air pollution sources. • Educational programs would be developed to inform visitors and regional residents about the threats of air pollution. 	

ECOSYSTEM MANAGEMENT	
Desired Conditions	Pertinent Servicewide Laws and Policies
Big Thicket National Preserve is managed holistically as part of a greater ecological, social, economic, and cultural system. Natural resources are managed to preserve fundamental physical and biological processes, as well as individual species, features, and plant and animal communities. The National Park Service demonstrates leadership in resource stewardship and conservation of ecosystem values within and outside the preserve. Big Thicket National Preserve is managed from an ecosystem perspective, where internal and external factors affecting environmental quality and resource stewardship goals are considered at a scale appropriate to their impact on affected resources. Natural processes and wildlife population fluctuations occur with as little human intervention as possible. The preserve continues to serve as a wildlife corridor. Preserve resources are managed considering the ecological and social conditions of the preserve and surrounding area. Preserve managers adapt to changing ecological and social conditions within and external to the preserve and work in partnership with other federal and state agencies in regional planning and land and water management. The preserve is managed proactively to resolve external issues and concerns to ensure preserve values are not compromised.	<ul style="list-style-type: none"> • NPS <i>Management Policies 2006</i> • Reference Manual 77: Natural Resource Management

ECOSYSTEM MANAGEMENT	
Management Strategies	
<ul style="list-style-type: none"> • Science-based, adaptive, decision making would be followed, with the results of resource monitoring and research incorporated into all aspects of preserve operations. • Preserve staff would apply ecological principles to ensure that natural resources are maintained unimpaired. Integrated pest management procedures would be used when necessary to control nonnative organisms or other pests. • Preserve staff would expand monitoring programs to include geographic areas and resources that are not currently monitored. Partnerships with institutions, agencies, and scientists would be an important component of this endeavor. • Preserve staff would work with state agency partners to maintain healthy fish and wildlife populations. • Future facilities would be built in previously disturbed areas or in carefully selected sites with as small a construction footprint as possible. Preserve staff would apply mitigation techniques to minimize impacts of construction and other activities on preserve resources. • Scientific research would be encouraged. Cooperative basic and applied research would be encouraged through various partnerships and agreements to increase the understanding of preserve resources, natural processes, and human interactions with the environment, or to answer specific management questions. A resource stewardship strategy would be prepared to identify resource management priorities, consider sequencing of projects, and link on-the-ground projects to higher-tier management goals and objectives. • The preserve staff would continue to expand the data management system, including a geographic information system, a research database, and a literature database, for analyzing, modeling, predicting, and testing trends in resource conditions. • Visitors would be educated about the importance and fragility of preserve resources, threats to those resources, and mitigation measures to lessen impact. • The National Park Service would continue to seek agreements with the Texas Parks and Wildlife Department, American Indian tribes, and other owners of adjacent property to protect and enhance the ecosystem. • Preserve staff would work cooperatively to manage nonnative species in the region. • Preserve staff would continue to partner with the research community to further the knowledge of ecosystem processes that affect the preserve. • Preserve staff would continue to work with partners to protect species of concern and reintroduce extirpated native species when practical. 	

ECOSYSTEM RESTORATION	
Desired Conditions	Pertinent Servicewide Laws and Policies
Big Thicket National Preserve is a model of successful ecological restoration efforts. Altered ecosystems in the preserve are restored as nearly as possible had natural ecological processes not been disturbed. All federal and state threatened and endangered species are no longer in danger of extinction and are at least stable in the preserve.	<ul style="list-style-type: none"> • <i>NPS Management Policies 2006</i> • Reference Manual 77: Natural Resource Management
Management Strategies	
<ul style="list-style-type: none"> • Inventories and monitoring invasive nonnative plant species would continue in the entire preserve. Efforts would continue to control or eradicate nonnative plants that are particularly invasive and destructive pests, or have the potential to rapidly spread and dominate plant communities, such as Chinese tallow, water hyacinth, and hydrilla, provided control is prudent and feasible. Native species would be planted along the margins of developed areas, such as walls and fences, to enhance native plant and wildlife populations. Efforts would be made to educate visitors to the preserve visitors about the value of native plants. • Preserve managers would restore disturbed lands as much as possible and determine on a site-by-site basis whether passive or active restoration is necessary. Active restoration of previously or newly disturbed areas would be performed using native genetic materials to regain maximum habitat value. Under some circumstances, primarily in frontcountry developed areas, it may be appropriate and within policy to use nonnative plants in restoration efforts. Only plants that are noninvasive and would remain within developed areas would be used. • Extirpated native species would be restored where suitable habitat exists and such restoration would be compatible with social, political, and ecological conditions. 	

FIRE MANAGEMENT	
Desired Conditions	Pertinent Servicewide Laws and Policies
Fire management programs are designed to meet resource management objectives prescribed for the preserve's units. All wildland fires are effectively managed, considering resource values to be protected and firefighter and public safety, using the full range of strategic and tactical operations as described in an approved fire management plan.	<ul style="list-style-type: none"> • NPS <i>Management Policies 2006</i> • Director's Order 18: <i>Wildland Fire Management</i> and its accompanying Reference Manual 18: <i>Wildland Fire</i>
Management Strategies	
<ul style="list-style-type: none"> • The preserve's fire management plan would be maintained to reflect changes in wildland fire policy, fire use applications, and the body of knowledge on fire effects within the preserve's vegetation types. • The National Park Service would maintain a cooperative agreement for fire suppression with appropriate federal, tribal, state, and local agencies and organizations. • Where appropriate, fire would be used as a management tool to maintain native plant communities and control nonnative species. • Visitors handouts would provide information about the role of fire in the ecosystem. 	

FLOODPLAINS	
Desired Conditions	Pertinent Servicewide Laws and Policies
Natural floodplain values of Big Thicket National Preserve are preserved or restored. Long-term and short-term environmental effects associated with the occupancy and modification of the floodplain is avoided.	<ul style="list-style-type: none"> • Rivers and Harbors Appropriation Act of 1899 • Executive Order 11988, "Floodplain Management" • NPS <i>Management Policies 2006</i> • Director's Order 77-2: <i>Floodplain Management</i>
Management Strategies	
<ul style="list-style-type: none"> • Whenever possible, new developments would be located on sites outside of floodplains. If it is not possible to avoid locating a new development within a floodplain or to avoid a management action that would affect a floodplain, the National Park Service would: <ul style="list-style-type: none"> ○ prepare and approve a statement of findings in accordance with DO-77-2 ○ use nonstructural measures as much as practicable to reduce hazards to human life and property while minimizing impacts on the natural resources of floodplains ○ ensure that structures and facilities are designed to be consistent with the intent of the standards and criteria of the National Flood Insurance Program (44 CFR 60) • Mitigation measures would be required as part of construction to avoid any potential indirect effects to floodplains. Before initiating any ground-disturbing projects, further investigation would be conducted to determine if floodplain resources would be affected. Floodplain issues would be addressed at the project level to ensure that projects are consistent with NPS policy and Executive Order 11988. • Visitors would be informed about the values of natural floodplains. 	

NATIVE VEGETATION AND WILDLIFE	
Desired Conditions	Pertinent Servicewide Laws and Policies
The National Park Service strives to maintain, as part of the natural ecosystem, native plants and wildlife in Big Thicket National Preserve. Populations of native plant and animal species function in as natural condition as possible except where special considerations are warranted. Native species populations that have been severely reduced in or extirpated from the preserve are restored where feasible and sustainable.	<ul style="list-style-type: none"> • NPS <i>Management Policies 2006</i> • Reference Manual 77: <i>Natural Resource Management</i>
Management Strategies	
<ul style="list-style-type: none"> • Preserve staff would continue to monitor and update the vegetation and wildlife inventory. • A resources stewardship strategy would be prepared and implemented. • Whenever possible, natural processes would be relied upon to maintain native plant and animal species, and to influence natural fluctuations in populations of these species. • NPS staff would cooperate with other agencies and organizations to enhance preservation of migratory species habitats and populations outside the preserve. • Educational programs would be developed to inform visitors and the general public about wildlife issues and concerns. 	

NATURAL SOUNDSCAPES	
Desired Conditions	Pertinent Servicewide Laws and Policies
The National Park Service preserves natural ambient soundscapes, restores degraded soundscapes to the natural ambient condition wherever possible, and protects natural soundscapes from degradation due to human-caused noise. Natural sounds predominate outside developed areas—the sounds of civilization are generally confined to developed areas. Visitors have opportunities throughout much of the preserve to experience natural sounds in an unimpaired condition.	<ul style="list-style-type: none"> • NPS <i>Management Policies 2006</i> • Director's Order 47: <i>Sound Preservation and Noise Management</i>
Management Strategies	
<ul style="list-style-type: none"> • Actions would be taken to monitor and minimize or prevent unnatural sounds that adversely affect preserve resources or values or visitor enjoyment. • Tour bus companies would be required to reduce noise levels (e.g., turning off engines when buses are parked). • Noise generated by NPS management activities would be minimized by regulating administrative functions such as the use of motorized equipment where appropriate. Noise would be a consideration in the procurement and use of equipment by the preserve staff. • Visitors would be encouraged to avoid making unnecessary noise. • NPS staff would work with adjacent landowners, local governments, and other partners to reduce noise sources that affect the preserve's soundscape. 	

