# Big Thicket National Preserve

# Fire Management Plan

# 2004

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# *I. INTRODUCTION*

The primary objective of the fire management program is to allow fire to function in its natural ecological role (a goal of the 10 Year Plan), restore ecosystem balance (stand structure and diversity) of phyric communities, and manage hazardous fuels in the Urban Interface (a goal of the Cohesive Strategy) through the use of prescribed fire and mechanical treatments. Wildland fire response is based on ecological, social, and legal consequences. The plan describes a range of appropriated management actions that are consistent with resource management objectives, public health issues, firefighter and public safety, environmental laws and regulations, activities of the area, and is based upon the best available science. It incorporates mitigation, burned-area rehabilitation, hazardous fuel reduction, and restoration activities. It satisfies Directors Order 18's requirement that all areas with vegetation capable of sustaining fire will develop a Fire Management Plan.

The preserve's first Fire Management Plan was approved in 1982, and quickly developed initial attack capabilities and an active prescribed fire program through collaboration with local interagency partners, principally the Texas Forest Service, US Fish & Wildlife, National Forests of Texas, and Texas Nature Conservancy. Over twenty years of interaction with preserve resource management staff and managers has defined land management goals. The national FIREPRO program in the early 1990's provided non-ONPS funding, creating staff positions dedicated to fire management actions (not collateral duty assignments). The severe fire season of 2000, and subsequent years, provided the impetus for the Presidential Report on Managing the Impact of Wildfires on Communities and the environment, a National Fire Plan, the 10-Year Comprehensive Strategy (and Implementation Plan), and the Healthy Forest Initiative. This impetus also resulted in a standardized format requirement for fire management plans, and increased collaboration. On December 17, 2002 the preserve conducted Internal NEPA scoping, invited members of local government (Tyler County Commissioners), other land management agencies (Bureau of Indian Affairs, Alabama - Coushatta Tribe, The Nature Conservancy, USDA Southern Research Station, Texas Parks & Wildlife, US Fish & Wildlife) and local conservation groups (Stephen F. Austin University, Big Thicket Association), to develop a list of impact topics. An interdisciplinary group was formed to create fire management alternatives and determine the level of fire effects (see NEPA Compliance section). All persons that attended scoping sessions and local land management agencies will be sent a draft copy of the Fire Management Plan for comment. It will also be posted on the preserve's web page for public comment. The Texas Forest Service has the primary initial attack responsibility in the Big Thicket area, and increasing collaboration on all fire management activities will be pursued.

The plan will implement fire management policies and help achieve resource management and fire management goals as defined in: the Federal Wildland Fire Management Policy and Program Review, Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (USDOI/USDA), and A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

This Fire Management Plan meets National Environmental Policy Act (NEPA) requirements through the use of the Categorical Exclusion for Fire Management Plans published in the Federal Register (Vol 68, NO.108, pages 33814-33824). The standard Environmental Screening form and decision memorandum (per Environmental Statement Memorandum ESM03-2) is in Appendix C. National Historical Preservation Act (NHPA) requirements have been meet through an initial assessment of structures by Dethloff and Treat [1975] and clearance by the Texas State Historical Preservation Office (SHPO).

The authority for fire management is broadly stated in the "Organic Act" of the National Park System (Title 16 USC 1), dated August 25, 1916:

> **"...The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations...by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."**

Authorities for procurement, personnel, and other administrative activities necessary to accomplish wildland fire suppression missions are contained in the Interagency Incident Management Handbook. Authorities to enter into agreements with other Federal bureaus and agencies; with state, county, and municipal governments; and with private companies, corporations, groups and individuals are cited in NPS-20 (Federal Assistance and Interagency Agreements).

31 U.S. Code 665 (E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.
The authority for interagency agreements is found in "Interagency Agreement Between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture" (1982).

The authority for rendering emergency fire or rescue assistance outside of the National Park system is the Act of August 8, 1953 (16 USC 1b(1)), and the Departmental Manual (910 DM).

