

Environmental Assessment

July 2001

Wildland-Urban Interface Fuels Management

Draft Environmental Assessment

Wildland-Urban Interface Fuels Management

BIG THICKET National Preserve • Texas

Summary

This wildland-urban interface fuels management environmental assessment evaluates a new fire management strategy that would be appended to the Big Thicket National Preserve fire management program. This project, located in the 703-acre Hickory Creek Unit of the preserve, would reduce fuels on a 290-acre treatment area, including that portion of the boundary that is adjacent to the Wildwood Community. This action would protect approximately 600 private homes. Fuel reduction would be needed prior to re-instituting the use of prescribed burns in accordance with the 1998 fire management plan for the preserve. The action evaluated in this environmental assessment would reduce fuel loads to create a buffer strip with low fuel availability between the interior of the preserve and adjacent private landowners. The 21-acre buffer strip, along with the spot treatment of approximately 150 additional acres, would provide increased protection to human life and property in the Wildwood Community and would be consistent with the National Park Service (NPS) goal of habitat restoration.

The alternative of continued management/no action (Alternative A) and three action alternatives were evaluated. All of the action alternatives would reduce the volume of woody vegetation within the treatment area. The alternatives would differ in the methods used to achieve the fuel reduction. Treatments associated with the alternatives would include targeted applications of herbicide, use of mechanized equipment to cut and chip vegetation into small pieces, or both chemical and mechanical treatment. The goal would be to return the fuel levels to a condition where prescribed fire, a previously approved action, can be re-instituted as a routine vegetation management practice within the Hickory Creek Unit.

Alternative B (the preferred action) would use a one-time targeted herbicide application, followed by one-time mechanical thinning. The treatment area would include 21 acres that comprise a 200-foot-wide strip along the boundary, with an additional 150 acres of brush to be spot thinned. Alternative C would involve mechanical thinning only, with chipping and scattering of woody debris over the treatment area. Alternative D would use chemical thinning only. Alternative C and D would treat the same area as the preferred action.

None of the action alternatives would have major environmental consequences. In the key area of fire control, the proposed action (Alternative B) would be beneficial compared to the alternative of continued current management/no action.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations, businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses available for public inspection in their entirety.

Superintendent
3785 Milam Street
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TABLE OF CONTENTS

	Page
SUMMARY	i
PURPOSE AND NEED.....	1
Purpose	1
Need	2
Brief Description of the Wildland-Urban Interface Program.....	2
Fire Management at Big Thicket National Preserve	3
Description of the Preserve and Geographic Location.....	4
Description of the Treatment Area	5
Summary of Enabling Legislation Defining Why the Preserve Was Established.....	5
Project's Relationship to Other Plans and Areas Adjacent to the Preserve Boundary.....	7
Impact Topics.....	8
Objectives	11
Scoping.....	11
ALTERNATIVES CONSIDERED.....	17
Alternative A: Continue Current Management/No Action	17
Alternative B, Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	18
Alternative C: Mechanical Treatment (One-Time).....	21
Alternative D: Chemical Treatment (One-Time)	22
Alternatives Considered but Rejected	23
Environmentally Preferred Alternative.....	23
Summary of Impacts	25
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES.....	29
Regulations and Policies.....	29
Methodology	29
Cumulative Effects Analysis Method	29
Impairment Analysis Method	30
Air Quality	36
Affected Environment.....	36

TABLE OF CONTENTS (Continued)

	Page
Impacts of Alternative A, Continue Current Management/No Action.....	36
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	37
Impacts of Alternative C, Mechanical Treatment (One-Time).....	38
Impacts of Alternative D, Chemical Treatment (One-Time).....	39
Endangered and Threatened Species	39
Affected Environment.....	39
Impacts of Alternative A, Continue Current Management/No Action.....	40
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	41
Impacts of Alternative C, Mechanical Treatment (One-Time).....	42
Impacts of Alternative D, Chemical Treatment (One-Time).....	43
Soils	43
Affected Environment.....	43
Impacts of Alternative A, Continue Current Management/No Action.....	44
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	45
Impacts of Alternative C, Mechanical Treatment (One-Time).....	46
Impacts of Alternative D, Chemical Treatment (One-Time).....	47
Vegetation.....	48
Affected Environment.....	48
Impacts of Alternative A, Continue Current Management/No Action.....	48
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	49
Impacts of Alternative C, Mechanical Treatment (One-Time).....	51
Impacts of Alternative D, Chemical Treatment (One-Time).....	52
Water Quality and Hydrology	53
Affected Environment.....	53
Impacts of Alternative A, Continue Current Management/No Action.....	53
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	54
Impacts of Alternative C, Mechanical Treatment (One-Time).....	54

TABLE OF CONTENTS (Continued)

	Page
Impacts of Alternative D, Chemical Treatment (One-Time).....	55
Wildlife	56
Affected Environment.....	56
Impacts of Alternative A, Continue Current Management/No Action.....	56
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	57
Impacts of Alternative C, Mechanical Treatment (One- Time)	58
Impacts of Alternative D, Chemical Treatment (One-Time).....	59
Economic Effects	60
Affected Environment.....	60
Impacts of Alternative A, Continue Current Management/No Action.....	60
Impacts of Alternative B, Alternative C, and Alternative D.....	61
Park Operations	61
Affected Environment.....	61
Impacts of Alternative A, Continue Current Management/No Action.....	62
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time).....	62
Impacts of Alternative C, Mechanical Treatment (One- Time).....	63
Impacts of Alternative D, Chemical Treatment (One-Time).....	63
Public Health and Safety.....	63
Affected Environment.....	63
Impacts of Alternative A, Continue Current Management/No Action.....	64
Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical (One-Time Treatment).....	64
Impacts of Alternative C, Mechanical (One-Time Treatment).....	65
Impacts of Alternative D, Chemical (One-Time Treatment).....	66
CONSULTATION/COORDINATION.....	67
Agencies/Tribes/Organizations/Individuals Contacted	67
Scoping	67
Preparers	67
List of Recipients.....	68
Federal Agencies	68
State and Local Agencies.....	68

TABLE OF CONTENTS (Continued)

	Page
Organizations	68
Individuals	68
References.....	69
APPENDIX A: LETTERS AND OTHER COORDINATION DOCUMENTATION	73

LIST OF TABLES

No.	Title	Page
Table 1:	Impact Topics for the Big Thicket National Preserve Wildland- Urban Interface Fuels Management Environmental Assessment.....	9
Table 2:	Objectives, and the Ability of the Alternatives to Meet Them	13
Table 3:	Alternative Descriptions.....	17
Table 4:	Comparison of Impacts of Alternatives.....	26
Table 5:	Wildland-Urban Interface Project Impact Threshold Definitions	32
Table 6:	Federally Listed Endangered, Threatened, and Candidate Species for Tyler County, Texas	40

LIST OF FIGURES

No.	Title	Page
	Wildland – Urban Interface Treatment Area	6

PURPOSE AND NEED

PURPOSE

The purpose of wildland-urban interface fuels management at Big Thicket National Preserve is to protect and preserve the natural and cultural resources of the preserve for the enjoyment of present and future generations. This includes perpetuation of the ecosystem in which these resources occur. Wildland-urban interface fuels management also is intended to protect human life and property, both public and private, within and adjacent to National Park Service (NPS) lands.

To help in achieving these long-term goals, the Big Thicket National Preserve has implemented a comprehensive fire management program. Actions within this program include, but are not limited to, fuels reduction, prescribed fire for resource benefit, and wildland fire suppression.

Increasingly, parks are in close proximity to communities, large and small. The varied land use and management practices on adjacent private and public lands offer opportunities and risks. One of the risks is exposure to wildfire. As development pressure grows, park managers must develop strategies to limit the risk of fire migrating across park borders.

Following dramatic fire seasons in 1994 and 2000, fire management policy for public lands was reviewed and updated. The guiding principles for fire management in the National Park Service remain protection of human health and safety and safeguarding the historical and natural resources of the park.

Excessive fuel levels within the wildland-urban interface of the preserve's Hickory Creek Unit and the adjacent community of Wildwood greatly increase the risk of a wildland fire moving off the preserve and threatening residences. The community of Wildwood has allowed natural fuels to accumulate on undeveloped lots. During periods of high fire danger, a wildfire can quickly move onto, and through, these fuels. The severity of this risk became apparent in the summer of 2000, when two wildfires swept across timber company lands into the Hickory Creek Unit and Village Creek Corridor Units. A slight change in wind direction or duration would have burned homes in Wildwood.

Since the establishment of the Big Thicket National Preserve, the National Park Service used prescribed fires as a fuels management tool in the Hickory Creek Unit, conducting 29 planned ignitions in the Hickory Creek Savanna between 1981 and 1995 (NPS 1998). However, because of the increasing risk at the wildland-urban interface following development of the Wildwood Community, the National Park Service has not burned the treatment area since 1995. As a result, fuel loads are high. The pine forests and savannas (to a lesser degree) have a

dense brush understory that would burn unpredictably. To reduce fuel loading and reduce risk, the preserve is proposing to reduce fuels using methods other than prescribed fire. Ideally, these methods would mimic the beneficial effects of fire while reducing the risk of a prescribed fire escaping and burning property outside the unit. Following this fuels-reducing action, regular prescribed fires could once again be instituted for fuels management in the Hickory Creek Unit.

NEED

During much of the 20th century, total fire suppression on public lands was viewed as the most appropriate method to prevent widespread, catastrophic wildland fires. However, as land managers gained knowledge and experience, it became obvious that complete exclusion of fire was not the best technique to promote ecosystem health. In fire-evolved systems, suppression led to an accumulation of fuels that increased fire risk and had detrimental impacts on native flora and fauna. In addition, accumulations of combustible fuels near archeological sites posed a high risk to ancient resources on public lands.

Following damaging fire seasons in 1988 (which included the major Yellowstone National Park fires) and 1994, fire management policies for public lands were reviewed and updated. In 1995, the role of fire in the natural system was recognized, and controlled, prescribed burns were emphasized as a management tool. Reductions of fuel loads were planned to facilitate the control of wildfire following human- or nature-induced ignitions.

Another severe fire season occurred in the year 2000, when nearly 7 million acres burned nationwide. This was more than twice the 10-year average. The numbers, sizes, and severities of these fires were the result of drought conditions, weather patterns, and a large number of lightening strikes. In addition, nearly a century of fire suppression in areas that historically burned on a regular basis resulted in heavy fuels accumulations and altered vegetation structure. These conditions contributed to increased fire intensity, spread, and resistance to control.

Current federal policy reinforces the protection of human life, including the safety of both firefighters and the public, as an overriding principle in wildland fire management. Other guiding principles include protecting the natural functioning of ecological systems and safeguarding historical and natural resources.

Brief Description of the Wildland-Urban Interface Program

A contributing factor to the amount of damage resulting from uncontrolled wildland fires has been the growth of communities in areas adjacent to national parks and other public wildlands. Developments in these areas put human life,

homes, and other property at risk. Wildland-urban interface projects are intended to reduce the fire hazard in areas where wildlands adjoin developed areas.

The National Park Service is implementing wildland-urban interface fuels management activities under the authorities and programs of the 2001 Interior Appropriations Act (H.R. 4578) and the President's Fire Initiative (known as the National Fire Plan).

- The 2001 U.S. Department of Interior appropriations bill provided funds to the National Park Service to "accelerate treatments, efforts, and collaborative projects with non-federal partners in the wildland urban interface."
- The National Fire Plan provides increased funding and direction to address wildland fire management needs that have been recognized as a result of the past decade of increasingly severe fire seasons.

In fiscal years 2001 and 2002, National Park Service will be undertaking numerous fuels management projects at units throughout the country. Fuels management will be accomplished by such methods as mechanical thinning, prescribed fire and herbicide treatments.

Prior to the implementation of specific fuels management projects, the effects of the preferred actions and their alternatives must be evaluated in environmental documents. Proposed actions would be evaluated in accordance with the requirements of the:

- The National Environmental Policy Act of 1969 (NEPA), as amended.
- The Council of Environmental Quality's (1978) "Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (40 *Code of Federal Regulations* (CFR) 1500-1508.
- *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a).
- Section 106 of the National Historic Preservation Act.

Fire Management at Big Thicket National Preserve

Fire has significantly influenced the evolution of ecosystems throughout the southeast Coastal Plain and has maintained a diverse mosaic of vegetative communities, particularly in the Big Thicket region. The periodic occurrence of fire, in conjunction with geographic location, climate, geology, topography, soils, and moisture gradient are factors contributing to the vegetative diversity of Big Thicket National Preserve. Of the 86,500 land acres within the preserve,

approximately 13,000 acres contain mixes of highly fire-dependent ecosystems (NPS 1998).

Almost 75 years of fire suppression prior to NPS acquisition has resulted in numerous vegetation changes from fire dependent communities such as open pine savannas and sandhills with dense herbaceous ground cover, to mixed pine/hardwood and hardwood/pine forests with dense understory. The absence of fire has disrupted the natural processes of plant succession that were dependent upon periodic interruption by wildfires.

Restoring fire's role as a dynamic force shaping the vegetative structure will restore the conditions that occurred in the natural forests of the Big Thicket (NPS 1998). The stated purpose of fire management in the Big Thicket National Preserve is "... to restore vegetation structure and distribution through the natural interaction of fire in the landscape. Land use practices prior to preserve acquisition (especially fire suppression) have promoted an overabundance of loblolly pine and brush in upland vegetation types and caused significant loss of upland grass/forb ground cover" (NPS 1998).

Since 1981, prescribed burns have been used to achieve fire management goals in the Hickory Creek Unit. However, since 1995, the construction of numerous houses in the Wildwood Community in concert with drought conditions have limited the use of prescribed burns in this area. This has allowed fuel levels to increase to a point where it would difficult for the National Park Service to safely manage prescribed burns.

Fuel loads can be reduced by implementing appropriate strategies. The process for selecting the best approach must integrate public input, interagency cooperation, and fire management expertise. The selection process presented in this environmental assessment is based on professional expertise and sound scientific information, and is consistent with National Park Service authority and management practices.

DESCRIPTION OF THE PRESERVE AND GEOGRAPHIC LOCATION

The Big Thicket National Preserve was the first preserve in the national park system, and was established October 11, 1974. The preserve consists of nine land units and six water corridors, encompassing more than 99,290 acres of land and water. The area is considered the biological crossroads of North America. A convergence of ecosystems occurred here during the last ice age, bringing together, in one geographical location, the eastern hardwood forests, the Gulf coastal plains, and the Midwest prairies. Its uniqueness lies in the juxtaposition of landforms and wildlife. For example, bogs occur near arid sand hills and eastern bluebirds nest near roadrunners. Historically the density of vegetation "thicket"

limited the use and settlement of the area by Native Americans and whites until the mid-1800s. The preserve receives approximately 60,000 visitors per year.