NIGHT SKY	
Desired Conditions	Pertinent Servicewide Laws and Policies
Excellent opportunities to see the night sky are available. Artificial light sources within and outside the preserve do not adversely affect night sky viewing and native plant populations.	<ul style="list-style-type: none"> NPS <i>Management Policies 2006</i>
Management Strategies	
<ul style="list-style-type: none"> The National Park Service would cooperate with preserve visitors, neighbors, and local government agencies to find ways to prevent or minimize the intrusion of artificial light into the night scene in the preserve. In natural areas, artificial outdoor lighting would be limited to basic safety requirements and would be shielded when possible. The NPS staff would evaluate the impacts on the night sky caused by preserve facility lighting. If light sources in the preserve are impairing night sky viewing, the staff would study alternatives such as shielding lights, changing lamp types, or eliminating unnecessary sources. 	

SOILS	
Desired Conditions	Pertinent Servicewide Laws and Policies
The preserve's soils are preserved; to the extent possible; the unnatural erosion, physical removal, or contamination of the soil, or its contamination of other resources, are prevented. Natural soil resources and processes function in as natural a condition as possible, except where special considerations are allowable under policy. When soil excavation is an unavoidable part of an approved facility development project, the National Park Service would minimize soil excavation, erosion, and off-site soil migration during and after any ground-disturbing activity.	<ul style="list-style-type: none"> NPS <i>Management Policies 2006</i> Reference Manual 77: <i>Natural Resource Management</i>
Management Strategies	
<ul style="list-style-type: none"> Soil conservation practices would be followed to reduce impacts. Effective best management practices would be applied to problem soil erosion and compaction areas in a manner that stops or minimizes erosion, restores soil productivity, and reestablishes or sustains a self-perpetuating vegetative cover. When use of a soil fertilizer or other soil amendment is an unavoidable part of restoring a natural landscape or maintaining an altered plant community, use would be guided by a written prescription. The prescription ensures that such use of soil fertilizer or soil amendment does not unacceptably alter the physical, chemical, or biological characteristics of the soil, biological community, or surface or ground waters. Whenever possible, NPS staff would educate visitors about soil conservation. 	

THREATENED OR ENDANGERED SPECIES	
Desired Conditions	Pertinent Servicewide Laws and Policies
Federally listed threatened and endangered species and their habitats are protected and sustained. Native threatened and endangered species populations that have been severely reduced or extirpated from the preserve are restored where feasible and sustainable. Essential habitats that support these species are protected.	<ul style="list-style-type: none"> Endangered Species Act NPS <i>Management Policies 2006</i> Reference Manual 77: <i>Natural Resource Management</i>
Management Strategies	
<ul style="list-style-type: none"> Preserve staff would continue to work with the U.S. Fish and Wildlife Service and Texas Parks and Wildlife Department to ensure that NPS actions help special-status species to recover. If any federal- or state-listed or proposed threatened or endangered species are found in areas that would be affected by construction, visitor use, or restoration activities proposed under any of the alternatives in this general management plan, the National Park Service would consult with the above-listed agencies and would try to avoid or mitigate any potential adverse impacts. Preserve staff would cooperate with the above-listed agencies to inventory, monitor, protect, and perpetuate the natural distribution and abundance of all special-status species and their essential habitats in Big Thicket National Preserve. Periodic inventories would be conducted for special-status species. These species and their habitats would be specifically considered in ongoing planning and management activities. The National Park Service would support research that contributes to management of federal- and state-listed species and their habitat. A resource stewardship strategy that addresses special-status species would be prepared and implemented. Preserve staff would participate in the recovery planning process when appropriate. 	

VIEWSHED AND VISTAS	
Desired Conditions	Pertinent Servicewide Laws and Policies
Natural vistas and cultural landscapes provide visitors with an immediate and lasting sensory experience that strongly conveys the character of the preserve. Key scenic vistas are protected.	<ul style="list-style-type: none"> NPS <i>Management Policies 2006</i>
Management Strategies	
<ul style="list-style-type: none"> Key vistas and viewpoints in the preserve would be identified. NPS staff would work with neighboring landowners, communities, conservancy groups, management agencies, and other partners to develop preservation goals for identified viewsheds; identify potential threats; and establish a sense of stewardship by these groups for important visual resources. NPS staff would work with adjacent landowners, partners, and others to preserve the scenic character of preserve entrance areas and corridors that complement the preserve's key viewpoints and vistas. 	

WATER RESOURCES	
Desired Conditions	Pertinent Servicewide Laws and Policies
Surface water and groundwater are protected and water quality meets or exceeds all applicable water quality standards. The preserve's water quality reflects natural conditions and supports native plant and animal communities, and administrative and recreational uses. NPS-permitted programs and facilities are maintained and operated to avoid pollution of surface water and groundwater.	<ul style="list-style-type: none"> • Clean Water Act • Executive Order 11514, "Protection and Enhancement of Environmental Quality" • NPS <i>Management Policies 2006</i> • Reference Manual 77: <i>Natural Resource Management</i>
Management Strategies	
<ul style="list-style-type: none"> • NPS staff would work with state and regional water quality agencies and other appropriate governmental bodies to obtain the highest possible water quality standards available under the Clean Water Act. • Preserve staff would cooperate with other government agencies to maintain and/or restore the quality and quantity of preserve surface and groundwater resources. Preserve staff would pursue methods to preserve and protect acceptable stream flows and groundwater levels to sustain aquatic and terrestrial life and provide recreational opportunities. • Water conservation would be promoted by the National Park Service, visitors, and preserve neighbors. • Best management practices would be applied to all pollution-generating activities and facilities in the preserve, such as NPS maintenance and storage facilities and parking areas. • The use of pesticides, fertilizers, and other chemicals would be minimized and managed in keeping with NPS policy and federal regulations. • Monitoring the water quality of preserve water resources would continue. If degraded water quality and/or flows occur, attempts would be made to locate and mitigate the source. • Visitors would be informed and educated about the preserve's water resources and their values. 	

WETLANDS	
Desired Conditions	Pertinent Servicewide Laws and Policies
The natural values of wetlands are maintained and protected. When practicable, natural wetland cultural values are enhanced by using them for educational, recreational, scientific, and similar purposes that do not disrupt natural wetland functions. Natural wetlands that have been degraded due to past human actions, including the introduction of nonnative species, are restored to predisturbance conditions whenever feasible. The National Park Service avoids to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and avoids direct or indirect support of new construction in wetlands wherever there is a practicable alternative.	<ul style="list-style-type: none"> • Clean Water Act • Rivers and Harbors Appropriation Act of 1899 • Executive Order 11514, "Protection and Enhancement of Environmental Quality" • Executive Order 11990, "Protection of Wetlands" • NPS <i>Management Policies 2006</i> • Director's Order 77-1: <i>Wetland Protection</i> and the accompanying <i>Wetland Protection Procedural Manual</i>
Management Strategies	
<ul style="list-style-type: none"> • A wetland inventory, condition assessment, and functional evaluation would be performed for Big Thicket National Preserve to ensure proper management and protection of wetland resources. If human activities or developments are proposed that may result in wetland degradation or loss, then more detailed wetland mapping would be prepared. • All facilities would be sited to avoid wetlands if feasible. If avoiding wetlands would not be feasible, other actions would be taken to comply with Executive Order 11990, "Protection of Wetlands," the Clean Water Act, and Director's Order 77-1: <i>Wetland Protection</i>. • A statement of findings for wetlands would be prepared if NPS actions would result in adverse impacts on wetlands. The statement of findings would include an analysis of the alternatives, delineation of the wetland, a wetland restoration plan to identify mitigation, and a wetland functional analysis of the impact site and restoration site. • If natural wetland functions have been degraded or lost due to human action, the National Park Service would work to restore wetlands to predisturbance conditions, to the extent practicable. 	