This Fire Management Plan will be reviewed, updated, and approved annually.

## *II. RELATIONSHIP TO LAND MANAGEMENT PLANNING AND FIRE POLICY*

### A. NPS Management Policies

The NPS is committed to protecting park resources and natural ecological processes; but firefighter and public safety must be the first priority in all fire management activities.

NPS fire management activities will be performed in accordance with the principles, policies, and recommendations of the Final Report of the Federal Wildland Fire Management Policy and Program Review, and with Part 620 of the Departmental Manual. The Wildland fire program at BITH will be managed within the policy, guidelines and standards of Directors Order – 18 and Reference Manual – 18. Air operations during wildland fire incidents will comply with the provisions of Director’s Order #60 (Aviation Management) and Parts 350-354 of the Departmental Manual.

All naturally caused wildland fires may be managed to accomplish resource management goals, provided there is an approved fire management plan, and provided they do not compromise firefighter and public safety, threaten property, or violate air quality laws or regulations.

To implement NPS Management Policies governing fire management, the NPS will administer its wildland fire program in a manner that will:

- Achieve maximum overall benefits and minimize damages of wildland fire use within the framework of land use objectives and resource management plans, while giving primary consideration to firefighter and public safety.

- Educate employees and the public about the scope and effect of wildland fire management, including fuels management, resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.
- Stabilize and prevent further degradation of natural and cultural resources lost in and/or damaged by impacts of wildland fires and/or fire management activities.
- Maintain the highest standards of professional and technical expertise in planning and safely implementing an effective wildland fire management program.
- Integrate fire management with all other aspects of park management.
- Manage wildland fire incidents in accordance with accepted interagency standards, using appropriate management strategies and tactics and maximize efficiencies realized through interagency coordination and cooperation.
- Scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program.
- Protect life and property and accomplish resource management objectives, including restoration of the natural role of fire in fire-dependent ecosystems.
- Effectively integrate the preservation of wilderness including the application of "minimum requirement" management techniques into all activities impacting this resource.

**B. Big Thicket National Preserve Authorization**

The Act establishing Big Thicket National Preserve (Title 16 USC 698) states:

> "That in order to assure the preservation, conservation, and protection of the natural, scenic, and recreational values of a significant portion of the Big Thicket area in the State of Texas and to provide for the enhancement and public enjoyment thereof, the Big Thicket National Preserve is hereby established...Such lands shall be administered by the Secretary as a unit of the National Park System in a manner which will assure their natural and ecological integrity in perpetuity in accordance with the provisions of this Act and with the provisions of the Act of August 25, 1916, as amended and supplemented."

The primary intent of Congress in establishing Big Thicket National Preserve is to assure the preservation of numerous representative areas typical of the Big Thicket region and to protect and preserve the natural values which make this 'biological crossroads' unique in the United States (H.R. 93-676, 93rd Congress, 1st Session, November 29, 1973).

The Big Thicket National Preserve brochure (for public distribution) states: People have called the Big Thicket an American ark and the biological crossroads of North America. The preserve was established to protect the remnant of its complex biological diversity. What is extraordinary is not the rarity or abundance of its lifeforms, but how many coexist here. Once vast, this combination of pine and cypress forest, hardwood forest, meadow, and backwater swamp is but a remnant….Major North American biological influences bump up against each other here: southeastern swamps, eastern forests, central plains, and southwest deserts. Bogs sit near arid sandhills. Eastern bluebirds nest near roadrunners. There are 85 tree species, more than 60 shrubs, and nearly 1000 other flowering plants, including 26 ferns and allies, 20 orchids, and four of North America's five types of insect eating-plants. Nearly 186 kinds of birds live here or migrate through. Fifty reptile species include a small, rarely seen population of alligators. Amphibious frogs and toads abound.

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, geographical location, climate, geology, topography, soils, and moisture gradient are significant factors contributing to the vegetative diversity of Big Thicket National Preserve.