DESCRIPTION OF THE TREATMENT AREA

As shown in the Wildland-Urban Interface Treatment Area map, the 290-acre treatment area is located within the Hickory Creek Unit (703 acres) located in Tyler County, Texas. The treatment area is adjacent to the Wildwood Community located on the west and southwest boundary of the Hickory Creek Unit. A natural drainage swale running north-south that experiences seasonal ponding separates the treatment area from the remainder of the unit. Vehicle access is limited to routes through the Wildwood Community, and a single public road that dead-ends at the NPS boundary. The Hickory Creek Unit has no official roads.

Existing development in the unit consists of two north-south oriented pipelines and one north-south oriented transmission line, all of which are in the eastern portion of the Hickory Creek Unit. Visitor amenities, located in the eastern half of the Hickory Creek Unit, include a parking lot, pavilion and picnic area, and the 1.5 mile Sundew Trail. No visitor activities or facilities occur in the treatment area.

The Hickory Creek Unit is divided into 11 fire management units, utilizing natural and man-made features, plus a 9-acre no-burn research area. Most of the fire management units (45 percent) have been burned on a 3-year rotation, with the last 2 or 3 being summer (growing season) burns. The treatment area is listed as Fire Management Unit 2101.

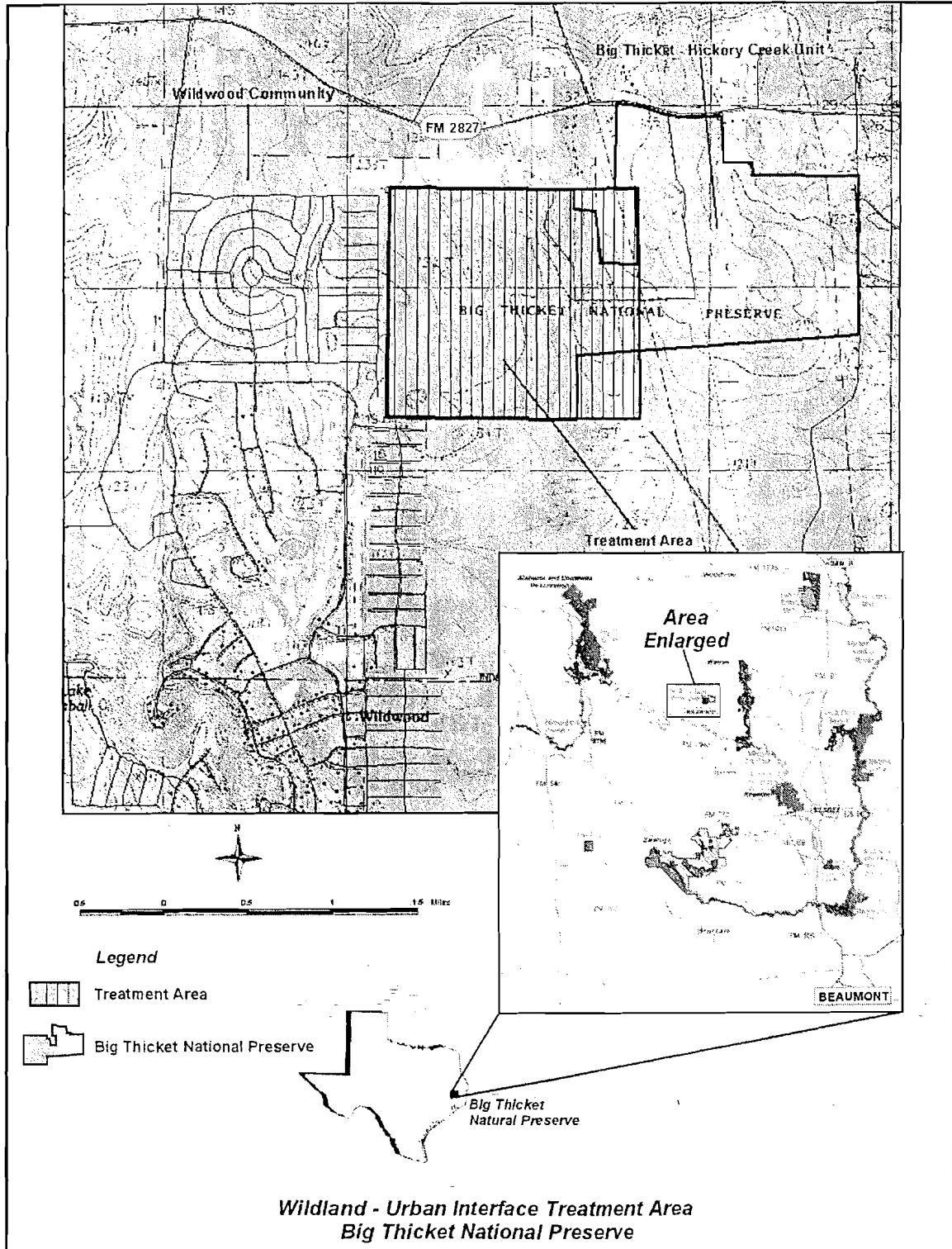
The treatment area received its last prescribed burn in 1995. When burning was conducted in Fire Management Unit 2101, all burns occurred during the winter to reduce risk from high fuel loads. Because the treatment area has not been burned since 1995, fuel levels are high. Forests and thickets that would barely carry a fire under normal prescribed burning conditions, but would burn unpredictably during drought conditions, are replacing savannas.

To reduce fuel loading and reduce risk, the preserve needs to reduce high-fuel levels using methods other than prescribed fire until such time as the high-fuel levels are lowered. These methods would mimic the beneficial effects of fire while reducing the risk of a prescribed fire escaping and burning private property and structures outside the treatment area.

SUMMARY OF ENABLING LEGISLATION DEFINING WHY THE PRESERVE WAS ESTABLISHED

In 1936, a study completed by H. B. Parks and V. L. Cory first described the unique biological system in Texas known as the Big Thicket. This report played an important role in developing a protection strategy for this large landscape,

WILDLAND – URBAN INTERFACE TREATMENT AREA



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more than 1 million acres in size. Almost 40 years after the Parks and Cory survey, the U.S. Congress passed legislation creating the Big Thicket National Preserve. President Gerald Ford signed the bill in October 1974, establishing the first preserve in the national park system. The purpose of the designation was to conserve and protect natural, scenic, and recreational values and provide for enhanced enjoyment of the Big Thicket area.

In 1993, legislation was passed to expand the preserve, incorporating creek corridors and additional land areas. Today, the National Park Service manages more than 97,000 acres in what was the original Big Thicket surveyed by Parks and Cory (1936).

Further recognition of the Big Thicket biological diversity came from the United Nations UNESCO Man and the Biosphere program. In 1981, Big Thicket National Preserve was added to the list of International Biosphere Reserves. The United States Man and the Biosphere program, funded by the U.S. Department of State, provides a wider reach of scientific knowledge made available through the international community.

PROJECT'S RELATIONSHIP TO OTHER PLANS AND AREAS ADJACENT TO THE PRESERVE BOUNDARY

The proposed project alternative is part of a large-scale restoration effort for the Hickory Creek Unit for reducing wildfire risk and restoring the physiognomy of upland and longleaf pine savannas. The preserve's fire management plan provides policy, guidance, and actions for managing the fire program for the entire preserve.

Related plans include the Big Thicket National Preserve general management plan and environmental impact statement, and the preserve's resources management plan, fire management plan, and fire monitoring plan. The project would conform to all of these plans.

- The general management plan provides a broad objective for resources management, including the need to restore and maintain fire-dependent forest types such as those in the Hickory Creek Unit.
- The fire management plan provides specific tactics and strategies for all aspects of fire management. However, it does not include fuels reduction. This wildland-urban interface fuels management environmental assessment evaluates a new fire management strategy that would be appended to the fire management program.
- The fire monitoring plan has detailed monitoring protocols and includes guidance for evaluating fuel reduction actions.

Land ownership bordering the treatment area within the Hickory Creek Unit of the preserve includes a private timber company, private home and landowners, and the Wildwood Community, which includes a housing subdivision.

- North of the treatment area, land is used for private pasture and rural residences. The area contains no forested areas except for trees around earthen dams and fence lines.
- West of the treatment area, the 4,000-acre Wildwood Community adjoins the entire west side of the Hickory Creek Unit and wraps around the southwest corner. The housing subdivision contains approximately 600 houses and a golf course. Housing construction continues, and there are numerous vacant lots that are forested with dense brush.
- To the south, the treatment area is bordered by private commercial forest lands. A portion of the area has been clear-cut for commercial timber. The southeast corner has a mature forest where fire has been excluded.

IMPACT TOPICS

Impact topics were used to focus the evaluation of the potential consequences of the preferred actions and alternatives. Impact topics were identified based on legislative requirements, topics specified in *Director's Order #12 and Handbook* (NPS 2001a), scoping, and park-specific resource information. Impact topics for fuels management at Big Thicket National Preserve are presented in Table 1. In cases where an impact topic could be dismissed, the rationale for this decision is included in the table footnote.

Table 1: Impact Topics for the Big Thicket National Preserve Wildland-Urban Interface Fuels Management Environmental Assessment

Impact Topic	Retain or Dismiss ^{a/}	Relevant Regulations or Policies
Biological and physical resources		
Air quality	Retain	Federal Clean Air Act (CAA), CAA Amendments of 1990 (CAAA), NPS <i>Management Policies</i>
Ecologically critical areas or other unique natural resources	Dismiss	Wild and Scenic Rivers Act, 36 CFR 62 criteria for national natural landmarks, NPS <i>Management Policies</i>
Endangered or threatened and species and their habitats	Retain	Endangered Species Act; NPS <i>Management Policies</i>
Prime and unique agricultural lands	Dismiss	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Soils	Retain	NPS <i>Management Policies</i>
Vegetation	Retain	NPS <i>Management Policies</i>
Water quality and hydrology	Retain	Clean Water Act, Executive Order 12088, NPS <i>Management Policies</i>
Wetlands and floodplains	Dismiss	Executive Order 11988, Executive Order 11990, Rivers and Harbors Act, Clean Water Act, NPS <i>Management Policies</i>
Wilderness	Dismiss	Director's Order 41; NPS <i>Management Policies</i>
Wildlife	Retain	NPS <i>Management Policies</i>
Cultural resources	Dismiss	Section 106; National Historic Preservation Act; 36 CFR 800; National Environmental Policy Act; Executive Order 13007; Director's Order 28; NPS <i>Management Policies</i>
Socioeconomic considerations		
Conflicts with land use plans, policies, or controls	Dismiss	NPS <i>Management Policies</i>
Economics	Retain	40 CFR 1500 Regulations for Implementing NEPA
Energy requirements and conservation potential	Dismiss	NPS <i>Management Policies</i>
Environmental justice	Dismiss	Executive Order 12898
Indian trust resources	Dismiss	Department of the Interior Secretarial Order No. 3206, Secretarial Order No. 3175
Natural or depletable resource requirements and conservation potential	Dismiss	NPS <i>Management Policies</i>
Park operations	Retain	NPS <i>Management Policies</i>
Public health and safety	Retain	NPS <i>Management Policies</i>
Sustainability and long-term management	Dismiss	National Environmental Policy Act, 40 CFR 1500 Regulations for Implementing NEPA, NPS <i>Management Policies</i>
Visitor use and experience	Dismiss	Organic Act; NPS <i>Management Policies</i>

a/ Rationale for dismissal from detailed evaluation:

Ecologically critical areas: This area of the Big Thicket National Preserve does not contain any designated ecologically critical areas, wild and scenic rivers, or other unique natural resources, as referenced in 40 CFR 1508.27.

Prime and unique agricultural lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Lands within the Big Thicket National Preserve are not available for farming and, therefore, do not meet the definitions.

Wetlands and floodplains: The treatment area is composed of upland pine/oak and prairie. It does not meet the Executive Order 11990 criteria for jurisdictional wetlands or Executive Order 11988 criteria for protection of floodplains.

Wilderness: According to *Management Policies* (NPS 2001), proposals having the potential to impact wilderness resources must be evaluated in accordance with National Park Service procedures for implementing the National Environmental Policy Act. Because the Big Thicket National Preserve does not have any designated wilderness areas, this impact topic is dismissed.

Cultural resources: The treatment area does not contain any historic structures, known archeological sites, cultural landscapes, or historic properties listed on or eligible for listing on the National Register of Historic Places. The ground surface in the treatment area has been extensively disturbed by past logging and replanting operations, and by construction of roads and skid trails. Therefore, the likelihood of finding intact archeological deposits is minimal. The preserve has consulted with concerned Native American tribes and no traditional cultural properties have been identified for the treatment area. Should resources be uncovered during fuels management activities, provisions of Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR 800) would be applicable.

Conflicts with land use plans, policies, or controls: Refer to the section "Project's Relationship to Other Plans" for a discussion of the absence of conflicts with other plans.

Energy requirements and conservation potential: Refer to the impact topic "Sustainability and long-term management" for a rationale for dismissal.

Environmental justice: Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires that all federal agencies address the effects of policies on minorities and low-income populations and communities. None of the alternatives would have disproportionate health or environmental effects on minorities or low-income populations as defined in the Environmental Protection Agency's Draft Environmental Justice Guidance (July 1996).

Indian trust resources: Indian trust assets are owned by Native Americans but held in trust by the United States. Requirements are included in the Secretary of the Interior's Secretarial Order No. 3206, "American Indian Tribal Rites, Federal – Tribal Trust Responsibilities, and the Endangered Species Act," and Secretarial Order No. 3175, "Departmental Responsibilities for Indian Trust Resources." The Bureau of Indian Affairs (BIA) and the National Park Service have formed a joint agency, the National Interagency Fire Center (website, <http://www.fire.nps.gov/bia>), to handle wildfire management on Indian trust lands based on fire management plans approved by the Indian landowner. According to NPS personnel, Indian trust assets do not occur within Big Thicket National Preserve.

Natural or depletable resource requirements and conservation potential: Refer to the impact topic "Sustainability and long-term management" for the rationale for dismissal.

Sustainability and long-term management: Sustainability is the result achieved by doing things in ways that do not compromise the environment or its capacity to provide for present and future generations. Sustainable practices minimize the short- and long-term environmental impacts of development and other activities through resource conservation, recycling, waste minimization, and the use of energy-efficient and ecologically responsible materials and techniques.

Project actions would not compete with or dominate park features, or interfere with natural processes, such as the seasonal migration of wildlife or hydrologic activity associated with wetlands.

The NPS *Guiding Principles of Sustainable Design* (1993) 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. The guidebook articulates principles to be used in the design and management of visitor facilities that emphasize environmental sensitivity in construction, use of nontoxic materials, resource conservation, recycling, and integration of visitors with natural and cultural settings. 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 National Park Service also reduces energy costs, eliminates waste, and conserves energy resources by using energy-efficient and cost-effective technology. Energy efficiency is incorporated into the decision-making process during the design and acquisition of buildings, facilities, and transportation systems that emphasize the use of renewable energy sources.

Visitor use and experience: Visitors do not use the treatment area and the preserve has no short- or long-term plans to develop visitor activities or facilities in the treatment area.

OBJECTIVES

One of the risks of managing wildlands is wildfire. Buildup of highly volatile fuel can ignite easily and readily transmit fire across the landscape. Practices that mimic or replace natural fuels reduction can reduce the risk posed by wildfire to persons, property, and other resources.