CULTURAL RESOURCE MANAGEMENT

ARCHEOLOGICAL RESOURCES	
Desired Conditions	Pertinent Servicewide Laws and Policies
Prehistoric and historic archeological sites are identified, inventoried, documented, their significance evaluated, and, if appropriate, nominated to the National Register of Historic Places. Archeological sites are protected in an undisturbed condition unless it is determined through formal processes that disturbance or natural deterioration is unavoidable. When disturbance or deterioration is unavoidable, the site is professionally documented and excavated and the resulting artifacts, materials, and records are curated and conserved in consultation with the Texas SHPO and associated American Indian tribes. Some archeological sites that can be adequately protected may be interpreted to visitors.	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • Archeological and Historic Preservation Act • Archaeological Resources Protection Act of 1979 • Native American Graves Protection and Repatriation Act of 1990, as amended • 36 CFR 79 – <i>Curation of Archaeological Collections</i> • <i>The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation</i> • 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers • <i>NPS Management Policies 2006</i> • Director's Order 28: <i>Cultural Resource Management Guideline</i> (1998) • Director's Order 28A: <i>Archeology</i> (2004)
Management Strategies	
<ul style="list-style-type: none"> • Continue to survey and inventory archeological sites throughout the preserve; determine and document their significance. The most critical area for study is preserve land where development or visitor activity is planned. • If determined significant, sites would be nominated to the National Register of Historic Places. • Add significant archeological sites to the NPS Archeological Sites Management Information System (ASMIS) database. • Educate visitors on regulations governing archeological resources protection and the penalties for their removal and/or disturbance. • Monitor and assess the condition of known archeological sites. Develop and implement stabilization strategies for sites being threatened or destroyed. • Treat all archeological resources as eligible for listing in the National Register of Historic Places pending a formal determination of their significance by the National Park Service, the Texas SHPO, and associated American Indian tribes. • Protect all archeological resources eligible for listing or listed in the national register; if disturbance to such resources is unavoidable, conduct formal consultation with the Texas SHPO, traditionally associated American Indian tribes, and the Advisory Council on Historic Preservation, as appropriate, in accordance with the National Historic Preservation Act and implementing regulations. • As appropriate, archeological surveys and/or monitoring would precede any ground-disturbing activities. Known archeological resources would be avoided to the greatest extent possible. If national register-eligible or listed archeological resources could not be avoided, or if during construction previously unknown archeological resources were discovered and the resources could not be preserved in situ, an appropriate mitigation strategy would be developed in consultation with the Texas SHPO and, if necessary, traditionally associated American Indian tribes. 	

CULTURAL LANDSCAPES	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>Cultural landscape inventories and reports are completed as necessary that describe character-defining landscape features, site history, and existing conditions. Conduct analysis and evaluation, and (for cultural landscape reports) discuss and analyze recommended treatments and preservation strategies. The cultural landscape reports would assist in future management decisions for landscapes and associated resources, both cultural and natural.</p> <p>The management of cultural landscapes focuses on preserving the landscape's physical attributes, biotic systems, and uses when those uses contribute to its historical significance.</p> <p>The preservation, rehabilitation, or restoration of cultural landscapes would be undertaken in accordance with the <i>Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes</i>.</p>	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • Advisory Council on Historic Preservation's implementing regulations regarding the <i>Protection of Historic Properties</i> (36 CFR 800) • <i>Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for the Treatment of Cultural Landscapes</i> (1996) • <i>NPS Management Policies 2006</i> • Director's Order 28: <i>Cultural Resource Management Guideline</i> (1998) • 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers
Management Strategies	
<ul style="list-style-type: none"> • Complete cultural landscape inventories for Big Thicket National Preserve. • Send the inventory reports to the Texas SHPO and traditionally associated American Indian tribes for review and comment. • If needed, write National Register of Historic Places nominations for eligible cultural landscapes. Send the nominations to the Texas SHPO and traditionally associated American Indian tribes for review and comment. Send the final nomination to the Keeper of the National Register for review and formal listing. • Cultural landscape reports would be completed, as necessary, to determine and guide the appropriate level of treatment, in accordance with the <i>Secretary of the Interior's Standards</i>, for each landscape listed in or eligible to be listed in the national register. 	

ETHNOGRAPHIC RESOURCES	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>Appropriate cultural anthropological research is conducted in cooperation with groups traditionally associated with the preserve.</p> <p>To the extent practicable, permitted by law, and not clearly inconsistent with essential agency functions, the National Park Service accommodates access to and ceremonial use of American Indian sacred sites by American Indian religious practitioners and avoids adversely affecting the physical integrity of these sacred sites.</p> <p>NPS general regulations on access to and use of natural and cultural resources in the preserve are applied in an informed and balanced manner that is consistent with preserve purposes and do not unreasonably interfere with American Indian use of traditional areas or sacred resources and does not result in the degradation of resources.</p> <p>All ethnographic resources are protected. If disturbance of such resources is unavoidable, formal consultation with the Texas SHPO, traditionally associated American Indian tribes, and the Advisory Council on Historic Preservation is conducted as appropriate.</p>	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • American Indian Religious Freedom Act • Native American Graves Protection and Repatriation Act of 1990 • Archeological Resources Protection Act • Executive Order 13007, "Indian Sacred Sites" • Presidential Memorandum of April 29, 1994, on Government-to-Government Relations with Tribal Governments • 36 CFR 800 Advisory Council on Historic Preservation Regulations for the Protection of Historic Properties • <i>NPS Management Policies 2006</i> • Director's Order 28: <i>Cultural Resource Management Guideline</i> (1998) • 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers

ETHNOGRAPHIC RESOURCES	
Management Strategies	
<ul style="list-style-type: none"> • Complete an ethnographic overview and assessment of the preserve. • Consult in writing and in person, when possible, with traditionally associated American Indian tribes about proposed undertakings that may affect ethnographic resources. Consider and incorporate input from the tribes about ways to avoid or mitigate potential impacts into management strategies. • Continue to provide access to sacred sites when the use is consistent with preserve purposes and the protection of resources. • Treat all ethnographic resources as eligible for listing in the National Register of Historic Places pending a formal determination by the preserve with concurrence from the Texas SHPO. • Protect all ethnographic resources determined eligible for listing in, or listed in, the national register; if disturbance to such resources is unavoidable, conduct formal consultation with traditionally associated American Indian tribes, Texas SHPO, and the Advisory Council on Historic Preservation, as needed, in accordance with the provisions of the National Historic Preservation Act. • Conduct regular consultations with associated American Indian tribes to continue to improve communications between the tribes and the preserve. • Continue to provide access to, and use of, natural and cultural resources in the preserve that are consistent with preserve purposes, do not unreasonably interfere with American Indian use of traditional areas or sacred resources, and do not degrade resources. 	

MUSEUM COLLECTIONS	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>All museum collections (objects, specimens, and archival collections) are identified and inventoried, catalogued, documented, preserved, and protected, and provisions are made to ensure their accessibility for exhibits, research, and interpretation, except irreplaceable or culturally sensitive items that would not be displayed or stored at Big Thicket National Preserve.</p> <p>The qualities that contribute to the significance of collections are protected in accordance with established standards.</p>	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • Museum Properties Management Act of 1955, as amended • American Indian Religious Freedom Act • Archeological and Historic Preservation Act • Native American Graves Protection and Repatriation Act of 1990 • 36 CFR 79 – <i>Curation of Archaeological Collections</i> • 36 CFR 800 – <i>Advisory Council on Historic Preservation Regulations for the Protection of Historic Properties</i> • <i>NPS Management Policies 2006</i> • Director's Order 24: <i>NPS Museum Collections Management</i> (2008) • Director's Order 28: <i>Cultural Resource Management Guideline</i> (1998) • NPS Museum Handbook, Parts I, II, and III • 2008 Programmatic Agreement among the National Park Service, Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers • ICMS User Manual
Management Strategies	
<ul style="list-style-type: none"> • Inventory and catalog all preserve museum collections in accordance with standards in the <i>NPS Museum Handbook</i>. • In accord with NPS standards, develop or update a collections management plan for the preserve that would guide the protection, conservation, and research use of museum objects. • Use NPS standards and guidelines on the display and care of artifacts to plan for exhibit area facilities sufficient to meet current curation standards. • Collections generated by research, including permitted research and NPS Inventory and Monitoring research would be properly catalogued, documented, preserved, and protected following NPS museum collection management guidelines. 	