C. **General Management Plan**, page 47, states in part:

"A fire management action plan will be formulated to establish criteria for wildfire suppression and management burns. In order to determine appropriate actions for long-term management, the National Park Service will evaluate the research in progress concerning fire history, fuel loads, and initiate a forest and ground fuel monitoring system."

D. **Resources Management Plan**, page 7, (1996 - Zip) states:

Fire Management - The purpose of the fire management program 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 groundcover.

Of the 86,500 acres within the Preserve, approximately 13,000 acres contain various mixes of highly fire dependent ecosystems. Almost seventy-five years of fire suppression prior to NPS acquisition has resulted in numerous vegetation changes - from fire dependent communities such as open pine savannahs and sandhills with dense herbaceous ground cover, toward mixed pine/hardwood and hardwood/pine forests with dense brush understory. The absence of fire has disrupted the natural processes of plant succession that was dependent upon periodic interruption by wildfire. 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. (Resources Management Plan - BITH-N-25.001).

E. **Desired Future Condition**

Removing invasive brush and utilizing fire's role as a dynamic force shaping the vegetative communities will restore forest structure and species abundance, creating an example of natural forests of the Big Thicket region. The application of wildland fire in vegetation communities historically dominated by fire-adapted species began in 1981 following approval of the original Fire Management Plan (McHugh 1981). An active prescribed fire program began in 1982, and focused on hazardous fuel accumulations within fire dependent ecosystems. The prescribed fire program includes the Hickory Creek Unit (wetland pine savannah), Turkey Creek Unit (pitcher plant bog, upland pine forest, and sandhill pine forest), Lance Rosier Unit (wetland pine savannah), and Big Sandy Units (upland pine forest). While these areas provided the most cost-effective treatments for the risk reduction, additional areas will be included as weather and other constraints permit.

## *III. WILDLAND FIRE MANAGEMENT STRATEGIES*

### A. General Management Consideration

The fire management program and activities will be based upon the best available science, incorporate the role of wildland fire as an essential ecological process, and utilize fire as a natural process and as a tool to restore and maintain cultural landscapes or dispose of vegetation and debris. It will ensure that cost effective programs and activities are based on values, risk management, and resource management objectives. Interagency coordination, cooperation, and involvement of all parties will be encouraged, and procedures among federal agencies standardized.

Fire management planning, preparedness, prevention, suppression, fire use, restoration and rehabilitation, monitoring, research, and education will be conducted on an interagency basis with the involvement of cooperators and partners. Big Thicket National Preserve will provide certified employees and equipment to participate in regional and national assignments per national fire level determinations. The preserve is an ‘umbrella park’ and provides fire management assistance, oversight, and national dispatch coordination to Padre Island National Seashore, Lyndon B. Johnson National Historical Park, and San Antonio Missions National Historical Park through interpark agreements. The preserve will pursue agreements with the Tyler County Firefighters Association and individual volunteer fire departments (Wildwood, Saratoga, Spurger, Dallardsville, Indian Springs, Kountze, and Silsbee) for wildland fire management and urban interface actions.

Collaborative efforts are guided by a Memorandum of Understanding with the Texas Forest Service that establishes cooperative efforts in fire management activities, a ‘mutual aid zone’, and co-share of a TFS transported/dozer unit; a state-wide All-Risk Memorandum Of Understanding between the Texas Forest Service, US Fish & Wildlife-Region 2, National Park Service-Intermountain Region, the Nature Conservancy-Texas Chapter, and the National Forests of Texas; and a Cooperative Agreement with the Alabama - Coushatta Indian Tribe (See Appendix E).