Preserve managers must develop strategies to limit the risk of fire migrating across preserve boundaries. Fire management, including judicious use of prescribed fire and thinning of vegetation, is intended to prevent the ignition and spread of wildfire and to restore and maintain the integrity of diverse ecological systems.

A variety of management techniques are available for use on NPS lands. Methods used in the wildland-urban interface on park service lands, including Big Thicket National Preserve, are designed to meet the objectives shown in Table 2, with protection of human health and safety being the highest priority. Table 2 also summarizes how well each alternative meets the project objectives, based on the information presented in the "Affected Environment and Environmental Consequences" section.

SCOPING

NPS internal discussions led to identification of the main issues to be addressed in this environmental assessment. Protection of private property and public health and safety are the primary objectives of the wildland-urban interface project. Conservation of park resources also is important. Resource topics identified for assessment are air quality, endangered or threatened species, soils, vegetation, water quality and hydrology, wildlife, and economic impacts. As shown in Table 1, several resource topics were dismissed from consideration, as they are absent or not applicable in the project area. These include wetlands and floodplains, wilderness, cultural resources, and conflicts with land use plans (Table 1).

No cultural resources are known to be present in the project area. Extensive ground disturbance from historical logging activities makes it unlikely that any intact archeological resources would be encountered during project implementation. Therefore, as provided for in 36 CFR 800.4 (d)(1), the Big Thicket National Preserve staff plans to use this environmental assessment to notify consulting parties, including the Texas State Historic Preservation Officer, that there are no historic properties present, and that no historic properties would be affected by project implementation.

The U.S. Fish and Wildlife Service was contacted regarding endangered and threatened species compliance for this project (Appendix A). No written response was received, although verbal confirmation was given that no federally listed species have been documented in the treatment area.

A notification, "Public Comment Request: Fire and the Urban Interface, the Wildwood Community," was placed in the local newsletter for distribution to community residents. A copy of this notice is provided in Appendix A. Ten responses were received. There was general support for use of prescribed fire as a management tool within the Big Thicket National Preserve. Three individuals expressed opposition to use of chemical treatment, three individuals had opposition to use of heavy machinery, and one individual wanted a 300-foot-wide, rather than a 200-foot-wide, buffer strip between the preserve boundary and the Wildwood Community. The environmental assessment addresses these issues and concerns and how they could be resolved.

Support for the eventual reinstatement of prescribed fire in accordance with the approved *Big Thicket National Preserve Fire Management Plan* (NPS 1998) reflects the changing public sentiment toward the use of this management tool. The combination of one-time specialized treatment prior to reinstituting the preserve's prescribed burn program will support the long-term goals identified in the general management plan and the resource management plan. These include protecting life and property and restoring the historical longleaf pine/savanna vegetation regime.

Table 2: Objectives, and the Ability of the Alternatives to Meet Them

Objective	Alternative A: Continue Current Management /No Action	Alternative B, Preferred Action: Chemical followed by Mechanical Treatment (one time)	Alternative C, Mechanical Treatment (one time)	Alternative D, Chemical Treatment (one time)
Protect human life, property, and designated resources, both natural and cultural	Approximately 600 homes would continue to be subjected to potential wildfires, endangering both life and property. The continuation of restricting prescribed burns would continue to permit fuel loads to increase, allowing wildfires to adversely impact both natural and cultural resources.	The successful implementation of this alternative would reduce fuel loads, allowing the preserve to re-institute prescribed burns. This alternative meets the objective of protecting human life and property and provides for the protection of both natural and cultural resources.	The fast re-growth potential of plant species (resprouting) would limit the effectiveness of this alternative, providing only short-term beneficial impacts. In the long term, the objective would not be achieved and the consequences would be similar to Alternative A.	Similar to Alternative B, except that this technique would be labor intensive and costly to implement. This treatment would also leave standing dead vegetation which would be subject to fire, making this alternative less effective than Alternative B.
Ensure firefighter and public safety	Although all standard fire protection safety measures would be followed to ensure firefighter and public safety, the potential for a wildfire would continue to exist, potentially endangering both firefighters and public safety.	This alternative would reduce fuel loads, thus decreasing the potential for wildfires. This would reduce the danger to firefighters and the public.	The fast re-growth potential of plant species would limit the effectiveness of this alternative, providing only short-term beneficial impacts. In the long term, the objective would not be achieved and the consequences would be similar to Alternative A.	This treatment would leave standing dead vegetation which would be subject to fire, making this alternative less effective than Alternative B.
Restore and maintain natural resources and their processes	Although prescribed burns are approved for use by the preserve's fire management plan as the best means of maintaining natural resources and processes, the inability to carry out prescribed burns because of current high fuel loads restricts the preserve from meeting this objective.	By reestablishing a condition where fire can be periodically introduced into the system, this alternative would better meet the objective of transforming the existing loblolly pine and hardwood forest with a dense understory to a more open longleaf pine savanna and sandhill ecosystem.	The fast re-growth potential of plant species would limit the effectiveness of this alternative, providing only short-term beneficial impacts. In the long term, the objective would not be achieved and the consequences would be similar to Alternative A.	This treatment would leave standing dead vegetation which would inhibit the return of a more natural regeneration process.

Table 2: Objectives, and the Ability of the Alternatives to Meet Them (Continued)

Objective	Alternative A: Continue Current Management /No Action	Alternative B, Preferred Action: Chemical followed by Mechanical Treatment (one time)	Alternative C, Mechanical Treatment (one time)	Alternative D, Chemical Treatment (one time)
Use cost-effective, environmentally sensitive techniques to reduce wildfire risk	Although prescribed burns provide a cost-effective method to reduce wild fires, this treatment is now restricted in its use because of high fuel loads. Thus the objective of environmental sensitivity and ability to reduce wildfire risks would not be met.	This alternative is somewhat more costly and less environmentally sensitive than other treatments, but provides a more immediate reduction of fuel loads for reducing wildfire risk. This alternative would enable the National Park Service to achieve the long-term objective of using cost-effective, environmentally sensitive techniques prescribed burns.	This alternative utilizes a somewhat less cost effective and less environmentally sensitive treatment which would have only a short-term beneficial impact. Due to fast regrowth of vegetation, the long-term results would be similar to Alternative A.	It also would delay (waiting for plant mortality) the implementation of prescribed burns. This technique would also leave standing dead woody vegetation which would increase the risk of fire.
Use minimum-impact suppression techniques (MIST) to reduce or avoid impacts of fire fighting on biotic systems, cultural or historic resources, and nearby communities	Prescribed burns provide one of the more effective minimum impact suppression techniques. However, this objective is not being achieved because of current high fuel loads. The high probability of wildfire associated with these high fuel loads increases the risk that fire-fighting impacts would occur.	Prescribed burns best meet the objective of a minimum-impact suppression technique. Once fuel loads were reduced to a level where prescribed burns could be re-instituted, the avoidance of wildfires will help minimize fire-fighting impacts.	Due to fast regrowth of vegetation, this treatment would only have short-term beneficial impacts. The long-term results would be similar to Alternative A.	This technique would take longer to implement (waiting for plant mortality) and would leave standing dead vegetation. However, once fuel loads were reduced to a level where prescribed burns could be re-instituted, the avoidance of wildfires will help minimize fire-fighting impacts.

Table 2: Objectives, and the Ability of the Alternatives to Meet Them (Continued)

Objective	Alternative A: Continue Current Management /No Action	Alternative B, Preferred Action: Chemical followed by Mechanical Treatment (one time)	Alternative C, Mechanical Treatment (one time)	Alternative D, Chemical Treatment (one time)
Stabilize and prevent degradation of natural and cultural resources that could be lost or irretrievably damaged by wildfire or large-scale fire suppression activities.	Wildfires and associated large-scale suppression techniques could potentially occur with this alternative, preventing the preserve from meeting this objective.	This alternative would reduce the potential for wildfires and the need for large-scale fire suppression techniques, thus enhancing the protection of the preserve's resources.	Similar to Alternative A except that there would be some short-term beneficial effects prior to regrowth of vegetation.	Similar to Alternative B except that the objective would take longer to achieve due to the slower rate of plant mortality.

ALTERNATIVES CONSIDERED

Four alternatives described in this section were evaluated. They include the alternative of continue current management/no action, the preferred alternative, and two other action alternatives. Fuel reduction treatments associated with the alternatives include targeted applications of herbicide, use of specialized equipment that would cut and chip fuels into small pieces, and prescribed fire. Each alternative presents a different approach or combination of approaches for fuel reduction.

The actions identified in the alternatives are designed to meet the wildland-urban interface objective of risk reduction using methods that mimic natural fire processes and effects. The alternatives are summarized in Table 3 and described below.

Table 3. Alternative Descriptions

Alternative	Descriptions/Treatment	Acres to be Treated
A	Continue current management/no action.	290
B	Preferred action. Conduct chemical (herbicide) one-time treatment followed by one-time mechanical reduction of fuels. Chipped slash would be left onsite.	171
C	Mechanical reduction only (one-time treatment). Chipped slash would be left onsite.	171
D	Chemical (herbicide) one-time treatment. Slash would be left onsite.	171

ALTERNATIVE A: CONTINUE CURRENT MANAGEMENT/NO ACTION

Under normal precipitation conditions, the preserve currently would use prescribed burns to control the level of fuels (NPS 1998). However, high fuel levels presently exist in the treatment area because the preserve has not been able to implement prescribed burns in this area since 1995. This condition occurred because of the long-term drought in the region and the construction of new houses in the Wildwood Community just to the west of the treatment area.

The inability to use prescribed burns has resulted in an increase in fuel levels that are of concern. Consequently, a prescribed fire that went out of control would jeopardize the health and safety of the families living in the approximately 600 homes adjacent to the preserve.

The preserve's fire management plan recommends the use of prescribed fire on a 3-year rotational basis. Prescribed burns would only be conducted in the late winter or early spring when the flammable brush was in fresh growth, reducing the potential for scattered downwind ignitions from windborne cinders, or in the summer when climatic conditions were favorable. This could be changed to a summer burn if fuels along the boundary, on both the National Park Service and private sides, were reduced, and greater staffing was available on burn days. Periodic prescribed fire would be used to restore and maintain the savannas. These burning conditions would favor low-intensity fires and thus reduce the potential for scattered downwind ignitions in the Wildwood Community.

Until such time as the approved action of prescribed burns in the *Big Thicket National Preserve Fire Management Plan* (NPS 1998) can be re-instated, the preserve will have to be vigilant in managing personnel and resources to give high priority to fire protection efforts. Within existing staffing and budget constraints, the preserve currently manages personnel and equipment at a level commensurate with the increased risk.

ALTERNATIVE B, PREFERRED ACTION: CHEMICAL FOLLOWED BY MECHANICAL TREATMENT (ONE-TIME)

Prescribed burning in vegetation historically dominated by fire-adapted species began in 1980, following approval of the 1981 Big Thicket Fire Management Plan. A total of 70 planned ignitions were conducted within the preserve between 1981 and 1998, including 29 within the Hickory Creek Savannah. In the absence of natural fire, the preserve uses planned ignitions to restore fire-adapted plant communities to maintain a desired historical and ecological condition.

Because of extended droughts and public concern about the use of prescribed burns, the preserve has been reluctant to use prescribed burns in some of its units. This alternative focuses on 290 acres of the Hickory Creek Unit of the preserve where the last planned ignition occurred in 1995. The *Big Thicket National Preserve Fire Management Plan* (NPS 1998) rates the Hickory Creek Unit of the preserve as:

- High hazard because grass and brush fuels promote intense, fast-burning fires;
- High value because the Wildwood Community and scattered rural homesteads are adjacent to the boundary; and
- High risk because of public access on county roads, debris burns on home sites, and the presence of power transmission lines and pipelines that cross the unit.

The 290-acre treatment area that would be included in this alternative addresses the high hazard associated with heavy fuel loads and the high value/high risk associated with the adjacent Wildwood Community.

The preferred action would conduct one-time chemical thinning followed by a one-time mechanical treatment to cut and chip the vegetation. This action would meet the objective of reducing fuels to a level that would safely allow the resumption of the preserve's approved prescribed fire program.

Under Alternative B, approximately 171 acres of the 290-acre treatment area would be chemically and mechanically treated to reduce the wildfire hazard.

- Fuels within 200 feet of the fenced boundary adjacent to the Wildwood Community, representing an area of approximately 21 acres, would be reduced using herbicide application followed by a mechanical treatment.
- Using the same treatment application, an additional 150 acres of brush reduction would be performed within the 290-acre treatment area. These additional fuel reduction areas would be targeted to break up fuel continuity throughout the fire management unit.
- Because portions of the treatment area contain low fuel levels, it was estimated that approximately 119 acres would not require any type of fuel reduction treatment.

Crews using backpack units would apply the herbicide Garlon 4®. Garlon 4® is the trade name for the systemic herbicide triclopyr. It is EPA-approved (USEPA 1998). This herbicide is mixed with a vegetable oil carrier at a dilution rate of approximately 8:1 to produce the application solution. Based on a targeted rate of one gallon of application solution per acre, approximately 20 to 30 gallons of Garlon 4® would be applied over a 4-week period. Additional targeted herbicide treatments (at a rate of one quarter to one third of the initial application rate) could occur after vegetation re-growth sprout for additional vegetation control.

Mechanical treatments would then be conducted using wheeled heavy equipment (equivalent to a Case 855) fitted with a front-end rotary shredder ("bull-hog"). The vehicle would be fitted with oversized tires to minimize soil compaction and rutting. Mechanical clearing would be conducted over a period of 2 to 4 weeks between August and October. Approximately 10 to 15 acres per day could be treated under normal operating conditions. Slash would be left in the project area. Limited manual clearing by chain saws could be conducted in concurrence with chemical and/or mechanical treatment.

The combination of chemical followed by mechanical treatment is considered the best means of reducing high fuel loads. This approach would allow the preserve to return to its approved prescribed fire treatment program.

Alternative B would incorporate best management practices and mitigation measures to prevent or minimize potential adverse effects associated with wildland-urban interface treatments. These practices and measures would ensure that major adverse impacts would not occur. Examples of best management practices would include parking vehicles in specified areas and having crews walk to the project sites to avoid resource damage, and using central refueling stations with ground protection for refueling chainsaws and brush cutters to minimize chances of gasoline or oil spills.

Some of the mitigation measures that would be used to reduce or eliminate the treatment-related effects to specific resources would include the following. Additional mitigation measures that would be incorporated into this alternative are described for specific impact topics in the "Affected Environment and Environmental Consequences" section.

- Endangered or threatened species
 - Wherever possible, treatments would not be used in known habitats of listed or sensitive species.
 - Where treatments would be necessary in proximity to known listed or sensitive species' habitats, the treatment would be selected to minimize the effect.
- Soils
 - The heavy equipment used for brush reduction would be wheeled and not tracked.
 - Oversized wheels would be used to minimize soil compaction and rutting.
 - Mechanical treatment would be conducted in the late summer and fall, which typically provide for dryer soil conditions, which would minimize soil displacement and compaction.
 - Saturated and ponded areas would be avoided during mechanical and chemical treatments.
- Vegetation and wildlife
 - Garlon 4[®] herbicide would be sprayed by hand application to targeted species.
 - To mitigate impacts to nesting birds, chemical and mechanical treatments would be performed outside of the breeding season (late summer through the fall).