PREHISTORIC AND HISTORIC STRUCTURES	
Desired Conditions	Pertinent Servicewide Laws and Policies
Prehistoric and historic structures are identified, inventoried, documented, their significance evaluated, and, if appropriate, nominated to the National Register of Historic Places. The qualities that contribute to the listing or eligibility for listing of prehistoric and historic structures in the national register are protected in accordance with the <i>Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation</i> (unless it is determined through a formal process that disturbance or natural deterioration is unavoidable).	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • Archeological and Historic Preservation Act • 36 CFR 800 – <i>Advisory Council on Historic Preservation Regulations for the Protection of Historic Properties</i> • <i>The Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation</i> • <i>The Secretary of the Interior's Standards for the Treatment of Historic Properties</i> • 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers • <i>NPS Management Policies 2006</i> • Director's Order 28: <i>Cultural Resource Management Guideline</i> (1998)
Management Strategies	
<ul style="list-style-type: none"> • Update and certify the NPS List of Classified Structures database. • Determine, implement, and maintain the appropriate level of preservation for each historic structure formally determined or eligible for listing in the National Register of Historic Places (subject to the <i>Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation</i>). • Implement and maintain the appropriate level of preservation for such structures. • Analyze the design elements (e.g., materials, colors, shape, massing, scale, architectural details) and the setting of historic structures to guide the preservation and stabilization of sites and structures. • Survey, inventory, and evaluate historic structures not already determined eligible for or listed in the National Register of Historic Places. Complete and submit a national register nomination form for historic structures determined eligible for listing; send the nomination to the Texas SHPO for review and comment; send the final nomination to the Keeper of the National Register for formal listing. • Implement and maintain the appropriate level of preservation for such structures. • Monitor and evaluate the condition of historic structures and develop and implement stabilization strategies for buildings and structures being threatened. • Before modifying any historic structure eligible for listing or listed in the National Register of Historic Places, the National Park Service would consult with the Texas SHPO and the Advisory Council for Historic Preservation, as required. • If disturbance to historic structures is unavoidable, conduct formal consultation with the Texas SHPO, associated American Indian tribes, and the Advisory Council on Historic Preservation, as appropriate, in accordance with the National Historic Preservation Act and the 2008 Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers. 	

VISITOR USE MANAGEMENT

COMMERCIAL VISITOR SERVICES	
A commercial activity is defined as any activity for which compensation is exchanged. It includes activities by for-profit and nonprofit operators. Commercial services are more than just concessions. They include concession contracts, commercial use authorizations, leases, cooperative agreements, rights of way, and special-use permits. All commercial services must be managed. All commercial services must be necessary and/or appropriate by achieving the resource protection and visitor use goals for the preserve.	
Desired Conditions	Pertinent Servicewide Laws and Policies
Commercial services are an important element of the visitor experience and the management of Big Thicket National Preserve. These services add to visitor enjoyment of the preserve, enable many people to see parts of the preserve they might not otherwise see, and help protect preserve resources. All commercial services are safe and sustainable.	<ul style="list-style-type: none"> • NPS <i>Management Policies 2006</i> • NPS Concessions Management Improvement Act of 1998 • Same as Visitor Experience and Use
Management Strategies	
<ul style="list-style-type: none"> • Ensure that all necessary and/or appropriate commercial activities in the preserve are authorized in writing by the superintendent. • Establish levels of commercial use that are consistent with resource protection and visitor experience goals for the preserve. • Businesses would continue to be managed through commercial use authorizations; commercial filming would continue to be managed through special-use permits. • Ensure that before commercial use authorizations are renewed or readvertised, the types of authorized uses are still necessary and/or appropriate, the levels of use are consistent with resource protection and quality visitor experiences, and the commercial services can be managed in an effective and efficient manner. 	

PUBLIC HEALTH AND SAFETY	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>While recognizing that there are limitations on its capability and constraints imposed by the NPS Organic Act to not impair resources, the National Park Service and its contractors and cooperators would seek to provide a safe and healthful environment for visitors and employees.</p> <p>Preserve staff strives to identify recognizable threats to safety and health and protect property by applying nationally accepted standards. The preserve is a safe workplace—no preventable workplace accidents, spills, or lost time injuries occur in the preserve. The preserve staff reduces or removes known hazards and/or applies appropriate mitigating measures, such as closures, guarding, gating, education, and other actions.</p>	<ul style="list-style-type: none"> • Occupational Safety and Health Administration 29 CFR • NPS <i>Management Policies 2006</i> • Director's Order -50 and RM-50 - <i>Safety and Health</i> • Director's Order -58 and RM-58 - <i>Structural Fire Management</i> • Director's Order -83 and RM-83 - <i>Public Health</i> • Director's Order -51 and RM-51 - <i>Emergency Medical Services</i> • Director's Order -30 and RM-30 - <i>Hazard and Solid Waste Management</i>
Management Strategies	
<ul style="list-style-type: none"> • NPS staff would ensure that all potable water systems and wastewater systems in the preserve meet state and federal requirements. • An emergency preparedness program could be developed to maximize visitor and employee safety and protection of resources and property. • Emergency operations or safety plans, including a hazardous spill response plan, would be maintained. • Interpretive signs and materials would be provided, as appropriate, to notify visitors of potential safety concerns/ hazards and procedures to help provide a safe visit to the preserve and to ensure that visitors are aware of the possible risks of certain activities. • Preserve equipment would be maintained in a safe and environmentally sound condition. • Routine safety and environmental checks would be conducted of employees, contractors, and business partner operations. • NPS staff would continue to work with local emergency and public health officials to make reasonable efforts to search for lost persons and rescue sick, injured, or stranded persons. • NPS staff would make reasonable efforts to provide appropriate emergency medical services for a person who becomes ill or is injured. 	

VISITOR INFORMATION, ORIENTATION, INTERPRETATION, AND EDUCATION	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>Visitors to Big Thicket National Preserve have opportunities for a safe and satisfying visit, with opportunities to:</p> <ul style="list-style-type: none"> • get information about the preserve (in multiple languages) before leaving home • get on-site information and an overview of the preserve (in multiple languages) • choose from a variety of recreational, interpretive, and educational experiences geared to diverse needs, interests, and abilities • easily find preserve facilities • learn about other theme-related sites and programs in the region • escape the routines and stresses of the urban environment <p>Visitors have opportunities to understand and appreciate the significance of the preserve and its resources, to make connections between preserve resources and their meanings, and to develop a personal stewardship ethic by directly relating to the resources. This may occur when visitors:</p> <ul style="list-style-type: none"> • understand elements of each of the primary interpretive themes (see "Planning Background" section) • experience key elements of the preserve's history • appreciate the range of plant and animal species in the preserve • interact with preserve staff • witness resource preservation in action • contribute to the support of preserve programs and preservation efforts • create personal and family memories from their preserve experiences • engage in forms of cultural demonstrations • explore and discover the preserve alone or with others 	<ul style="list-style-type: none"> • NPS Organic Act • National Park System General Authorities Act • NPS <i>Management Policies 2006</i> • Director's Order 6: <i>Interpretation and Education</i>
Management Strategies	
<ul style="list-style-type: none"> • Preserve managers would complete a comprehensive interpretive plan. This general management plan would emphasize providing information, orientation, and interpretive services through the most effective means. The comprehensive interpretive plan would provide the foundation and overall concept for the preserve's education plan, a plan that would be developed by the preserve staff in partnership with area educators. • The preserve staff would seek new ways to increase awareness of the preserve, its resources, and themes. This would include reaching out to segments of the population that do not use the preserve or know of its significance. Preserve staff would work with local communities and other theme-related sites to tell aspects of the Big Thicket stories in a coordinated and comprehensive fashion. Partnerships with other state and regional educational institutions, American Indian tribes, and other organizations would be sought to enrich interpretation and education opportunities about the preserve's themes. • Appropriate techniques and technologies would be used to make people aware of issues facing the preserve. • Interpretive and educational programs would include key resource issues, management priorities, and public safety, and would demonstrate standards for interpretive competencies identified and outlined by the NPS Interpretive Development Program. • Cooperative efforts and partnerships with local communities, public and private agencies, organizations, stakeholders, and land managers in the region would be enhanced so that visitors could learn about the abundance, variety, and availability of the region's cultural, recreational, and interpretive opportunities. This effort would orient visitors about what to do and which attractions to see. • Partnerships with state parks, educational institutions, and other organizations would be enhanced to enrich interpretive and educational opportunities regionally and nationally. 	