- The bull-hog attachment would be set to 18 inches above the ground to minimize wildlife mortality.
- Water quality
 - Herbicide would be applied directly to targeted plants in a manner to minimize runoff to surface water.
- Health and safety
 - Handlers would wear approved protective equipment to minimize exposure.

As discussed in the footnotes in Table 1, cultural resources were dismissed as an impact topic because there are no known cultural resources in the treatment area and the potential for intact archeological deposits is low. However, a formal survey of the project area would be performed before treatment was conducted to locate, determine the nature of, and mark the boundaries of cultural resources. Cultural resources would be marked for avoidance. Heavy equipment would not be driven over the resources. Personnel would be instructed regarding the illegality of collecting artifacts on federal lands.

ALTERNATIVE C: MECHANICAL TREATMENT (ONE-TIME)

Approximately 171 acres of the 290-acre treatment area would be mechanically treated to reduce the potential for a wildfire that could spread from the preserve onto nearly private lands. This alternative would not use herbicides.

- Fuels within 200 feet of the fenced boundary adjacent to the Wildwood Community, representing an area of approximately 21 acres, would be treated by mechanically cutting and chipping the vegetation into small pieces.
- Using the same treatment application, an additional 150 acres of brush reduction would be performed within the 290-acre project area. These additional fuel reduction areas would be targeted to break up fuel continuity throughout the fire management unit.
- Because portions of the treatment area contain low fuel levels, it was estimated that approximately 119 acres would not require any type of fuel reduction treatment.

Mechanical treatments would be similar to the mechanical component of Alternative B. In addition, limited manual clearing could be conducted in

concurrence with mechanical treatment in areas inaccessible to heavy machinery or along structures and fences.

As with Alternative B, this alternative would incorporate best management practices and mitigation measures to prevent or minimize potential adverse effects associated with wildland-urban interface treatments. These would include the same measures that were described for the mechanical reduction elements of Alternative B.

ALTERNATIVE D: CHEMICAL TREATMENT (ONE-TIME)

Approximately 171 acres of the 290-acre treatment area would be chemically treated to reduce the potential for a wildfire that could spread from the preserve onto nearly private lands. This alternative avoids the use of machinery to cut and chip the vegetation.

- Flammable brush within 200 feet of the fenced boundary adjacent to the Wildwood Community, representing an area of approximately 21 acres, would be chemically treated using the Garlon 4[®] herbicide.
- Using the same treatment application, an additional 150 acres of chemical treatment would be performed within the 290-acre project area. These additional fuel reduction areas would be targeted to break up fuel continuity throughout the fire management unit.
- Because portions of the treatment area contain low fuel levels, it was estimated that approximately 119 acres would not require any type of fuel reduction treatment.

Chemical treatments would be similar to the chemical component of Alternative B, although treatments could be extended over an 8-week period because there would be no need to complete the application in time to allow for follow-up mechanical treatment. Alternative D could include limited manual clearing concurrent with chemical treatment or after woody vegetation die-off. However, heavy machinery would not be used.

As with Alternative B, this alternative would incorporate best management practices and mitigation measures to prevent or minimize potential adverse effects associated with wildland-urban interface treatments. These would include the same measures that were described for the chemical reduction elements of Alternative B.

ALTERNATIVES CONSIDERED BUT REJECTED

Several alternatives for fuels management were considered but rejected early in the evaluation process. These alternatives and the reasons they were not considered further are described below.

Manual Clearing. Manual clearing using chainsaws would require extensive staff resources and create cut vegetation disposal problems. Currently there is very limited access through the treatment area and removing and hauling brush through temporary access roads would be damaging to resource values, would be logistically impractical, and would impose excessive burdens on staff resources.

Prescribed Burn. Prescribed burns have been used in the past to achieve fire management and fuel-reduction goals in the treatment area. However, the treatment area has not been burned since 1995, and fuel levels have increased to a point where it would be difficult to safely manage a prescribed burn.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

As stated in Section 2.7.D. of *Director's Order #12 and Handbook* (NPS 2001a), the environmentally preferred alternative is the alternative that will promote the national environmental policy expressed in the National Environmental Policy Act (Sec. 101 (b)). This includes alternatives that:

- Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.
- Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.
- Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.
- 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.
- Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.
- Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Simply put, “this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources” (Question 6a. in Council on Environmental Quality 1981). In the National Park Service, the no action alternative may also be considered as the environmentally preferred alternative.

Based on analyses of impact topics, Alternative B, chemical followed by mechanical treatment to reduce fuel loadings, is the environmentally preferred alternative. While prescribed burns are desirable for the long-term habitat restoration of the treatment area, the risk associated with the current no action (no prescribed burning due to high fuel loads) would potentially have an adverse effect on human life, property, and the preserve’s valued resources. The chemical followed by mechanical fuels reduction actions would work in combination to provide immediate and effective fuel reduction. Reducing fuels to a manageable, low-risk level would allow the preserve to most quickly re-institute the prescribed burn strategy in accordance with the approved *Big Thicket National Preserve Fire Management Plan* (NPS 1998).

Alternatives C and D would not accomplish fuel reduction as effectively or efficiently as Alternative B, limiting the preserve’s ability to re-institute prescribed burn strategies in a timely manner. Alternative C, one-time mechanical reduction, would reduce high fuel loads in the short term. However, fast growth (resprouting) of treated vegetation would likely restrict the effective use of prescribed burns. Alternative D, one-time chemical treatment, would be effective in reducing fuel loads. However, it would take longer to reduce the fuels because of slow plant mortality, delaying the use of prescribed burns. It would also leave standing dead vegetation that would continue to represent a fire hazard.

Alternative A would not meet the preserve’s fire management objective of re-instituting prescribed burns.

Compared to the continue current management/no action alternative, Alternative B would:

- Provide an attractive, open, savanna-like setting with low-fuel loadings that would mimic the appearance and behavior of natural, fire-adapted conditions and enhance the protection of resources for succeeding generations.
- Improve the safety, healthfulness, and esthetics of the surroundings.
- Reduce the risk to health and safety and other undesirable consequences of wildfire.
- Restore dominance of fire-adapted plant communities.

- Provide better protection of historic and cultural resources.

SUMMARY OF IMPACTS

Table 4 briefly summarizes the effects of each alternative on the impact topics that were retained for analysis for the treatment area. More detailed information on the effects of the alternatives is provided in the “Affected Environment and Environmental Consequences” section.

The one-time treatment using a combination of herbicides and mechanical thinning is the most efficient, short-term solution for the treatment area. The immediate reduction of fuels in the treatment area would greatly reduce the potential for wildfire and accelerate the reinstatement of prescribed burns. The chemical chosen for use has no soil action, acts only on the vegetation to which it is applied, and is short-lived. No special permitting is required for its use. The use of machinery at the wildland-urban interface would be a one-time event that may have short-term, adverse effects associated with noise and exhaust.

Table 4: Comparison of Impacts of Alternatives

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Action – Chemical followed by Mechanical Treatment (one-time)	Alternative C: Mechanical Treatment (one-time)	Alternative D: Chemical Treatment (one-time)
Air quality	An uncontrolled wildfire would result in short-term, localized, direct adverse effects ranging from minor to moderate.	Herbicide applications would result in direct, short-term, local, negligible adverse effects to air quality. Mechanical treatment would create negligible, direct, local, short-term, adverse effects to air quality from machinery emissions.	Adverse effects would be direct, short-term, local, and negligible as a result of emissions from machinery.	Adverse effects to air quality would be direct, short-term, local, negligible.
Endangered or threatened species and their habitats	No direct, indirect, short- or long-term effects to this impact topic would occur because no listed species or their habitats are present in the treatment area.	No direct, indirect, short- or long-term effects to this impact topic would occur because no listed species or their habitats are present in the treatment area.	No direct, indirect, short- or long-term effects to this impact topic would occur because no listed species or their habitats are present in the treatment area.	No direct, indirect, short- or long-term effects to this impact topic would occur because no listed species or their habitats are present in the treatment area.
Soils	Initially, a wildfire would cause short-term, minor, direct, adverse effects to soils. Minor to moderate beneficial effects would occur in the short-term as increased nutrients become available.	Direct, negligible to minor adverse effects would occur on a local scale as a result of machinery operation.	Direct, negligible to minor adverse effects would occur on a local scale as a result of machinery operation.	Direct, negligible to minor adverse effects would occur on a local scale as a result of herbicide application.
Vegetation	Wildfire would cause minor, short-term direct adverse effects for existing plant assemblages.	In the short-term, effects to vegetation would be direct, negligible, and adverse, however, in the long-term, the treatments would result in beneficial effects with the restoration of historic vegetation regimes.	In the short-term, adverse effects to vegetation would be direct, and negligible. There would be a minor short-term beneficial effect as a result of reduced fire fuels.	Chemical treatment would result in direct, negligible, short-term, adverse impacts to vegetation. In the long-term, repeated treatments would be required and would result in negligible adverse impacts. A minor to moderate short-term direct beneficial effect would accrue to desired species as competition with undesired species would be reduced.

Table 4: Comparison of Impacts of Alternatives (Continued)

Impact Topic	Alternative A: Continue Current Management /No Action	Alternative B: Preferred Action – Chemical followed by Mechanical Treatment (one-time)	Alternative C: Mechanical Treatment (one-time)	Alternative D: Chemical Treatment (one-time)
Water quality and hydrology	No direct, indirect, short- or long-term adverse or beneficial effects to water quality would occur.	No direct, indirect, short- or long-term adverse or beneficial effects to water quality would occur because surface water is not present in the treatment area.	No direct, indirect, short- or long-term adverse or beneficial effects to water quality would occur because surface water is not present in the treatment area.	No direct, indirect, short- or long-term adverse or beneficial effects to water quality would occur because surface water is not present in the treatment area.
Wildlife	There would be negligible to minor long-term, direct and indirect habitat effects to wildlife. Effects could be adverse or beneficial depending on the size and location of the affected area. Adverse direct effects to wildlife through mortality would be negligible to minor and short-term.	There would be negligible to minor long-term, direct and indirect habitat effects to wildlife. Effects could be adverse or beneficial depending on the size and location of the affected area. Adverse direct effects to wildlife through from machinery and chemical use would be negligible and short-term.	There would be negligible to minor long-term, direct and indirect habitat effects to wildlife. Effects could be adverse or beneficial depending on the size and location of the affected area. Adverse direct effects to wildlife through from machinery would be negligible and short-term.	There would be negligible to minor long-term, direct and indirect habitat effects to wildlife. Effects could be adverse or beneficial depending on the size and location of the affected area. Adverse direct effects to wildlife through from chemical use would be negligible and short-term.
Economics	A wildfire could cause negligible to moderate adverse impacts to private property and the adjacent commercial forests. Adverse effects to general commercial activity and tourism would be more indirect and range from negligible to minor,	The reduction in fire fuels would result in long-term, direct, minor to moderate beneficial effects to the local economy.	The reduction in fire fuels would result in long-term, direct, minor to moderate beneficial effects to the local economy.	The reduction in fire fuels would result in long-term, direct, minor to moderate beneficial effects to the local economy.
Park operations	Effects to park operations would be adverse, short-term, and direct and range from minor to moderate.	Short-term adverse effects would be minor, although long-term effects would be beneficial and minor to moderate providing that the prescribed fire program was implemented.	Short-term adverse effects would be negligible to minor as a result of staff reallocations.	Short-term adverse effects would be minor as a result of staff reallocations.
Public health and safety	Long-term, direct adverse effects would be associated with the potential for fire to migrate out of the park and would be moderate.	Long-term, direct beneficial effects would be associated with the potential for fire to migrate out of the park and would be minor to moderate.	Long-term, direct beneficial effects would be associated with the potential for fire to migrate out of the park and would be minor to moderate.	There would be negligible adverse effects in the short-term. Long-term, direct beneficial effects would be associated with the potential for fire to migrate out of the park and would be minor to moderate.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

REGULATIONS AND POLICIES

In conformance with Section 1502.20 of the National Environmental Policy Act, this document tiers from the *Big Thicket National Preserve Fire Management Plan* (NPS 1998). To eliminate repetitive information, the regulations and policies associated with fuels management from the fire management plan are incorporated by reference. A list of applicable regulations and policies is provided in Table 1.

METHODOLOGY

For each impact topic, the analysis includes a brief description of the affected environment and an evaluation of effects. The affected environment section from the *Big Thicket National Preserve Fire Management Plan* (NPS 1998) is incorporated by reference, and is supplemented here with information specific to the 290-acre treatment area.

The impact analysis involved the following steps.

- Identify the area that could be affected.
- Compare the area of potential impact with the resources that are present.
- Identify mitigation measures that may be employed to offset potential adverse impacts.
- Identify the intensity, context, duration (short- or long-term), and type (direct or indirect) of effect, both as a result of this action and from a cumulative effects perspective. Identify whether effects would be beneficial or adverse. The criteria used to define the intensity of impacts associated with the alternatives are presented in Table 5.

The impact analyses were based on professional judgment using information provided by park staff, relevant references and technical literature, and subject matter experts.

Cumulative Effects Analysis Method

The Council on Environmental Quality (CEQ 1978) regulations for implementing the National Environmental Policy Act require assessment of cumulative effects in the decision-making process for federal projects. Cumulative effects are

defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative effects are considered for both the no-action and proposed action alternatives.

Cumulative effects were determined by combining the effects of the alternative with other past, present, and reasonably foreseeable future actions. Therefore, it was necessary to identify other past, ongoing, or reasonably foreseeable future actions at Big Thicket National Preserve and in the surrounding region. Other actions that have the potential to have a cumulative effect in conjunction with this wildland-urban interface project include:

- Other actions by the National Park Service in the implementation of the Big Thicket National Preserve fire management plan.
- Any non-fire-related actions by the National Park Service in the preparation or implementation of the general management plan.
- Resource development on both public and private lands in the vicinity, such as mining and timbering.
- Conversion of private lands outside the park to other uses, such as pasturage, agricultural production, transportation corridors, and urban development.

Impairment Analysis Method

National Park Service *Management Policies* (NPS 2001b) requires analysis of potential effects to determine whether or not actions would impair park resources or values.

The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, actions that would adversely affect park resources and values.

These laws give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute an impairment. Impairment may result from NPS activities in managing the park, from visitor activities, or from activities undertaken by concessionaires, contractors, and others operating in the park. An impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to opportunities for enjoyment of the park; or
- Identified as a goal in the park's general management plan or other relevant NPS planning documents.

A determination on impairment is included in the impact analysis section for all impact topics relating to park resources and values.

Table 5: Wildland-Urban Interface Project Impact Threshold Definitions

Impact Topic	Impact Threshold Definition			
	Negligible	Minor	Moderate	Major
Air quality	No changes would occur or changes in air quality would be below or at the level of detection. If detected, they would have slight and short-term effects.	Changes in air quality would be measurable, although the changes would be small, short-term, and localized. No air quality mitigation measures would be necessary.	Changes in air quality would be measurable and would have consequences, but the effects would be relatively local. Air quality mitigation measures would be necessary and would likely be successful.	Changes in air quality would be measurable, would have substantial consequences, and would be noticed regionally. Air quality mitigation measures would be necessary and the success of the measures would not be guaranteed.
Endangered or threatened species and their critical habitats	Federally listed species would not be affected, or the alternative would affect an individual of a listed species or its critical habitat, but the change would be so small that it would not be of any measurable or perceptible consequence to the protected individual or its population. This would equate with a U.S. Fish and Wildlife Service "no effect" determination.	The alternative would affect one or more individual of a listed species or its critical habitat, but the change would be small and short-term. This would equate with a U.S. Fish and Wildlife Service "may effect" determination and would be accompanied by a statement of "likely..." or "not likely to adversely affect" the species.	An individual or population of a listed species or its critical habitat would be noticeably affected. The effect would have some long-term consequence to the individual, population, or habitat. This would equate with a U.S. Fish and Wildlife Service "may effect" determination and would be accompanied by a statement of "likely..." or "not likely to adversely affect" the species.	An individual or population of a listed species or its critical habitat would be noticeably affected with a long-term, vital consequence to the individual, population, or habitat. This would equate with a U.S. Fish and Wildlife Service "may effect" determination and would be accompanied by a statement of "likely..." or "not likely to adversely affect" the species or critical habitat.

Table 5: Wildland-Urban Interface Project Impact Threshold Definitions (Continued)

Impact Topic	Impact Threshold Definition			
	Negligible	Minor	Moderate	Major
Soils	Soils would not be affected or the effects to soils would be below or at the lower levels of detection. Any effects to soil productivity or fertility would be slight and no long-term effects to soils would occur.	The effects to soils would be detectable, but short-term. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.	The effect on soil productivity or fertility would be readily apparent and long-term, and would result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.	The effect on soil productivity or fertility would be readily apparent and long-term, and would substantially change the character of the soils over a large area. Mitigation measures to offset adverse effects would be needed, and their success would not be guaranteed.
Vegetation	Native vegetation would not be affected, or individual native plants could be affected but there would not be any effect on native species populations. The effects would be short-term and limited to a small area. No species of special concern would be affected.	There would be short-term, localized effects on one or more native species populations. Mitigation to offset adverse effects, including measures to avoid affecting species of special concern, could be required and would be effective.	A sizeable segment of one or more native species populations would be affected in the long-term and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some species of special concern could be affected.	There would be considerable long-term effects on native plant populations, including species of special concern. The effect would occur over a large area. Mitigation to offset adverse effects would be required and would be extensive. Success of the mitigation would not be guaranteed.

Table 5: Wildland-Urban Interface Project Impact Threshold Definitions (Continued)

Impact Topic	Impact Threshold Definition			
	Negligible	Minor	Moderate	Major
Water quality and hydrology	Neither water quality nor hydrology would be affected, or changes would be at low levels of detection. Any detected effects to water quality or hydrology would be slight, local, and short-term.	Changes in water quality or hydrology would be measurable, although the changes would be small, short-term, and localized. No mitigation measure would be necessary.	Changes in water quality or hydrology would be measurable and long-term but would be relatively local. Mitigation could be necessary, but the mitigation would likely succeed.	Changes in water quality or hydrology would be readily measurable, and would have observable consequences on a regional scale. Mitigation would be necessary and its success would not be guaranteed.
Wildlife	Wildlife would not be affected, or individuals could be affected but there would not be any effect on any wildlife populations. The effects would be short-term and limited to a small area. No species of special concern would be affected.	There would be short-term, localized effects to one or more wildlife species, but they would be of little consequence to the population. Mitigation for adverse effects, including measures to avoid affecting special concern species, could be required and would be effective.	A sizeable segment of one or more wildlife populations would be affected in the long-term and over a relatively large area. Mitigation to offset adverse effects could be extensive, but would likely be successful. Some species of special concern could be affected.	Effects to wildlife, including species of special concern, would be obvious and long-term, and would have substantial regional consequences to wildlife populations. Extensive mitigation would be needed to offset adverse effects, and its success would not be guaranteed.
Economics	No effects would occur or the effects to economic conditions would be at low levels of detection. The effect would be slight and no long-term effects to economic conditions would occur.	The effects to economic conditions would be detectable, although short-term. Any effects would be small and if mitigation was needed to offset potential adverse effects, it would be simple and successful.	The effects to economic conditions would be readily apparent and likely long-term. Any effects would result in changes to economic conditions on a local scale. If mitigation was needed to offset potential adverse effects, it could be extensive, but would likely be successful.	The effects to economic conditions would be readily apparent, long-term, and would cause substantial changes to economic conditions in the region. Mitigation measures to offset potential adverse effects would be extensive and their success could not be guaranteed.

Table 5: Wildland-Urban Interface Project Impact Threshold Definitions (Continued)

Impact Topic	Impact Threshold Definition			
	Negligible	Minor	Moderate	Major
Park operations	Park operations would not be affected or the effects would be at low levels of detection and would not have an appreciable effect on park operations.	The effect would be detectable and short-term, but would not have an appreciable effect on park operations. If mitigation were needed to offset adverse effects, it would be relatively simple and likely successful.	The effects would be readily apparent and long-term, and would result in a substantial change in park operations in a manner noticeable to staff and the public. Mitigation would probably be necessary to offset adverse effects and would likely be successful.	The effects would be readily apparent and long-term. Park operations would be markedly different from existing operations, and the change would be noticeable to both to staff and the public. Mitigation measures to offset adverse effects would be extensive, and their success could not be guaranteed.
Public health and safety	Public health and safety would not be affected, or the effects would be at low levels of detection and would not have an appreciable effect on the public health or safety.	The effect would be detectable and short-term, but would not have an appreciable effect on public health and safety. If mitigation were needed, it would be relatively simple and likely successful.	The effects would be readily apparent and long-term, and would result in substantial, noticeable effects to public health and safety on a local scale. Mitigation measures would probably be necessary and would likely be successful.	The effects would be readily apparent and long-term, and would result in substantial, noticeable effects to public health and safety on a regional scale. Extensive mitigation measures would be needed, and their success would not be guaranteed.

AIR QUALITY

Affected Environment

The treatment area is in attainment for all of the regulated pollutants (Class II Airshed). Air quality generally is good. The area is zoned as recreational and residential. Sources of air contamination in the area are negligible. No state or local permits are required for burning.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. Until such time as prescribed burning can be re-instituted, there would be a continuing increase in high fuel levels that could potentially cause a wildfire that could have adverse impacts on the regional area. This type of fire would have direct short-term, moderate, adverse impacts on air quality.

Even with prescribed burning (the long-term desired management treatment) there would be minor direct impacts due to smoke in the air and particulate matter contamination. Smoke from prescribed fires is a complex mixture of carbon, tars, liquids, and gases. In addition to particulate matter, other typical pollutants from prescribed burning include carbon monoxide, volatile organics, and nitrogen oxides. Depending on the size of the prescribed burn, the particulate matter contamination could potentially exceed state and federal standards on a short-term basis.

Smoke dispersal would be visually monitored at set intervals during all prescribed burns. If air quality standards were exceeded or smoke created a hazard or nuisance, especially in or near smoke-sensitive areas, the prescribed burn ignition patterns would be altered. When conditions were unfavorable for smoke dispersion and air quality standards would be threatened, prescribed ignitions would be postponed and wildland fire use would be limited. Burns would be timed to coincide with best smoke dispersal conditions which occur during the winter. Burning during unstable weather conditions would be avoided. When management-ignited prescribed fires were conducted, notification would include appropriate state and federal agencies and local communities.

The State of Texas does not have a permit system. However, the National Park Service would provide appropriate written notification prior to any prescribed burn.

Cumulative Effects. Cumulative effects of smoke from other sources, such as automobile and fireplace emissions, emissions from adjacent commercial timber operations, and exhaust from petroleum exploration and production could have minor adverse impacts during inversions. However, if these external sources of

air pollution were combined with a major wildfire in the preserve, the impacts, although short-term, could be moderately adverse to the regional system. Cumulative effects to regional air quality could range from minor to moderate adverse direct effects, depending on the timing and size of other emissions that would coincide with fire events on the preserve.

Conclusion. The existing heavy fuel loads could result in a wildfire event that could have moderate adverse direct effects on air quality from the emission of smoke and particulate matter. These effects would be short-term, lasting only for the duration of the wildfire. Prescribed burning, once reinstituted, would cause some adverse, direct, short-term, localized smoke and particulate matter emissions on air quality. Effects could range from minor to moderate.

Alternative A would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of air quality resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. Herbicide treatment could potentially produce the direct, short-term impact of introducing chemicals into the air. However, because there would be no broadcast application of the chemical and the treatment area is small, the effects would be localized and negligible. The amount of vapors would be minimized by dispensing herbicide in a vegetable oil solution, which would limit airborne particulates. Because herbicide application would be conducted by crews using backpack units, air transport of herbicides would be minimal. Long-term air quality impacts would be negligible.

Mechanical treatment would introduce combustion by-products from the engines and particulate matter, including dust generation, from the cutting and chipping of vegetation. These equipment and dust emissions would be minimal and localized to the treatment area. The effect would be negligible.

Mitigation would ensure that mechanized equipment was in good operating condition so that exhaust emissions were kept to a minimum.

Cumulative Effects. With appropriate treatment planning, onsite mitigation measures and coordination between the preserve and other potential point sources in the local and regional area, the cumulative effects of the preferred

actions on regional air quality would be adverse but temporary, direct, and negligible because the emission amounts would be small and rapidly dissipated.

Conclusion. Effects to air quality from herbicide applications would be direct, short-term, and negligible because the volume of material applied would be small and the application methods would limit potential chemical dispersal. Mechanical treatment of potential fire fuels would introduce small amounts of combustion from engine emissions and particulate matter from cutting and processing potential fire-fuel materials.

Alternative B would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of air quality resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis. Mechanical treatment of plant materials that could become fire fuel would introduce combustion by-products from heavy-equipment engines and particulate matter from cutting and dropping of fuel material. These emissions would be minimal, localized to the treatment area, and have negligible impacts on air quality.

Mitigation would ensure that mechanized equipment is in good operating condition so that exhaust emissions are kept to a minimum.

Cumulative Effects. With appropriate treatment planning, onsite mitigation measures and coordination between the preserve and other potential point sources in the local and regional area, the cumulative effects of this action on regional air quality would be adverse but temporary, direct, and negligible because the emission amounts would be small and rapidly dissipated.

Conclusion. During the site treatment period, potential air quality effects would be direct and adverse, but short-term and localized. The resulting effects would be considered negligible. Although mechanical treatment of vegetation would potentially introduce emissions from heavy-machinery exhausts, these quantities would be kept low by using emission-control devices.

Alternative C would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for

enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of air quality resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. Herbicide treatment of vegetation could potentially produce the direct impact of introducing chemicals into the air. However, because there would be no broadcast application of the chemical and the treatment area is small, the effects would be negligible. The amount of vapors would be minimized by dispensing herbicide in a vegetable oil solution limiting airborne particulates. Application of this treatment would not occur during high-wind conditions. Because herbicide application would be conducted by crews using backpack units, air transport of herbicides would be negligible. Appropriate personal protective equipment would be required. Long-term air quality impacts would be negligible.

Cumulative Effects. With appropriate treatment planning, onsite mitigation measures and coordination between the preserve and other potential point sources in the local and regional areas, the cumulative effects of the preferred actions on regional air quality would be adverse but temporary, direct, and negligible because the emission amounts would be small and rapidly dissipated.

Conclusion. Effects to air quality from herbicide applications would be direct, short-term, and negligible because the volume of material applied would be small, application methods would limit potential chemical dispersal, and the treated areas would be small.

Alternative D would not produce major adverse impacts on air quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of air quality resources or values as a result of the implementation of Alternative D.

ENDANGERED AND THREATENED SPECIES

Affected Environment

Endangered and threatened species are listed by the U.S. Fish and Wildlife Service and the Texas Parks and Wildlife Department by county. Within Tyler County, there is the potential for several endangered or threatened species to occur. Species ruled out as possibly occurring in the treatment area due to lack

of habitat include those associated with water, such as fishes, other vertebrates, and invertebrates with aquatic life stages.

Federally listed species that may potentially occur in the unit as shown in Table 6. They include the red-cockaded woodpecker and the Texas trailing phlox. Neither of these species has been documented in the treatment area. There are no species that are candidates for listing within the treatment area.

Previous informal consultations by the preserve staff with U.S. Fish and Wildlife Service personnel concerning the possibility of red-cockaded woodpecker colonies occurring in the treatment area prompted a nest-cavity survey by preserve staff. No red-cockaded woodpeckers were found. Although no red-cockaded woodpecker were sighted, results of the survey indicated that if preserve restoration projects were successful, suitable habitat might become available (Peterson 2001).

Table 6: Federally Listed Endangered, Threatened, and Candidate Species for Tyler County, Texas

Common Name Scientific Name	Listing Status	Designated Critical Habitat
Red-cockaded woodpecker <i>Picoides borealis</i>	Endangered	Open stands of pines with a minimum age of 80 to 120 years needed for nesting habitat. Foraging is most often in pine and pine/hardwood stands that are 30 years old or older with a preference for pine trees 10 inches or larger in diameter. Sufficient foraging areas in suitable habitat are typically 80 to 125 acres. Roosts are excavated in living pines.
Texas trailing phlox <i>Phlox nivalis</i> ssp. <i>texensis</i>	Endangered	Historically found in open, frequently burned longleaf pine savanna in sandy soil. Currently associated with American beech, oak, magnolia, pine, beardgrass, hickory, and yaupon communities in two locations in east Texas.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. An intense wildfire would kill a substantial portion of canopy trees, further hindering the long-term objective of creating habitat for the red-cockaded woodpecker.

There are no known endangered or threatened species or critical habitat designations within the Hickory Creek Unit. However, the long-term goal of using prescribed burns would allow savanna restoration to proceed with loblolly pines being replaced with mature longleaf pine (at least 60 years old). This type of restoration could, in the long term, provide suitable habitat for the red-cockaded

woodpecker. If suitable habitat were present in the Big Thicket area, there is a possibility that the birds would colonize the area.

Cumulative Effects. The cumulative direct and indirect effects of either wildfire or the resumption of prescribed burnings in the treatment area may result in the gradual transformation of existing loblolly pine to longleaf pine conditions that are favored by the red-cockaded woodpecker. Such changes would be long-term, minor to moderate beneficial effects for this species. No endangered or threatened species would be directly affected.

Conclusion. Neither direct nor indirect short-term or long-term effects would be expected to this group of species because the treatment area does not support any known populations of species belonging to this group. Suitable habitat conditions are not present. Long-term transformation of the dominant pine forest to longleaf pine might beneficially affect the red-cockaded woodpecker to a minor extent.