VISITOR USE AND EXPERIENCE (GENERAL)	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>Preserve resources are conserved unimpaired for the enjoyment of future generations. Visitors have opportunities for forms of enjoyment that are uniquely suited to the natural and cultural resources found in the preserve. No activities occur that would cause derogation of the values and purposes for which Big Thicket National Preserve was established.</p> <p>The types and levels of visitor use for all preserve units are consistent with the desired visitor experience and resource conditions prescribed for those areas within the preserve's purpose.</p> <p>Big Thicket National Preserve's buildings, facilities, programs, and services at Big Thicket National Preserve are accessible to all people, including those with disabilities. All new and renovated buildings and facilities are designed and constructed to provide access to people with disabilities. All services and programs, including those offered by volunteers and interpreters, are designed to be accessible by people with disabilities.</p>	<ul style="list-style-type: none"> • NPS Organic Act • National Park System General Authorities Act • NPS <i>Management Policies 2006</i> • Architectural Barriers Act of 1968 • Rehabilitation Act of 1973 • Americans with Disabilities Act of 1990 • Director's Order 42: <i>Accessibility for Visitors with Disabilities in National Park Service Programs and Services</i> • 28 CFR, Part 36 • 43 CFR, Part 17 - <i>Nondiscrimination in Federally Assisted Programs of the Department of the Interior. Subpart B: Nondiscrimination on the Basis of Handicap</i>
Management Strategies	
<ul style="list-style-type: none"> • Preserve staff would stay informed of the preserve's existing and changing visitor demographics to better tailor programs and media to meet diverse visitor needs and preferences. All media and programs would reflect the preserve's purpose, mission, resources significance, and desired visitor conditions (including primary interpretive themes). • To meet the requirements of the 1978 National Parks and Recreation Act and NPS <i>Management Policies 2006</i>, NPS staff would monitor visitor comments on issues such as crowding and availability of parking spaces at busy times of the year, and would monitor for resource impacts caused by visitors. Should any of the trends increase to levels unacceptable to managers, NPS staff would consider what actions to take. (Additional information on user capacity can be found in chapter 2.) • Visitors would be provided with the tools and information they need for self-management and tips on how to enjoy the preserve in a safe, low-impact manner. • Preserve staff would ensure accessibility of opportunities for visitors to form their own intellectual and emotional connections to resource meaning for as many audiences as practical and possible by providing a variety of both personal and nonpersonal services. • Existing buildings and facilities would be evaluated on a regular basis to determine the degree to which they are accessible to and useable by people with disabilities, and to identify barriers that limit access. Action plans that would identify which barriers could be removed would be developed and implemented. • Similarly, existing programs, activities, and services (including interpretation, telecommunications, media, and web pages) would be regularly evaluated to determine the degree to which they are accessible to and useable by people with disabilities, and to identify barriers to access. Action plans would be developed and implemented that identify how barriers would be removed. 	

RELATIONS WITH LANDOWNERS, AGENCIES, TRIBES, AND OTHER ENTITIES

GOVERNMENT TO GOVERNMENT RELATIONS BETWEEN AMERICAN INDIAN TRIBES AND BIG THICKET NATIONAL PRESERVE	
Desired Conditions	Pertinent Servicewide Laws and Policies
The National Park Service and American Indian tribes culturally affiliated with Big Thicket National Preserve would maintain positive, productive government-to-government relationships. NPS staff respects the viewpoints and needs of the tribes, continue to promptly address conflicts that may occur, and consider American Indian values in preserve management and operations. Traditional American Indian activities occur in the preserve to the extent allowed by applicable laws and regulations.	<ul style="list-style-type: none"> • National Historic Preservation Act of 1966, as amended (16 USC 470) • Archeological Resources Protection Act • Native American Graves Protection and Repatriation Act of 1990 • American Indian Religious Freedom Act • Executive Order 13007, "Sacred Sites" • <i>NPS Management Policies 2006</i> • NPS Organic Act • National Environmental Policy Act
Management Strategies	
<ul style="list-style-type: none"> • Preserve staff would continue to cooperate with tribes in conducting ethnographic studies to identify culturally significant resources. • Regular consultations with affiliated tribes would continue to improve communications and resolve any problems or misunderstandings. • NPS staff would continue to identify and deepen the understanding of the significance of the preserve's resources and landscapes to American Indians through cooperative research and sharing. • The participation of tribes would be encouraged in protecting the preserve's natural and cultural resources of mutual interest and concern. The employment of American Indians on the preserve staff would be encouraged to improve communications and working relationships, and encourage cultural diversity in the workplace. • NPS staff would consider traditionally affiliated tribal values in efforts to improve overall preserve management and interpretation. Tribes would be involved in the preserve's interpretation program to promote accuracy of information about American Indian cultural values and enhance public appreciation of those values. 	

RELATIONS WITH PRIVATE AND PUBLIC ORGANIZATIONS, ADJACENT LANDOWNERS, GOVERNMENT AGENCIES, AND VOLUNTEERS	
Desired Conditions	Pertinent Servicewide Laws and Policies
<p>Big Thicket National Preserve is managed as part of a greater ecological, social, economic, and cultural system.</p> <p>Good relations are maintained with adjacent landowners, surrounding communities, and private and public groups that affect, and are affected by, the preserve. Big Thicket National Preserve is managed proactively to resolve external issues and concerns and ensure that preserve resources are not compromised.</p> <p>Because the preserve is an integral part of the larger regional environment, the National Park Service works cooperatively with others to anticipate, avoid, and resolve potential conflicts, protect preserve resources, and address mutual interests in the quality of life for community residents. Regional cooperation involves federal, state, and local agencies, American Indian tribes, neighboring landowners, and all other concerned parties.</p>	<ul style="list-style-type: none"> • <i>NPS Management Policies 2006</i>

RELATIONS WITH PRIVATE AND PUBLIC ORGANIZATIONS, ADJACENT LANDOWNERS, GOVERNMENT AGENCIES, AND VOLUNTEERS	
Management Strategies	
<ul style="list-style-type: none"> • Preserve staff would continue to encourage and establish partnerships with public and private organizations to achieve the purpose of the preserve. Partnerships would continue to be sought for resource protection, research, education, and visitor enjoyment. • NPS staff would keep landowners, land managers, local governments, and the general public informed about preserve management activities. The National Park Service would work closely with local, state, and federal agencies and tribal governments whose programs affect or are affected by activities in the preserve. • Periodic consultations would occur with landowners and communities who are affected by, or potentially affected by preserve visitors and management actions. NPS staff would respond promptly to conflicts that arise over their activities, visitor access, and proposed activities and developments on adjacent lands that may affect the preserve. NPS managers would seek agreements with landowners to encourage that their lands would be managed in a manner compatible with preserve purposes. Preserve staff would seek ways to provide landowners with technical and management assistance to address issues of mutual interest. • NPS staff would continue to work closely with local, state, and federal agencies and tribal governments to foster interagency training, cooperation, and mutual assistance that affords the highest level of protection and security for visitors and preserve resources. • Preserve managers would pursue cooperative regional planning to integrate the preserve into issues of regional concern whenever possible. • NPS staff would continue to support and encourage volunteers who contribute to preserve programs. 	

OTHER MANAGEMENT TOPICS

CLIMATE CHANGE	
Desired Conditions	Pertinent Servicewide Laws and Policies
Big Thicket National Preserve is a leader in its efforts to address climate change, reduce greenhouse gas emissions, increase use of renewable energy, and other sustainable practices in order to be a carbon neutral preserve; while preparing for and mitigating climate change impacts. Preserve staff proactively monitor, plan, and adapt to the effects of climate change on natural and cultural resources and visitor amenities by using the best available information. Preserve staff promote innovation, best practices, adaptive management, and partnerships to respond to the challenges of climate change and its effects on preserve resources. Education and interpretive programs help visitors understand the process of climate change, the threats to the preserve and the wider environment, and how they can respond to climate change.	<ul style="list-style-type: none"> • NPS Organic Act • Executive Order 13423 (includes requirements for the reduction of greenhouse gases and other energy and water conservation measures) • USDI Secretarial Orders 3226 and 3289 (ensure that climate change impacts be taken into account in connection with departmental planning and decision making) • NPS <i>Management Policies 2006</i> (including sections on environmental leadership [1.8], sustainable energy design [9.1.1.6], and energy management [9.1.7]) • NPS Environmental Quality Division's "Draft Interim Guidance: Considering Climate Change in NEPA Analysis" • NPS Climate Change Response Strategy
Management Strategies	
<ul style="list-style-type: none"> • Key natural and cultural resources and visitor amenities that are most vulnerable to climate change would be identified. Baseline resource conditions would be established, thresholds identified, and conditions monitored. Key resources in various management zones would be identified that may require different management responses to climate change impacts. • Big Thicket National Preserve would undertake comprehensive climate change planning to anticipate, adapt to, and mitigate for climate change impacts. This might include measuring park-based greenhouse emissions; developing sustainable strategies to mitigate these emissions; adapting to climate change impacts; educating the public about the undertaken climate change planning efforts, climate change scenario planning, participation in the NPS Climate Friendly Parks program, or adherence to the NPS Climate Change Response Strategy or Green Parks Plan guidance. 	