Alternative A would not produce major adverse impacts to endangered or threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of endangered or threatened species or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. There are no known endangered or threatened species found within the Hickory Creek Unit that would be affected by this treatment. However, these two treatments, followed by the resumption of prescribed burns, may allow future restoration of the savanna communities to proceed. The goal of prescribed fire, following mechanical and chemical treatment, would allow a return to historical vegetation composition and structure. Successful restoration could, in the long term, provide habitat for the red-cockaded woodpecker.

Cumulative Effects. The cumulative direct and indirect effects of either chemical or mechanical treatments would have negligible adverse or beneficial consequences to any member of the endangered or threatened species group because there are no known populations occupying the treatment area nor are suitable habitat conditions present. These two vegetation treatments alone would not encourage development of plant community conditions considered favored by the red-cockaded woodpecker. However, the resumption of prescribed burning treatments in the treatment area may, in the long term, result in the

transformation of the existing loblolly pine overstory to a longleaf pine overstory that would be favorable to supporting the red-cockaded woodpecker.

Conclusion. Neither direct nor indirect short-term or long-term effects of mechanical or chemical treatments would be expected to this group of species because the treatment area does not support any known populations of species belonging to this group. Suitable habitat conditions are not present. Long-term transformation of the dominant pine forest to longleaf pine might beneficially affect the red-cockaded woodpecker to a minor extent.

Alternative B would not produce major adverse impacts on endangered or threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of endangered or threatened species or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis. There are no known endangered or threatened species found within the Hickory Creek Unit that would be affected by this treatment. In this treatment, the cycle of shrub regrowth is unlikely to be broken, and therefore restoration of the savanna areas would probably not occur. Successful restoration is required to provide long-term adequate habitat for the red-cockaded woodpecker.

Cumulative Effects. The cumulative direct and indirect effects of mechanical treatment would have negligible adverse or beneficial consequences to any member of the endangered or threatened species group because there are no known populations occupying the treatment area nor are suitable habitat conditions present. This vegetation treatment alone would not encourage development of plant community conditions considered favored by the red-cockaded woodpecker.

Conclusion. Neither direct nor indirect short-term or long-term effects of mechanical treatment would be expected to this group of species because the treatment area does not support any known populations of species belonging to this group. Suitable habitat conditions are not present.

Alternative C would not produce major adverse impacts on endangered or threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents.

Consequently, there would be no impairment of endangered or threatened species or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. There are no known endangered or threatened species found within the Hickory Creek Unit that would be affected by this treatment. In this treatment, the cycle of shrub regrowth is unlikely to be broken, and therefore restoration of the savanna areas would probably not occur. Successful restoration is required to provide long-term adequate habitat for the red-cockaded woodpecker.

Cumulative Effects. The cumulative direct and indirect effects of chemical treatments would have negligible adverse or beneficial consequences to any member of the endangered or threatened species group because there are no known populations occupying the treatment area nor are suitable habitat conditions present. This vegetation treatment alone would not encourage development of plant community conditions considered favored by the red-cockaded woodpecker.

Conclusion. Neither direct nor indirect short-term or long-term effects of chemical treatment would be expected to this group of species because the treatment area does not support any known populations of species belonging to this group. Suitable habitat conditions are not present.

Alternative D would not produce major adverse impacts on endangered or threatened species or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of endangered or threatened species or values as a result of the implementation of Alternative D.

SOILS

Affected Environment

Big Thicket National Preserve is located on the geologically young Coastal Plain of southeast Texas. Surface formation were deposited by streams as alluvial plains and deltas during interglacial periods of the Pleistocene epoch. Elevations in the Hickory Creek Unit range from 110 to 136 feet. The Unit has two major soil series. A Hockley-Alazan fine sandy loam is present throughout 64 percent (452 acres) of the unit. The upper horizons are well-drained, but below this depth a marbling of plinthite (clay) reduces permeability. Scattered pockets of Jasco soil

also occur in lower areas. Jasco is an acid loam soil with a fragipan that results in poor drainage (Deshotels, 1978).

Impacts of Alternative A, Continue Current Management/No Action

Analysis. An uncontrolled wildfire would have mixed minor, short-term impacts. Removing some organic matter would be an adverse effect because it would reduce the water-holding capacity of the soil. Fire would return some nutrients to the soil profile which would be considered a beneficial change.

The direct impacts of fire on soil properties are governed by the fire intensity and the elapsed time between fire episodes. Light fires do not markedly affect soil texture, particle density, bulk density, porosity, or structure unless they occur annually on soils that depend on organic matter for aggregation (Agee 1973). Because low-intensity fires would be expected should this management action (with a long-term objective of prescribed burns) be used, little physical or chemical effect on the soil would occur. Low-intensity fires may have minor indirect effects on infiltration, runoff, and erosion. This is due in part to incomplete removal of the forest duff layer and the presence of overstory vegetation which lessens raindrop impact on the soil (Agee 1974). While runoff and erosion are related to the amount of organic litter and duff present, the lack of steep slope within the treatment area would also reduce potential for runoff of rainfall.

Prescribed burns may have various short-term impacts on soil conditions. Soil organic matter is often increased by light burns, but can be decreased by intense fires (Agee 1974). Nitrogen is often volatilized when vegetation and forest litter are burned. Nitrogen that is not lost by burning often becomes more available to plants, and soil nitrogen increases very much like the increase in organic matter (Agee 1974). Fire also increases the levels of calcium, magnesium, potassium, and phosphorus in the soil because the nutrient reservoir on the forest floor is released (Agee 1974). Where some vegetation remains after burning, and especially for fires that consume only the understory in forests, nutrient loss from the site is minimal and available plant nutrient levels may increase (Agee 1974).

This alternative would include wildfire prevention until fuel loads could be reduced. The preserve has developed an emergency plan to work with other federal, state, and local agencies to ensure adequate protection from a potential wildfire.

Cumulative Effects. The cumulative direct and indirect effects of either wildfire or prescribed burns on soil fertility and erosion-resistance would be negligible because such effects would be localized and an infrequent event.

Conclusion. A wildfire would cause short-term, minor, direct changes to soil productivity and fertility. Initial changes would be adverse as some organic matter is removed and soil water-holding capacity was temporarily decreased. Subsequent soil fertility changes would be direct minor to moderate beneficial effects to vegetation as increased nutrient levels became available to support plant growth. Increased soil fertility would be a short-term effect.

Alternative A would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of soil resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. While overspray and runoff may disburse Garlon 4[®] to a wider area than just the vegetation targeted for treatment, no direct impact to soils are expected given the short half-life of the compounds in soils. Given the herbicide's low toxicity level and relatively short half-life periods (about 100 days for some compounds; most compounds less than 30 days) there would not be a long-term impact to using this product (USEPA 1998).

Use of mechanical equipment can cause soil alterations, compaction and rutting in heavily traveled areas. Because the slash and other residue would be left in place after mechanical clearing, the risk of soil erosion should be minimized. Alteration of natural drainage patterns within the micro-topography caused by mechanical equipment (bull-hog) may locally alter soil topography within the savanna community. The duration of operation suggests little or no cumulative impacts to soils would occur.

The chemical application would be done in a way to avoid spills and be directed specifically at target areas. The chemical treatment would be applied during dry weather conditions when winds are minimal to prevent broadcast distribution over a larger area.

The mechanized vehicles used in this operation would avoid impacting areas larger than necessary. The vehicle would be used in dry weather conditions to avoid adverse effects resulting from soil rutting and compaction that would occur during wet conditions.

Cumulative Effects. The cumulative direct and indirect effects of either mechanical or chemical treatments on soil fertility and erosion-resistance would be negligible because such effects would be localized.

Conclusion. Direct effects would be short-term, localized and might adversely affect local soil structure from the operation of machinery. Such effects would be considered negligible to minor impacts. Residual compounds migrating into the soil from herbicide treatment would be expected to create short-term, adverse effects for target plant species, but should not adversely affect non-target plant or wildlife species if applied according to label directions.

Alternative B would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of soil resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis. Use of mechanical equipment for fuel reduction can cause soil disruption, compaction and rutting in heavily traveled areas. However, this condition is not anticipated with this alternative. The use of mechanical equipment would be avoided when soils are wet. Leaving the slash in place would add organic material to the soil upper layer. These impacts would influence the rate and type of vegetation growth response. Soil disturbance and compaction caused by mechanical equipment may have a direct, minor short-term and localized impact on soil fertility.

The mechanized vehicle used in this operation would avoid affecting areas larger than necessary. The vehicle would only be used in dry weather conditions to avoid adverse impact of rutting and compaction that would occur during wet conditions. Repeated trips over the same trails would be avoided.

Cumulative Effects. The cumulative direct and indirect effects of mechanical treatment on soil fertility and erosion-resistance would be negligible because such effects would be localized and a fairly infrequent event for any specific trail or location.

Conclusion. Direct effects would be short-term, localized and might adversely affect local soil structure from the operation of machinery. Such effects would be considered negligible to minor impacts.

Alternative C would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of soil resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. While overspray and runoff may disburse Garlon 4[®] to a wider area than just the vegetation targeted for treatment, no direct impact to soils are expected given the short half-life of the compounds in soils. While the potential exists for exposures to persons entering treated sites after application of the herbicide is complete, U.S. EPA has determined that the toxicological characteristics of Garlon 4[®] (very low dermal and inhalation toxicity), do not warrant any special restrictions on post-application exposure (USEPA 1998).

Given the herbicide's low toxicity level and relatively short half-life periods in soils (about 100 days for some compounds; most compounds less than 30 days), there does not appear to be a long-term impact to using this product (USEPA, 1998). The chemical application would be done in a way to avoid spills and be directed specifically at target areas. The chemical treatment would be applied during dry weather conditions when winds are minimal so as not to broadcast over a larger surface area.

Cumulative Effects. The cumulative direct and indirect effects of chemical treatments on soil fertility and erosion-resistance would be negligible because such effects would be localized and a fairly infrequent event for any specific location.

Conclusion. Direct effects would be short-term, localized and might adversely affect local soil structure from the application of herbicides. Such effects would be considered negligible to minor impacts. Residual compounds migrating into the soil from herbicide treatment would be expected to create short-term, adverse effects for target plant species, but should not adversely affect non-target plant or wildlife species if applied according to label directions.

Alternative D would not produce major adverse impacts on soil resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no

impairment of soil resources or values as a result of the implementation of Alternative D.

VEGETATION

Affected Environment

The current vegetation within the treatment area is markedly different in structure and composition than that described in historical accounts. Although the treatment area is considered a fire-dependent ecosystem that historically burned on a 3- to 5-year interval (Platt *et al.* 1988), the reduced fire occurrences in recent years have allowed woody shrubs to increase in size and dominance. The current shrub layer is between 20 and 30 feet tall. The dense woody understory vegetation in both the treatment area and the adjacent property poses a fire risk because of the fuel accumulations.

The current vegetation conditions are the result of modification of historic fire regimes. The vegetation of all management units of the preserve is diverse and has been described in several documents (Correll and Johnston 1970, Vines 1977, Nixon and Cunningham 1985, Agilvsgi 1979, and Cox and Leslie 1988). In the Hickory Creek Unit, vegetation communities consist of combination of upper slope pine/oak forest (about 45 percent of the total unit area), pine savanna (about 45 percent), and baygall thicket (about 10 percent) (Harcombe and Marks 1979). Many areas within the unit do not currently represent the potential natural vegetation, or the historical vegetation types present in the region. In the past, the unit has been subject to logging and fire suppression (Harcombe et al. 1993). Vegetation communities specific to the treatment area are upper slope pine/oak with intermixed (5 to 10 percent) pine savanna. The baygall community provides a separation (as well as a natural fire break) between the treatment area and the eastern portion of the unit.

The dominant overstory plant species within the Hickory Creek Unit consist of loblolly pine (*Pinus taeda*). The understory composition of this plant community is dominated by herbaceous plants and the woody shrubs (yaupon and waxmyrtle). Historically, the area was characterized by an overstory of longleaf pine (*Pinus palustris*) with a diverse herbaceous understory and limited shrub layer. The current herbaceous understory has been considerably modified through fire suppression and invasion of woody plants.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. The effects of no action on the existing vegetation communities would allow fuel loads to increase, perpetuating the fire load and the trend of increasing shrub replacement in the pine savanna. The risk of an accidental wildfire getting

started would still be present. The ability to control an accidental fire would decrease. The prevailing vegetation communities are fire tolerant and would be capable of recovering from a fire in a relatively short period. Shrub species could recovery more quickly than loblolly and longleaf pines.

The dominant woody shrub species (yaupon and waxmyrtle) can re-sprout shortly after fire because plants are rarely killed by low-intensity fire. Heavy fuel buildup includes a thick layer of duff which can girdle pine trees at ground level. The dominant tree species are rarely damaged by low-intensity burns. However, if fuel build-up occurs that allows a high-temperature fire to reach the tree crowns, individual trees could be killed. This effect, although very noticeable would be considered a minor long-term effect at the vegetation community level because of the fire-adaptations possessed by these species.

Increased soil nutrients concentrations following fire conditions would encourage rapid re-growth of herbaceous and pine seedlings. These changes would be considered a minor short-term beneficial effect to the vegetation communities in the burn area.

Cumulative Effects. With a prescribed fire program, cumulative effects would be a minor, long-term, beneficial change in plant community species composition to an assemblage of fire-tolerant species. The incremental effect of this change in the regional context would be considered a minor to negligible impact.

Conclusion. With implementation of prescribed burns, shifts in vegetation composition to a fire-tolerant assemblage would be considered a minor, long-term, direct impact. The change would be considered adverse for the non-fire-tolerant plant species currently present and a beneficial change for fire-tolerant species that would be encouraged. Wildfire effects would be considered a minor short-term direct adverse effect to the existing plant assemblages.

Alternative A would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Existing vegetation in the treatment area would experience long-term conversion to reduce existing and future fuel accumulation. Although this change would be

immediately noticeable and would represent a direct effect to existing vegetation, the effects would be considered a negligible to minor because the affected species are widely distributed in the unit, represent the typical fire-adapted vegetation conditions, and are tolerant of periodic stresses from fire and mechanical sources. Long-term trends in vegetation conditions would be shifted towards the historical native species complex that is adapted to frequent low-intensity fires. This change would be a negligible to minor beneficial effect.

Although the mechanical clearing equipment is designed to have direct, short-term negligible effects on non-target vegetation communities, some crushing of non-target plants and area would occur. This impact would be an adverse short-term effect, as the root structures of the vegetation would not be altered. Slash left on site would add organic material to the soil which would generally improve water-holding capacity of the upper soils. This moisture becomes available for herbaceous plants that remain.

Spot applications of the registered herbicide would introduce this chemical in to the existing environment to kill the target plant species. Use of spot application techniques would limit chemical exposure to non-target species and individuals. Incidental effects to non-target plant and wildlife species would be considered a negligible, indirect, adverse effect because typically registered chemicals applied according to label directions and by qualified and trained personnel are relatively non-hazardous.

The restrictions on the distribution of herbicide applications to spot treatments, use of mechanical equipment designed to minimize damage to soils and non-target plant communities, and restrictions on the degree of clearing to only the treatment areas, would contribute to minimizing adverse effects to non-target vegetation areas.

Cumulative Effects. Cumulative effects would be a minor beneficial change from a long-term native plant community and population restoration perspectives. The direct cumulative consequences would be a long-term restoration to the fire-adapted vegetation condition that historically existed. With a prescribed fire program, cumulative effects would be a minor, long-term, beneficial change in plant community species composition to an assemblage of fire-tolerant species. The incremental effect of this change in the regional context would be considered a minor to negligible impact.

Conclusion. Vegetation reduction through chemical and mechanical means in the treatment areas would be considered a direct, adverse, negligible short-term impact to treated species that would benefit species that are tolerant of and adapted to frequent, low-intensity fires. However, these two treatments, followed by the resumption of prescribed burns, would have a long-term, beneficial effect on restoring the historic vegetation regimes.

Alternative B would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

The same type of mechanical treatment effects to vegetation described for Alternative B would occur with this alternative, except that potential incidental exposure of non-target vegetation species to herbicide contaminants would be avoided and the gradual conversion to fire-adapted species would require more time to achieve. Total reliance on mechanical treatment to control vegetation, would require more frequent entry into the treatment area by men and equipment to keep plant growth in check. Effects to non-target vegetation from these activities would increase compared to either no action or Alternative A, but would still be considered a negligible, short-term, adverse effect because of the small area that would be affected.

The same mechanical clearing and treatment mitigation measures that were described for Alternative B would apply to this alternative as well. Mitigation measures associated with herbicide treatments would not be required with Alternative C.

Cumulative Effects. The same cumulative effects that were described for Alternative B would apply to this alternative. The same results and long-term changes would be expected. However, because mechanical treatment would be less efficient than fire in converting vegetation composition, the transformation would require a longer period. Because this alternative is targeted to specific areas, there would be no impacts to other projects at the unit.

Conclusion. Vegetation reduction through mechanical means would be considered a direct, adverse, negligible short-term impact. From a long-term perspective, effects to vegetation would be a negligible, adverse impact because existing species would re-grow after treatment. Some negligible, adverse, direct, effects to non-target vegetation could occur. There would be a minor, short-term beneficial effect in reducing potential fire fuels.

Alternative C would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general

management plan or other NPS planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. The elimination of vegetation species using chemical treatment would have the same lethal effects to the target vegetation areas as Alternative B. However, the time required to effectively eliminate fuels that could support potential wildfires would be longer compared to the other approaches. Dead plant materials would not be physically removed from the area and would therefore remain onsite to fuel a potential wildfire.

Use of selective spot hand-application technique is less efficient than other methods of herbicide application in eliminating all undesirable plant species and target plants, but it is more accurate in delivering herbicide treatment to the target plants. Because herbicide delivery would be conducted as a targeted treatment (rather than broadcast), negligible incidental adverse effects to non-target plant species would occur.

Indirect effects of herbicide treatment on soils, wildlife, and water quality would be considered negligible because of the small quantities of herbicides that would be delivered, the small areas that would be exposed to herbicide treatment, and the low toxicity of the registered herbicide to non-target wildlife species when applied in accordance with label instructions. The application of the herbicide by licensed personnel and the application of the herbicide only to target species would further minimize adverse effects to non-target organisms.

Cumulative Effects. The same cumulative effects that were described for Alternative B would apply to this alternative. The same results and long-term changes would be expected. Because this alternative is targeted to specific areas, there would be no impacts to other projects at the Hickory Creek Unit. The time over which transitions to the preferred fire-adapted vegetation types would be relatively longer because treatment efficiencies would be lower and because fuel materials would remain in the treatment area.

Conclusion. Vegetation reduction through chemical means in the treatment area would be considered a direct, adverse, negligible short-term impact. From a long-term perspective, repeated treatments would be required and effects to vegetation would be considered a negligible adverse impact because existing species would re-grow after treatment. Some negligible adverse direct, adverse effects to non-target vegetation could occur. There would be a minor to moderate short-term direct beneficial effect to desired plant species as they are released from competition with non-desirable plant species.

Alternative D would not produce major adverse impacts on vegetation resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of vegetation resources or values as a result of the implementation of Alternative D.

WATER QUALITY AND HYDROLOGY

Affected Environment

The Hickory Creek Unit is located within the watershed of Hickory Creek, which is a subwatershed of Village Creek in the lower Neches River Basin. There is no main tributary of Hickory Creek within the treatment area. The topography is very slightly rolling, and is marked by two minor, natural drainage swales that have intermittent ponding of water. Neither of these minor drainage swales traverse the treatment area.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. Potentially, the effect of fire on surface water resources is related to the possibility of increased runoff. However, because there is no significant surface water flow on site and the treatment area is mostly flat terrain, no direct or indirect adverse effects to water quality are anticipated.

Low-intensity prescribed burns may cause small, localized alterations to the existing natural ponding properties of the soil, thereby having a short-term, negligible, localized, adverse effect on the typical ponding that occurs after seasonal rainfalls. There are no potential mitigation measures that would apply to these circumstances.

Cumulative Effects. There are no cumulative effects that would apply to Alternative A because surface water features are not present in the treatment area and because a potential contamination pathway to a receiving permanent surface water body is not present.

Conclusion. No direct or indirect, short-term or long-term, adverse or beneficial water quality impacts are expected.

Alternative A would not produce major adverse impacts on water quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the

natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. Because there is no significant surface water flow on site and the treatment area is mostly flat topography, no direct impacts to any surface water bodies on or offsite would occur from chemical or mechanical treatments of fire fuel areas. If a significant rainfall event occurred immediately following an over-application of herbicide, there is a slight possibility that the herbicide could be transported to and reside in localized ponding that is typical of these soils. The existence of the herbicide in these small temporarily ponded areas would be considered a negligible, short-term effect because of the small quantities that may be involved and because the toxicity of the herbicide would probably be substantially reduced by exposure to suspended particulate matter in the water. There are no potential mitigation measures that would apply to these circumstances.

Cumulative Effects. There are no cumulative effects that would apply to these circumstances because surface water features are not present and because a potential contamination pathway to a receiving permanent surface water body is not present.

Conclusion. No direct or indirect, short-term or long-term, adverse or beneficial water quality impacts are expected because surface water features are absent from the treatment area.

Alternative B would not produce major adverse impacts on water quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis. Mechanical treatment effects to water quality and hydrology similar to those described for Alternative B would apply to Alternative C for the same reasons that were described for Alternative B, except that localized nutrients

rather than herbicides might temporarily accumulate in ponded water areas. The treated areas and the surface water conditions of the treated area would be identical.

Cumulative Effects. There are no cumulative effects that would apply to these circumstances because a permanent surface water body is not present.

Conclusion. No direct or indirect, short-term or long-term, adverse or beneficial water quality impacts are expected because surface water features are absent from the treatment area.

Alternative C would not produce major adverse impacts on water quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. Chemical treatment effects to water quality and hydrology similar to those described for Alternative B would apply to Alternative D for the same reasons that were described for Alternative B. The treated areas and the surface water conditions of the treated area would be identical.

Cumulative Effects. There are no cumulative effects that would apply to these circumstances because a permanent surface water body is not present.

Conclusion. No direct or indirect, short-term or long-term, adverse or beneficial water quality impacts are expected because surface water features are absent from the treatment area.

Alternative D would not produce major adverse impacts on water quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of water quality resources or values as a result of the implementation of Alternative D.

WILDLIFE

Affected Environment

The Big Thicket region supports a wide diversity of wildlife species (Schmidly 1983, Davis and Schmidly 1994). Wildlife assemblages associated with the vegetation communities of the Big Thicket region are well-adapted to coping with fire-episodes.

White-tailed deer (*Odocoileus virginianus*) are common in the Hickory Creek Unit, and there are reports of cougar (*Felis concolor*), gray fox (*Urocyon cinereoargenteus*), and bobcat (*Lynx rufus*) (Roy Zipp, personal communication). Birds that are common to the Hickory Creek Unit are typical of the region (see Parks and Cory 1936 for list of possible birds). Because there are only limited water resources in the unit, there are few fish species.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. Wildlife species composition and habitat conditions would continue to gradually change to a assemblage more closely affiliated with shrub cover types rather than tree-grass savanna cover type. This trend would favor edge-associated species such as the white-tailed deer and gray fox.

General trends in overall wildlife species richness and diversity would be expected to increase as shrub abundance invades grassland and other non-woody complexes. This effect would occur because more complex plant structural diversity associated with shrub development would offer a larger number of specialized habitat conditions that would attract a larger variety of wildlife species. In areas of dense shrub cover, such increases would not be expected because the number of habitat niches is relatively smaller.

Changes in wildlife composition with no action would be considered a minor indirect effect. The replacement wildlife assemblage would still contain species associated with a wide range of vegetation types and the wildlife assemblage would be representative of species found throughout the preserve and non-preserve areas.

Wildlife assemblages associated with the vegetation communities of the Big Thicket region are well-adapted to coping with fire episodes. Direct mortality from uncontrolled wildfire is rarely considered a serious wildlife mortality factor. Therefore, the possible loss of some individual members of a wildlife population from uncontrolled fires would be a negligible to minor, short-term, adverse impact to affected species.

There are no known special-interest wildlife populations or habitat features present in the treatment area that would be adversely affected by an uncontrolled fire or by the gradual conversion of vegetation types that would be associated with continuing present land management policies.

Cumulative Effects. Without treatment, long-term wildlife composition would either remain unchanged or would gradually change in response to changes in habitat conditions associated with the gradual transition from tree-savanna complex to shrub-dominated complex. The changes would be considered either a negligible to minor change, depending on the long-term perspective of the land managers. The net effects of changes induced in such a small treatment area of 290 acres compared to the surrounding untreated areas would have negligible long-term cumulative effects.

Conclusion. There would be negligible to minor long-term, direct and indirect habitat effects to wildlife species that are dependent on conditions in the treatment area. Effects could be either beneficial or adverse to the affected species, depending on the location and size of the affected area. Adverse direct effects to individual animals and to populations through fire-induced mortality would be considered negligible to minor and short term.

Alternative A would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative A.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. Some individual animals may be killed by the mechanical disturbance, particularly species that are small or less mobile (for example, snakes, small rodents, and insects). Such losses would be considered a negligible adverse impact.

Abrupt changes in habitat conditions resulting from changes in plant structural characteristics in the treatment areas would have a more noticeable and longer-lasting effect because plant changes would persist for several years. Some species would benefit slightly from vegetation changes while others would be adversely affected. These changes would be considered a minor effect because the total area to be affected by the change would be small, and the affected species are common throughout the region.

Licensed herbicides that are applied in conformance with label instructions are rarely linked to wildlife mortality episodes. Wildlife species would be adversely affected directly or indirectly by herbicide application. Mitigation measures to enhance vegetation rehabilitation and limit the areas to be treated would further reduce the minor adverse effects to wildlife habitat.

Cumulative Effects. Long-term wildlife composition would either remain unchanged or would gradually change in response to changes in habitat conditions associated with the gradual transition from a shrub-dominated to a tree-savanna complex. The changes would be considered a minor direct effect. Depending on prevailing land management objectives slight shifts in species assemblages could be considered either adverse or beneficial. The net effects of changes induced across such a small treatment area (290 acres) compared to the surrounding untreated areas would have negligible long-term cumulative effects.

Conclusion. There would be negligible to minor long-term, direct and indirect habitat effects to wildlife species that are dependent on conditions in the treatment area. Effects could be either beneficial or adverse to the affected species, depending on the location and size of the affected area. Adverse direct mortality effects to individual animals and to populations from machinery and chemical use would be negligible and temporary.

Alternative B would not produce major adverse impacts on wildlife quality resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of wildlife quality resources or values as a result of the implementation of Alternative B.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis.

Mechanical treatment effects to wildlife similar to those described for Alternative B would apply to Alternative C for the same reasons that were described for Alternative B. The rate of change could be relatively slower for this alternative because reliance on only mechanical treatment would mean long-term conversion of vegetation conditions would be slower to develop. Mechanical treatments would be relatively less efficient in achieving long-lasting changes.

Mitigation measures that would be applicable to this alternative would be limitations on the extent of clearing in non-target treatment areas, restricting vehicle uses to specified locations only, and timing treatments to minimize

conflicts with the breeding season requirements of special-interest birds that may be present in the proposed treatment area.

Cumulative Effects. The same mechanical treatment effects described for Alternative B would be expected for Alternative C.

Conclusion. There would be negligible to minor long-term, direct and indirect habitat effects to wildlife species that are dependent on conditions in the treatment area. Effects could be either beneficial or adverse to the affected species, depending on the location and size of the affected area. Adverse direct mortality effects to individual animals and to populations from machinery use would be considered negligible and temporary.

Alternative C would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative C.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis.

Chemical treatment effects to wildlife similar to those described for Alternative B would apply to Alternative D for the same reasons that were described for Alternative B. Herbicide application would not be expected to directly affect wildlife species because herbicides licensed for vegetation control are generally considered to be non-toxic to wildlife when applied to vegetation according to label directions. Possible negligible, indirect minor changes in wildlife species composition and abundance related to changes in vegetation structure and species composition would occur at a slower rate than changes that would be associated with the preferred alternative that included both mechanical clearing and chemical reduction.

Mitigation measures would include minimizing accidental applications of herbicide to non-target areas; avoiding spills of herbicide; re-filling herbicide application equipment in designated and confined areas; treating vegetation only during calm periods (which minimizes herbicide drift to non-target areas) and using only herbicides that are approved for these designated uses.

Cumulative Effects. The same chemical treatment effects described for Alternative B would be expected for Alternative D.

Conclusion. There would be negligible to minor long-term, direct and indirect habitat effects to wildlife species that are dependent on conditions in the treatment area. Effects could be either beneficial or adverse to the affected species, depending on the location and size of the affected area. Adverse direct mortality effects to individual animals and to populations from chemical use would be considered negligible and temporary.

Alternative D would not produce major adverse impacts on wildlife resources or values whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation of the preserve, (2) key to the natural or cultural integrity of the Big Thicket National Preserve or opportunities for enjoyment of the preserve, or (3) identified as a goal in the preserve's general management plan or other NPS planning documents. Consequently, there would be no impairment of wildlife resources or values as a result of the implementation of Alternative D.

ECONOMIC EFFECTS

Affected Environment

The economy of Tyler County is primarily supported by timber production, followed by farming, lumbering, manufacturing and tourism. Oil and gas production in the county showed limited increase during the 1970s and early 1980s, but has shown considerable increase since the 1990s. The industrial development initiatives in Tyler County have resulted in the expansion of the state prison in 1999, and the development of a window manufacture and a metal fabrication company. According to the Tyler County Chamber of Commerce, the average household income is around \$27,000.

The population in Tyler County showed a 25 percent increase from 1990 to 2000, with populations rising from 16,646 to 20,871 (Bureau of the Census 2000). About 86 percent of the Tyler County residents identify themselves as white and 11 percent of the population identify themselves as African American.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. Without intervention, fuels would continue to build and short-term, adverse effects could include periodic disruption of local economic activity in the area from uncontrolled fires. An intense wildfire could potentially have long-term, adverse effects due to loss of commercial timber and property on adjacent lands.