- Key ecosystem features and processes would continue to be restored, and key cultural resources protected to increase their resiliency to climate change. By reducing other types of impacts on resources, the overall condition of the resources should improve, and they would more easily recover from or resist the impacts of climate change.
- Scientific studies and inventories would be used to identify and document climate change effects, to predict potential effects, and to assist in identifying potential responses to climate change. Key natural and cultural resources and visitor amenities that are at risk from climate change would be identified and monitored.
- Because emissions from all motorized vehicles contribute to the preserve's emissions, options to improve transportation efficiencies would be explored, including NPS and visitor activities. Opportunities for alternative transportation options, and effective carbon offset strategies, would be explored. Use of low-emission vehicles for NPS operations would be used whenever possible.
- Opportunities would be pursued in preserve operations and visitor services to use and promote "green" technologies and products and reduce overall energy and resource consumption.
- Preserve education and interpretive efforts would engage staff, partners, visitors, and the public on climate change, providing the latest research and monitoring data and trends, informing the public about what responses are being taken at the preserve, and inspiring visitors to reduce their carbon footprint.
- NPS staff would work with partners to plan for climate change, and identify actions that can be taken to respond to these changes. Cooperative efforts would be pursued to maintain regional habitat connectivity and refugia that allow species dependent on preserve resources to better adapt to changing conditions.
- Concessioners and other partners would be encouraged to provide or use low-emission vehicles in their activities, within and outside the preserve.
- Anticipated climate change impacts, such as changes in vegetation, would be incorporated in future management plans.
- See also the strategies identified under "Sustainability."

Adapted from IHDP 2008 and NPS 2010d

SUSTAINABILITY

Sustainability can be described as doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices consider local and global consequences to minimize the short- and long-term environmental impacts of human actions and developments through alternative energy sources, resource conservation, recycling, waste minimization, and the use of energy efficient and ecologically responsible materials and techniques.

Desired Conditions	Pertinent Servicewide Laws and Policies
The preserve is a leader in sustainable practices. All decisions regarding preserve operations, facilities management, and development in Big Thicket National Preserve—from the initial concept through design and construction—reflect principles of resource conservation. Thus, all preserve developments and preserve operations are sustainable to the maximum degree possible. New developments and existing facilities are sited, built, and modified according to the <i>Guiding Principles of Sustainable Design</i> (NPS 1993) or other similar guidelines. The preserve uses state-of-the-art water systems for conserving water, and energy conservation technologies and renewable energy sources whenever possible. Biodegradable, nontoxic, and durable materials are used in the preserve whenever possible. The reduction, use, and recycling of materials is promoted, while materials that are nondurable, environmentally detrimental, or that require transportation from great distances are avoided as much as possible.	<ul style="list-style-type: none"> • Executive Order 12873 (mandates federal agency recycling and waste prevention) • Executive Order 12902 (mandates energy efficiency and water conservation at federal facilities) • <i>NPS Management Policies 2006</i> • <i>NPS Guiding Principles of Sustainable Design</i> (1993) • Leadership in Energy & Environmental Design (LEED) • NPS Green Parks Plan
Management Strategies	
The National Park Service <i>Guiding Principles of Sustainable Design</i> (1993b) directs NPS management philosophy. It provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. Sustainability principles have been developed and are followed for interpretation, natural resources, cultural resources, site design, building design, energy management, water supply, waste prevention, and facility maintenance and operations. The NPS Green Parks Plan further advances the agency's commitment to reducing environmental impacts and greenhouse gas emissions across all levels of the organization. In addition to following the guidance in these plans, the	

following also would be accomplished:

- NPS staff would work with experts both inside and outside the agency to make the preserve's facilities and programs sustainable. Partnerships would be sought to implement sustainable practices in the preserve. NPS staff would work with stakeholders and business partners to augment NPS environmental leadership and sustainability efforts.
- Preserve managers would perform value analysis and value engineering, including life-cycle analysis, to examine the energy, environmental, and economic implications of proposed developments.
- NPS staff would support and encourage the service of suppliers and contractors that follow sustainable practices. Concessioners would be encouraged to embrace principles of environmental stewardship that enhance the protection, conservation, and preservation of resources.
- Energy-efficient practices and renewable energy sources such as solar and wind energy and alternative fuel sources would be implemented wherever possible for both operational facilities and visitor facilities and amenities.
- Preserve interpretive programs would address sustainable and nonsustainable practices. Visitors would be educated on the principles of environmental leadership, alternative energy, and sustainability through exhibits, media, and printed material.
- Preserve employees would be educated to have a comprehensive understanding of their relationship to environmental leadership and sustainability.
- Preserve managers would measure and track environmental compliance and performance. Audits would ensure environmental compliance, emphasize best management practices, and educate employees at all levels regarding environmental management responsibilities.

UTILITY AND COMMUNICATION FACILITIES

The Telecommunications Act of 1996 directs all federal agencies to assist in the national goal of achieving a seamless telecommunications system throughout the United States by accommodating requests by telecommunication companies for the use of property, rights-of-way, and easements to the extent allowable under each agency's mission. The National Park Service is legally obligated to permit telecommunication infrastructure in the preserve if such facilities can be structured to avoid interference with preserve purposes.

Desired Conditions	Pertinent Servicewide Laws and Policies
Preserve resources or public enjoyment of the preserve are not denigrated by nonconforming uses. Telecommunication structures are permitted in the preserve to the extent that they do not jeopardize the preserve's mission and resources. No new nonconforming use or rights-of-way are permitted within the preserve without specific statutory authority and approval by the director of the National Park Service or his representative, and are permitted only if there is no practicable alternative to such use of NPS lands.	<ul style="list-style-type: none"> • Telecommunications Act; 16 USC 79; 23 USC 317; 36 CFR 14 • NPS <i>Management Policies 2006</i> • Director's Order 53 and Reference Manual 53: <i>Special Park Uses</i>
Management Strategies	
<ul style="list-style-type: none"> • NPS staff would work with service companies, local communities, and the public to site new utility lines so that there is minimal effect on preserve resources. If necessary, and there are no other options, new or reconstructed utilities and communications infrastructure would be placed in association with existing structures and along roadways or other established corridors in developed areas. Companies would be urged to place utility lines underground to the maximum extent possible. • Preserve staff would follow NPS <i>Management Policies 2006</i> (RM 53) and National Environmental Policy Act guidelines in processing applications for commercial telecommunications applications. 	

APPENDIX E: WATER QUALITY

Water is the unifying resource at Big Thicket National Preserve. The 43,790.29-hectare (108,208-acre) preserve is essentially a series of riparian corridors centered on the Neches River; Beech, Menard, Big Sandy, Hickory, and Village creeks; and Pine and Little Pine Island bayous. An average of 14,500 visitors use the preserve waters for recreation each year. Preserve managers are responsible for conserving water resources of 930 km (578 miles) of stream, ranging in size from small headwaters to the Neches River. The waterways of the preserve are home to an estimated 92 fish and 16 mussel species, as well as numerous other aquatic flora and fauna. One of the challenges is that the preserve represents only about 1.6% of the 26,000 km² (6.4 million acres) Neches River watershed.

Water quality and quantity is monitored quarterly at six locations within the preserve as directed by the NPS Gulf Coast Inventory and Monitoring Network (GULN). Sampling is performed at 13 sites proximal to the preserve by the Lower Neches Valley Authority and at six stations in the Lower Neches River Valley by the U.S. Geological Survey. Considering that much of the landscape of the preserve has been altered from its natural condition, it is encouraging that most waters are in good condition for most measured parameters.

The first water quality survey was performed between 1977 and 1981 by Lamar University. Results showed severe impacts from oil fields in Little Pine Island Bayou and depressed oxygen levels in Little Pine Island Bayou and Big Sandy Creek. While large-scale brine events have not been observed in recent years, some stream segments still do not meet state surface water quality standards.

Each stream segment is assigned a designated use (e.g., recreational, aquatic life, or public water supply), which is a reflection of water

use. All of Pine Island and Little Pine Island bayous within the preserve have low dissolved oxygen (DO). Little Pine Island Bayou and the headwaters of Big Sandy Creek exceed limits for *E. coli*.

Some of the stream segments are either listed by the state as not meeting the High Aquatic Life Use due to depressed DO or were identified in this study as having periodic low DO. Depressed oxygen may be caused by a combination of natural hydraulic conditions consisting of warm water, tree canopy shading, and low gradients, which result in limited water movement and limited aeration. These conditions are exacerbated during summer low flow and warm temperatures. While these conditions are largely natural, low dissolved oxygen may also indicate eutrophication, the processes of a water body receiving excessive nutrients from point and nonpoint sources.

E. coli is a naturally occurring bacteria found in the intestines and feces of warm-blooded animals. Our data indicate that the majority of *E. coli* found in Big Thicket National Preserve streams are from nonpoint sources, as high bacteria levels coincide with high flows. In this study, bacteria levels exceeded the state's surface water quality criterion on three occasions (Menard and Turkey creeks and Little Pine Island Bayou). Due to this relationship with runoff and high flows, it is possible that any stream in the preserve may exceed the standard after rainfall events.