Cumulative Effects. Cumulative effects on economic activity would range from negligible to moderately adverse, depending on the timing and size of other burn activities that would coincide with fire events in the preserve.

Conclusion. There exists a higher potential chance for an intense wildfire in this alternative due to the continuation of fuel build-up beyond acceptable levels. An intense wildfire could cause minor to moderate adverse impacts to private property and to the long-term productivity of adjacent commercial forests. A low-intensity prescribed fire would have negligible effects to the same community. Impacts on general commercial activity and tourism would be more indirect and could range from negligible to minor adverse due to the small size and scale of the treatment area operations.

Impacts of Alternative B, Alternative C, and Alternative D

Analysis. With varying levels of effectiveness, Alternatives B, C and D would have direct beneficial impact of reducing existing fuel loads, thus reducing the potential for an intense wildfire.

The long-term economic effects of any of these alternatives would be moderate and directly beneficial, reducing the threat to surrounding property from wildfire leaving the preserve. The proposed actions would reduce the potential for exposure to wildfire and all of its effects, including the cost of and results of large-scale firefighting. Avoidance of destructive crownfire would protect a variety of forest resources and services, including the recreation and tourism base provided by the preserve, and the use of private and U.S. Forest Service lands for such purposes as grazing and the extraction of forest products.

Cumulative Effects. The greatest effect on the regional economy would be the costs associated with fighting a large-scale wildfire emanating from either inside or outside the national preserve. The beneficial effects would result from avoiding economic disruption caused by wildfire fighting activities.

Conclusion. Under alternatives B, C, and D, a reduction of fuels would have a direct beneficial impact in the long term by protecting property and commercial timber values from intense wildfires. Local commercial activities and tourism would be less positively affected by these actions due to the small size of the treatment area and lack of visitors to this treatment site.

PARK OPERATIONS

Affected Environment

The Resource Management Division is responsible for implementing actions associated with fire management in the preserve. The Resource Management Division has five permanent staff and a similar number of seasonal staff.

Impacts of Alternative A, Continue Current Management/No Action

Analysis. A wildfire would have a moderate, short-term, adverse impact on preserve operations, and would require the resources of the preserve and other cooperating agencies to manage, coordinate, and fight the fire.

The conduct of prescribed burning of the existing high fuel loads would require increased planning and reallocation of staff. The preserve would run a higher risk of prescribed fires escaping and burning property outside the treatment area.

Preserve operations, in both the short term and long term, may have to reallocate staff to maintain the safety of adjacent residences due to heavy fuels buildup. Fire management activities in other preserve units could be adversely affected by the reallocation of staff to manage high risk, prescribed fires in the treatment area.

Cumulative Effects. The no action alternative would require a commitment to reallocate staff to both manage the potential for wildfires and to implement the long-term, prescribed fire program. These indirect effects would create long-term, moderate adverse effects on park operations staff.

Conclusion. Effects to park operations would be adverse, short-term, and direct and could range from minor to moderate, depending on the severity and duration of a wildfire. The long-term, direct, adverse effects of conducting prescribed and contained burns could range from minor to moderate, depending on the scheduling of burn events. There could be minor indirect, adverse, short-term effects on other operations in the event of larger fires or more numerous burn projects, if staff were diverted from other preserve operation activities.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical Treatment (One-Time)

Analysis. About six preserve personnel would be required to perform the chemical treatment. Because the preserve does not have mechanized equipment, the follow-up mechanical treatment would be privately contracted. The preserve would be required to monitor and supervise this mechanical operation.

Cumulative Effects. Following the chemical and mechanical reduction and until such time as fuel loads reached appropriate levels, the preserve's fire management division might be required to reallocate resources and personnel to maintain the prescribed burn program at a level to achieve effectiveness. This condition would be a direct minor to moderate adverse, long-term effect on preserve operations.

Conclusion. Effects of reducing fuel materials through chemical and mechanical treatments would create short-term, minor adverse effects on preserve operations due to reallocation of staff. However, following these two one-time treatments, the implementation of the long-term, prescribed fire program could have long-term, minor to moderate beneficial impacts on preserve operations, depending on the number of programmed burns.

Impacts of Alternative C, Mechanical Treatment (One-Time)

Analysis. Alternative C would have the lowest impact on staffing, because the preserve would contract out the mechanical work. The preserve does not have the mechanized equipment to implement the action. Some staff reallocation would be required to supervise and monitor the mechanical treatment.

Cumulative Effects. Because mechanical treatment would be a one-time application that would be privately contracted, it would have no cumulative effect on preserve operations.

Conclusion. Negligible to minor, short-term, adverse effects on preserve operations would occur, requiring staffing reallocations to monitor and supervise the mechanical treatment operation.

Impacts of Alternative D, Chemical Treatment (One-Time)

Analysis. The preserve would conduct the one-time chemical application for the treatment area. Short-term, minor adverse effects on preserve operations would occur in association with the reallocation of some staff to conduct the chemical treatment.

Cumulative Effects. Because chemical treatment would be a one-time application, it would have no cumulative effect on preserve operations.

Conclusion. Short-term, minor adverse effects on preserve operations would occur in association with the reallocation of some staff to conduct the chemical treatment.

PUBLIC HEALTH AND SAFETY

Affected Environment

Several groups could potentially be affected by the proposed action. Park visitors, employees, nearby residents and regional firefighters would likely experience a slight positive impact to their health and safety by reducing the chance of exposure to wildfire. Residents of the 600 homes in the Wildwood community and owners of adjacent commercial property would experience increased protection from migration of wildfire ignited within the preserve.

Nearby residents using the preserve boundary for recreation would be notified of herbicide application to avoid exposing children at play.

None of these groups would be involved in implementing the action, and would not be at risk from the silviculture practices.

Impacts of Alternative A, Continue Current Management/No Action

If the proposed action were not undertaken, fuel loads along the boundary would not be reduced in the short-term. The risk of exposure to wildfire would remain constant or increase. Vacant lots within the community, laden with fuels, will continue to pose a threat of spreading uncontrolled fire into the community. The risks to public health and safety of uncontrolled fire would include loss of life and property, injury and health effects caused by exposure to smoke and particulate emissions.

New homes will continue to be built in the community. The density of homes would ultimately reduce the number of undeveloped lots, and risk may be reduced. In the event of wildfire, firefighting resources from numerous volunteer fire departments, the Texas Forest Service, and the Big Thicket National Preserve could be required. The preserve has developed a contingency emergency plan to work with other federal, state, and local agencies to ensure adequate protection from a potential, wildlife.

Cumulative Effects. Alternative A, in combination with the existing Fire Management Plan, produces no effects on public health and safety. The public is not involved in implementation of park management activities and is at little risk from these activities. Long-term effects would be those associated with the presence of abnormal amounts of combustible fuels along the park boundaries. These include potential for migration of wildfire across the preserve borders.

Conclusion. Alternative A would not affect public health and safety in the short-term. Long-term, direct, effects would be those associated with the chance for fire to migrate out of the park. The overall effects would be adverse and moderate.

Impacts of Alternative B, the Preferred Action: Chemical followed by Mechanical (One-Time Treatment)

Risk to neighbors, visitors and park staff during implementation of this alternative would be minimal. Use of machinery along the preserve boundary with the Wildwood Community would generate noise levels that may disrupt daily routines to a small extent. Emissions from equipment will be minimal. The controlled use of herbicides poses no threat to public health. Due to the small area over which

actions will be taken, park visitors and employees can avoid exposure and still remain within the preserve.

Long-term effects to employees, visitors and neighbors and nearby communities will be small but positive. As part of the overall fire management plan, the goal of this action is to effectively reduce the potential of wildland fire to migrate, protect life and property, and ensure perpetuation of the cultural and natural resources of the park. By avoiding wildfire, associated loss of life and property, and exposure to the dangers of fire are removed. In addition, avoiding the costs and results of large-scale fire suppression would result in efficient use of public funding for park operations and maintenance. This alternative provides the most effective fuel load reduction to allow reinstitution of the preserve's prescribed fire routine.

An educational program and discussions with the community about the need and safety of the treatments and the frequency and timing of treatment operations could assist in gaining support for the treatment programs.

Cumulative Effects. Alternative B, in combination with the current fire management activities, poses negligible to minor short-term risk to public health and safety. In the long-term, effects would be beneficial due to the reduction in fuel loading at the preserve boundary, which would deter fire migration.

Conclusion. Alternative B would not affect public health and safety in the short-term. Long-term effects would be beneficial, minor to moderate and associated with reduced opportunity for fire to move outside the preserve.

Impacts of Alternative C, Mechanical (One-Time Treatment)

Reducing the high fuels loads with only mechanical treatment would not effectively create the appropriate conditions for reinstituting the preserve's prescribed burn regime, and therefore provides no long-term protection for adjacent landowners. Mechanical thinning may also generate noise levels that have an adverse effect of the local community.

Cumulative Effects. Alternative C, in combination with the current fire management activities, poses direct, minor, short-term effects associated with use of heavy equipment at the urban interface. There is no additional hazard posed to the public at large. In the long-term, effects would be beneficial due to the reduction in fuel loading at the park boundary, which would deter fire migration.

Conclusion. Alternative C would not affect public health and safety in the short-term. Long-term effects would be beneficial, direct, minor to moderate, and associated with reduced opportunity for fire to move outside the preserve.

Impacts of Alternative D, Chemical (One-Time Treatment)

The controlled use of herbicides along the urban interface would pose negligible to minor, short-term, adverse effects to public health and safety. Following chemical treatment, there would be a short-term effect of an increasing in fire hazard associated with standing dead vegetation. Over the longer-term, the risk of fire migration from the preserve would be reduced.

Reducing the high fuel loads with only chemical treatment would not effectively create the appropriate conditions for reinsituting the preserve's prescribed burn program. In the long-term, effects would be beneficial due to the reduction in fuel loading at the park boundary, which would deter fire migration.

An educational program and discussions with the community about the need and safety of the treatments and the frequency and timing of treatment operations could assist in gaining support for the treatment programs.

Cumulative Effects. Alternative D, in combination with the current fire management activities, poses negligible to minor hazard to the public at large. When implemented with the current fire management plan, direct, long-term, effects would be minor to moderate and beneficial due to the reduction in fuel loading at the park boundary, which would deter fire migration.

Conclusion. Alternative D would pose negligible adverse effects to public health and safety in the short-term. Long-term effects would be beneficial, direct, minor to moderate and associated with reduced opportunity for fire to move outside the preserve.

CONSULTATION/COORDINATION

AGENCIES/TRIBES/ORGANIZATIONS/INDIVIDUALS CONTACTED

SCOPING

Initial scoping for this project was conducted with the preserve's resource management staff (Doug Neighbors, Roy Zipp, David McHugh). Additional input from the fire ecologist (Fulton Jeansonne), safety officer (Charles Boettcher) and Visitor Protection Division (Johnny Stafford) was considered in drafting this document. Melvin Hinklin of 'Woods Gator' provided a video demonstrating the grinders capability. Consultation with the U.S. Fish and Wildlife Service identified the possibility of red-cockaded woodpecker presence, which was resolved with an area survey.

National Park Service staff sought public input from local residents through publication of a local newsletter ("Public Comment Request: Fire and the Urban Interface, the Wildwood Community") that was distributed to the community.

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 U.S. Environmental Protection Agency

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REFERENCES

Agee, J.K.

- 1973 Prescribed fire effects on physical and hydrologic properties of mixed-conifer forest floor and soil. University California Water Resource Center. 143.

Agee, J.K.

- 1974 Environmental impacts from fire management alternatives. Report to National Park Service, Western Regional Office, San Francisco, CA.

Agilvsgi, G.

- 1979 Wildflowers of the Big Thicket, east Texas and western Louisiana. Texas A&M University Press, College Station, Texas.

Correll, D.S. and M.C. Johnston.

- 1970 Manual of the vascular plants of Texas. The University of Texas at Dallas, Richardson, Texas.

Council on Environmental Quality, Executive Office of the President

- 1978 Regulations for implementing the procedural provisions of the National Environmental Policy Act. *Code of Federal Regulations* Title 40, Parts 1500-1508. Washington, D.C.

- 1981 Forty most asked questions concerning CEQ's National Environmental Policy Act regulations (40 CFR 1500 – 1508). *Federal Register* 46(55): 18026-18038.

Cox, P.W. and P. Leslie.

- 1988 Texas trees: a friendly guide. Corona Publication Company, Austin, Texas, Distributed by Texas Monthly Press.

Davis, W.B. and D.J. Schmidly.

- 1994 The Mammals of Texas. Texas Parks and Wildlife Press, Nongame and Urban Program, Austin, Texas.

Deshotels, J.D.

- 1978 Soil survey for the Big Thicket National Preserve, Texas. United States Department of Agriculture Soil Conservation Service, Texas Agric. Experiment Station.

Harcombe, P.A. and P.L. Marks.

1979 Forest vegetation of the Big Thicket National Preserve. Contract number: PX7029-8-0437. National Park Service, Santa Fe, New Mexico.

Harcombe, P.A., J.S. Glitzenstein, R.G. Knox, S.L. Orzell, and E.L. Bridges.

1993 Vegetation of the longleaf pine region of the west Gulf coastal plain. Proceedings of the Tall Timbers Fire Ecology Conference 18: 83-104.

Nixon, E.S. and B.L. Cunningham.

1985 Trees, Shrubs, and Woody Vines of East Texas. Bruce Lyndon Cunningham Productions, Nacogdoches, Texas.

Parks, H.B. and V.L. Cory.

1936 The fauna and flora of the Big Thicket area. Sam Houston State Teachers College, Huntsville, Texas.

Peterson, R.R.

2001 Letter from Richard R. Peterson, Park Superintendent to Carlos H. Mendoza, Project Leader, U.S. Fish and Wildlife Service, Division of Ecological Services.

Platt, W.J., G.W. Evans, and S.L. Rathbun.

1988 The population dynamics of a long-lived conifer (*Pinus palustris*). American Naturalist 131: 491-525.

Schmidly, D.J.

1983 Texas Mammals East of the Balcones Fault Zone. Texas A&M University Press, College Station, Texas.

Vines, R.A.

1977 Trees of East Texas. University of Texas Press, Austin, Texas.

Wells, C.G., R.E. Campbell, L.F. DeBano, C.E. Lewis, R.L. Frederickson, E.C. Franklin, R. C. Froelich, P.H. Dunn.

1979 Effects of fire on soil. United States Department of Agriculture Forest Service General Tech. Report WO-7. Washington, D.C.

U.S. Department of the Interior, National Park Service

1991 *Draft Environmental Assessment for Wildland Fire Management Plan: Yellowstone National Park, Idaho/Montana/Wyoming.*

2001 *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making.* [Washington, D.C.]

2001b Management Policies 2001. NPS D1416. [Washington, D.C.].

United States Environmental Protection Agency (USEPA)

1998 Prevention, Pesticides And Toxic Substances, (7508C). EPA 738-R-98-011. October.