In March 2010 the Texas Department of State Health Services (DSHS) posted a fish-consumption advisory for mercury in the Neches River and all contiguous waters in Angelina, Hardin, Houston, Jasper, Polk, Trinity, and Tyler counties. This includes the entire reach of Village Creek and the Neches River upstream of Evadale. While mercury is accumulated through the food chain in the preserve, it is not a problem confined to the

preserve. High mercury content in fish tissue is common among many of the east Texas waterbodies. While mercury naturally occurs in the environment, atmospheric deposition also occurs through the burning of fossil fuels, as well as natural sources. The methylation of mercury, which is the path to food chains, is conducive in systems with low pH and high dissolved organic carbon, which are conditions common to east Texas streams and reservoirs.

The frequency and duration of saltwater intrusion events can be expected to increase as demand for fresh water in the greater Beaumont area increases and the Sabine-Neches Waterway is deepened and widened. While the LNVA Saltwater Barrier will help prevent the intrusion of salt water into the preserve upstream from the structure, the new Beaumont unit may experience higher salinities.

The Gulf Coast Network will continue quarterly water quality sampling at the preserve through the Lower Neches Valley Authority as part of the TCEQ Clean Rivers Program routine schedule for the Lower Neches River Valley. All aspects of the sampling, transportation, analysis, and data management will continue under the protocols of the Gulf Coast Network and the Texas Commission on Environmental Quality. The Gulf Coast Network expects to continue week-long deployments of datasondes during the late May indexing period. If any questions regarding the hydrology or water quality of the preserve arise, the GULN hydrologist should be contacted.

Pine Island Bayou Watershed

The Pine Island Bayou watershed drains about 657 square miles before confluenting with the Neches River just upstream of the City of Beaumont. The watershed is largely wooded but also contains substantial industrial and residential development. Three units of the preserve are contained within the Pine Island Bayou watershed: the Loblolly

unit, Lance Rosier unit, Little Pine Island-Pine Island Bayou corridor unit, and additionally, part of the Beaumont unit. The watershed slopes in a southeasterly direction and varies in elevation from about 2 feet (above mean sea level) at the confluence to about 160 feet at the watershed divide (U.S. Army Corps of Engineers 1985).

A large number of structures within the watershed are flood prone due to the presence of substantial residential development on the fringes of some of the bayous and creeks. The threshold of flood damages for both Pine Island and Little Pine Island Bayous is the 5-year flood, which has been estimated at 8,000 and 4,000 cfs, respectively (U.S. Army Corps of Engineers 1985). Several flood mitigation plans have been proposed although none at this time have been accepted.

Little Pine Island Bayou and Pine Island Bayou comprise the water corridor unit between the Lance Rosier unit upstream and the Beaumont unit downstream. Little Pine Island Bayou is a tributary to Pine Island Bayou, and the two join upstream or west of the Beaumont unit near Bevil Oaks. Black Creek, another major tributary to the water corridor unit, joins Pine Island Bayou downstream of Bevil Oaks.

The Lance Rosier unit, located upstream (west) of the Little Pine Island-Pine Island Bayou corridor unit, includes the upper end of the Little Pine Island Bayou. It is the largest unit of the preserve. Changes in geology, elevation, vegetation, and other transitions across the Lance Rosier unit influence the type and quality of water resources. As in the water corridor unit, seepage springs form cypress brakes, acid bogs, and baygalls, where the water is typically low in dissolved oxygen concentrations and pH, and decay of organic material creates clear, dark water.

Hydrochemical Regime. Generally speaking, streams flowing through the Pine Island Bayou watershed are similar to other surface waters in southeastern Texas in that

seasonal flows are variable and total dissolved solids concentrations are relatively low (Flora et al. 1984). In addition to natural factors, land use practices in the watershed have influenced area water quality, generally contributing to its degradation.

Hughes and others (1986) summarized water quality monitoring results from 1975 to 1983, and showed that water quality in Little Pine Island-Pine Island Bayou corridor unit was moderately degraded with respect to specific conductance and chloride concentrations. An additional observation regarding water quality is that turbidity in Little Pine Island Bayou varied with discharge, from a low during low flows, to a high during high flows (Harrel et al. 1978). Interestingly, turbidity was lowest at the station near Sour Lake, attributed to contamination with oil field brine (salt water), which precipitates suspended particles. Dissolved oxygen concentrations were frequently low in Little Pine Island Bayou (minimum of 0.3 mg/L), and were lowest in the summer and highest in the winter.

Stream Segments, Uses, and Permits.

Segment 607 is described in Texas Surface Water Quality Standards from the confluence with the Neches River in Hardin and Jefferson counties to FM 787 in Hardin County. This segment is water-quality-limited due to violations of existing water quality standards (TNRCC 1996). Designated uses for segment 607 are contact recreation, high quality aquatic habitat, and public water supply. Because Little Pine Island Bayou is an unclassified tributary to Pine Island, it is an off-segment stretch of Pine Island Bayou with the same designated uses. The classification for segment 607 is water-quality-limited due to previous water quality standards violations.

There are three National Pollutant Discharge Elimination System (NPDES) permitted discharges in the water corridor unit for sewage treatment plant effluent from Pinewood Estates, Bevil Oaks, and Lumberton. In 1992, eight NPDES municipal

wastewater discharge permits were recorded for Pine Island Bayou for a total flow of 3.17 MGD. There are also 11 domestic outfalls into the bayou for a total of 4.94 MGD.

Violations/Exceedances/Problems. The Texas Water Commission (1985) identified dissolved oxygen, pH, and *E. coli* as potential problem areas for water quality. Depressed dissolved oxygen concentrations and elevated *E. coli* counts, which occur primarily during summer conditions when streamflows are low and the water is warmer, have resulted in nonsupport designated uses. Specifically, the middle 26 miles of the segment 607, located downstream of Sour Lake wastewater discharge, has not supported high quality aquatic habitat or contact recreation due to depressed dissolved oxygen and *E. coli* (Adsit and Hagen 1978). Sediment samples collected during an intensive survey by the Texas Water Commission (TWC) at two sites, one in Pine Island Bayou, and the other in Little Pine Island Bayou, were analyzed for pesticides and metals at both sites, and also for PCBs at Little Pine Island Bayou. Survey results indicated elevated levels of arsenic, manganese, and mercury, but no state or federal standards were exceeded.

Water quality of Little Pine Island Bayou was considered the worst in the region throughout its length (Hall and Bruce 1996). Little Pine Island Bayou water quality has long been impacted by salt water (brine) in the Saratoga and Sour Lake area. An influx of brine into Little Pine Island Bayou, either from existing or abandoned oil field operations, increased specific conductance, chloride concentrations, pH, and total dissolved solids, and decreased turbidity and color (Kaiser et al. 1993). In July 1985, a pipeline rupture released brine, which resulted in exceedingly high specific conductance readings (16,241 mmhos/cm) and a maximum chloride concentration that reached at least 1,400 mg/L in Little Pine Island Bayou. Effects of the spill were studied for 26 months, but persisted beyond that time. Eventually, the brine settled to the bottom of the channel,

reducing the specific conductance at the surface to about 2,000 mmhos/cm (Hughes et al. 1987).

In 1978, a study determined that Pine Island Bayou complied with the *E. coli* standard of 200 organisms/100 mL less than 50% of the time during the sampling period during high and low flow conditions (Commander 1978). *E. coli* ranged between 0 to 5,880/100 mL, with spikes observed after heavy rains (Harrel and Darville 1978).

Menard Creek Watershed

Menard Creek originates in central Polk County and flows approximately 48 miles before entering the Trinity River. Menard Creek is an off-stream component of segment 802 of the Trinity River Basin. Designated uses for this segment are contact recreation, high aquatic life, and public water supply. Two unofficial swimming beaches exist along Menard Creek: Holly Grove and Whoop-N-Holler. These sites have been traditionally used for baptisms in addition to swimming.

Hydrochemical Regime. Menard Creek is among a number of creeks in the preserve that exhibit low alkalinity and turbidity (LNVA 1994). Additionally, total dissolved solids tended to increase on Menard Creek in the downstream direction. Periods of elevated chloride concentrations at Menard Creek have been attributed to contamination by waste brines from the Schwab oil field (Hughes et al. 1987).

Seasonal discharge and stream temperatures were similar to those of Little Pine Island Bayou. Dissolved oxygen concentrations tend to be greater than 5 mg/L, but occasionally drop below 4 mg/L, which may be a natural occurrence in streams as influenced by high seasonal water temperatures, concurrent low flows, combined with natural organic loading (e.g., decaying vegetation) (LNVA 1994). Bacterial counts were not excessive (i.e., mean of 200 *E. coli*/100 mL), but were somewhat elevated.

APPENDIX F: ENDANGERED AND THREATENED SPECIES AND SPECIES OF CONCERN

Common Name	Scientific Name	Federal Status	State Status	County
AMPHIBIANS				
Houston toad	<i>Anaxyrus houstonensis</i>	E	E	Liberty
Pig frog	<i>Lithobates grylio</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Tyler
BIRDS				
Bachman's sparrow	<i>Aimophila aestivalis</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler
Bald eagle	<i>Haliaeetus leucocephalus</i>	DL	T	All
Black rail	<i>Laterallus jamaicensis</i>	R/NL	R/NL	Jefferson
Brown pelican	<i>Pelecanus occidentalis</i>	DL	E	Jefferson, Orange
Henslow's sparrow	<i>Ammodramus henslowii</i>	R/NL	R/NL	All
Peregrine falcon	<i>Falco peregrinus</i>	DL	T	All
American peregrine falcon	<i>Falco peregrinus anatum</i>	DL	T	All
Arctic peregrine falcon	<i>Falco peregrinus tundrius</i>	DL	R/NL	All
Piping plover	<i>Charadrius melodus</i>	T	T	All
Red-cockaded woodpecker	<i>Picoides borealis</i>	E	E	Hardin, Jasper, Liberty, Polk, Tyler
Reddish egret	<i>Egretta rufescens</i>	R/NL	T	Jefferson
Snowy plover	<i>Charadrius alexandrinus</i>	R/NL	R/NL	Jefferson
Sooty tern	<i>Sterna fuscata</i>	R/NL	T	Orange
Southeastern snowy plover	<i>Charadrius alexandrinus tenuirostris</i>	R/NL	R/NL	Jefferson
Sprague's pipit	<i>Anthus spragueii</i>	C	R/NL	All
Swallow-tailed kite	<i>Elanoides forficatus</i>	R/NL	T	All
Western snowy plover	<i>Charadrius alexandrinus nivosus</i>	R/NL	R/NL	Jefferson
White-faced ibis	<i>Plegadis chihi</i>	R/NL	T	Hardin, Jasper, Jefferson, Liberty, Orange
Wood stork	<i>Mycteria americana</i>	R/NL	T	All
FISH				
American eel	<i>Anguilla rostrata</i>	R/NL	R/NL	All
Blue sucker	<i>Cycleptus elongatus</i>	R/NL	T	Hardin, Jasper, Tyler
Creek chubsucker	<i>Erimyzon oblongus</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler
Ironcolor Shiner	<i>Notropis chalybaeus</i>	R/NL	R/NL	Jasper, Orange
Orangebelly darter	<i>Etheostoma radiosum</i>	R/NL	R/NL	Jasper, Polk
Paddlefish	<i>Polyodon spathula</i>	R/NL	T	Hardin, Jasper, Liberty, Polk, Tyler

Common Name	Scientific Name	Federal Status	State Status	County
Smalltooth sawfish	<i>Pristis pectinata</i>	E	E	Jefferson
Western sand darter	<i>Ammocrypta clara</i>	R/NL	R/NL	Hardin, Jasper, Tyler
INSECTS				
A mayfly	<i>Plauditus gloveri</i>	R/NL	R/NL	Jasper
Bay skipper	<i>Euphyes bayensis</i>	R/NL	R/NL	Jefferson
Gulf Coast clubtail	<i>Gomphus modestus</i>	R/NL	R/NL	Liberty
MAMMALS				
Black bear	<i>Ursus americanus</i>	T/SAT;NL	T	All
Louisiana black bear	<i>Ursus americanus luteolus</i>	T	T	All
Plains spotted skunk	<i>Spilogale putorius interrupta</i>	R/NL	R/NL	All
Rafinesque's big-eared bat	<i>Corynorhinus rafinesquii</i>	R/NL	T	All
Red wolf	<i>Canis rufus</i>	E	E	All
Southeastern myotis bat	<i>Myotis austroriparius</i>	R/NL	R/NL	All
West Indian manatee ¹	<i>Trichechus manatus</i>	E	NL	Jefferson, Orange
MOLLUSKS				
Creeper (squawfoot)	<i>Strophitus undulatus</i>	R/NL	R/NL	All
Fawnsfoot	<i>Truncilla donaciformis</i>	R/NL	R/NL	All
Little spectaclecase	<i>Villosa lienosa</i>	R/NL	R/NL	All
Louisiana pigtoe	<i>Pleurobema riddellii</i>	R/NL	T	All
Sandbank pocketbook	<i>Lampsilis satura</i>	R/NL	T	All
Southern hickorynut	<i>Obovaria jacksoniana</i>	R/NL	T	Hardin, Jasper, Jefferson, Orange, Polk, Tyler
Texas heelsplitter	<i>Potamilus amphichaenus</i>	R/NL	T	All
Texas pigtoe	<i>Fusconaia askewi</i>	R/NL	T	All
Triangle pigtoe	<i>Fusconaia lananensis</i>	R/NL	T	Hardin, Tyler
Wabash pigtoe	<i>Fusconaia flava</i>	R/NL	R/NL	All
Wartyback	<i>Quadrula nodulata</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Polk, Tyler
REPTILES				
Alligator snapping turtle	<i>Macrochelys temminckii</i>	R/NL	T	All
Atlantic hawksbill sea turtle ²	<i>Eretmochelys imbricate</i>	E	E	Jefferson
Green sea turtle ³	<i>Chelonia mydas</i>	T	T	Jefferson
Gulf saltmarsh snake ⁴	<i>Nerodia clarkia</i>	R/NL	R/NL	Jefferson, Orange
Kemp's Ridley sea turtle ⁵	<i>Lepidochelys kempii</i>	E	E	Jefferson
Leatherback sea turtle ⁶	<i>Dermochelys coriacea</i>	E	E	Jefferson

Common Name	Scientific Name	Federal Status	State Status	County
Loggerhead sea turtle⁷	<i>Caretta caretta</i>	T	T	Jefferson
Louisiana pine snake	<i>Pituophis ruthveni</i>	C	T	Hardin, Jasper, Liberty, Polk, Tyler
Northern scarlet snake	<i>Cemophora coccinea copei</i>	R/NL	T	Hardin, Jasper, Jefferson, Liberty, Orange, Tyler
Sabine map turtle	<i>Graptemys ouachitensis sabinensis</i>	R/NL	R/NL	Hardin, Jasper, Jefferson, Orange, Tyler
REPTILES				
Texas diamondback terrapin⁸	<i>Malaclemys terrapin littoralis</i>	R/NL	R/NL	Jefferson, Orange
Texas horned lizard	<i>Phrynosoma cornutum</i>	R/NL	T	Jefferson, Liberty, Orange
Timber rattlesnake	<i>Crotalus horridus</i>	R/NL	T	All
PLANTS				
Chapman's orchid	<i>Platanthera chapmanii</i>	R/NL	R/NL	Hardin, Jefferson, Orange, Tyler
Long-sepaed false dragon-head	<i>Physostegia longisepala</i>	R/NL	R/NL	Hardin, Jasper, Orange, Tyler
Navasota false foxglove	<i>Agalinis navasotensis</i>	R/NL	R/NL	Tyler
Navasota ladies'-tresses	<i>Spiranthes parksii</i>	E	E	Jasper
Neches River rose-mallow	<i>Hibiscus dasycalyx</i>	C	R/NL	Jasper
Nodding yucca	<i>Yucca cernua</i>	R/NL	R/NL	Jasper
Texas screwstem	<i>Bartonia texana</i>	R/NL	R/NL	Hardin, Jasper, Polk, Tyler
Texas trailing phlox	<i>Phlox nivalis ssp texensis</i>	E	E	Hardin, Polk, Tyler
Texas trillium	<i>Trillium texanum</i>	R/NL	R/NL	Jasper
White firewheel	<i>Gaillardia aestivalis var winkleri</i>	R/NL	R/NL	Hardin, Tyler

Sources: USFWS, last updated 3/8/2011; TPWD, last updated 2/28/2011

¹⁻⁸ Species is listed in the noted county; however, the species is not likely to exist in the section of the county that encompasses the preserve due to their preference for saltwater (not including brackish water species).

Key:

E, T – Federal- or State-Listed Endangered/Threatened
 PE, PT – Federally Proposed Endangered/Threatened
 SAE, SAT – Federal-Listed Endangered/Threatened by Similarity of Appearance
 C – Federal Candidate for Listing; formerly Category 1 Candidate
 DL, PDL – Federally Delisted/Proposed for Delisting
 NL – Not Listed
 NT – Not tracked or no longer tracked by the State
 R/NL – Rare, but with no regulatory listing status

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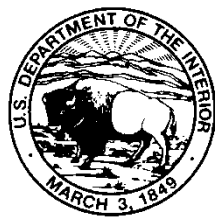
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