### B. Wildland Fire Management Goals

***Goal 1**: Make firefighter and public safety the highest priority of every fire management activity.*

***Objective: Ensure all wildland fire operations sustain no injuries to members of the public or firefighters.***

***Strategies:***

- All personnel involved in fire management operations will receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior.
- Fire management operations will be carried out by qualified individuals that promote the safe and skillful application of fire management strategies and techniques.
- Preserve neighbors, visitors and adjacent residents will be notified of all planned and unplanned fire management activities that have the potential to impact them.
- All or portions of the preserve will be closed to the public when fire activity poses a threat to human safety (at the discretion of the Superintendent).

- Maintain a proactive fire organization that effectively responds to changing fire conditions, coordinates with the Texas Forest Service, and assists other land management agencies.
- Manage all wildland fire incidents in the most cost effective manner possible commensurate with values at risk.

***Goal 2*: Manage wildland and prescribed fires in concert with federal, state and local air quality regulations.**

***Objective: Ensure air quality thresholds for National Ambient Air Quality Standards are not exceeded due to prescribed fire activities.***

***Strategies:***
- Impacts to air quality will be considered as a part of the prescribed fire go/no go decision, in all Prescribed Fire Plans, and implementation of all prescribed fire projects.
- Air quality impacts will be addressed as a part of the alternative development and selection in the Wildland Fire Situation Analysis (WFSA).
- Smoke impact mitigation measures will be developed and implemented for all prescribed fire actions.

***Goal 3*: Suppress all wildland fires occurring in the Corridor Fire Management Unit, or posing a threat to adjacent resources.**

***Objective: Contain 95% of all wildland fires in the Corridor FMU to a size of 20 acres or less.***

***Strategies:***
- Prioritize suppression actions on fires or portions of fires that threaten to damage public or private property.
- Assure safe, rapid response to wildland fires with trained and qualified personnel and equipment.
- Complete annual and regular preparedness reviews to assure program readiness.
- Ensure preserve staff responsible for fire operations understand wildland fire standards, guidelines and policy.
- Maintain an effective fire prevention program that eliminates human-caused fires and minimizes threats to life and property.
- Manage all wildland fire incidents in the most cost effective manner possible commensurate with values at risk.

***Goal 4*: Manage wildland fires within active treatment units and large floodplain or flatland hardwood forest areas so that preserve resources (natural, cultural, and improvements) are protected from damage by suppression actions, and costs reflect values at risk.**

***Objective: Manage suppression actions so that unnatural disturbance is minimized, suppression costs are reduced, and rehabilitation costs are less than 5% of suppression costs.***

***Strategies:***
- Ensure wildland fire suppression operations employ Minimum Impact Suppression Tactics (Interagency Standards for Fire and Aviation Operations [Redbook], page 11-31).
- Ensure fire operations personnel are briefed on preserve resources and potential damage from suppression actions.

- Ensure park staff members are assigned as resource advisor(s) to wildland fires within the preserve.
- Monitor, evaluate and report on the effects of fire on preserve resources.

***Goal 5*: Facilitate reciprocal fire management activities through the development and maintenance of cooperative agreements and working relationships with cooperator fire management entities.**

***Objective: Annually review and modify as necessary agreements with the agencies listed below and participate in annual meetings between cooperators.***

***Strategies:***

- Ensure cooperative agreement with the Texas Forest service is current and operational, and pursue mutual aid agreements with local volunteer fire departments.
- Participate in coordination meetings with the following entities:
  1. Texas Interagency Coordination Center
  2. Local Fire Program Analysis group
  3. Multi-Agency Coordination meetings
  4. Interagency Training Academies (board member)

***Goal 6*: Reduce wildland fire hazard around developed areas and adjacent to cultural and historic sites.**

***Objective: Ensure protection of administrative structures, cultural, and historic sites from unwanted wildland fire.***

***Strategies:***

- Apply mechanical hazard fuel reduction and prescribed fire within and adjacent to Urban-Interface Zones to reduce fire intensity and severity to lesser levels.
- Apply mechanical hazard fuel reduction and prescribed fire around those cultural and historic sites vulnerable to unwanted wildland fire.

***Goal 7*: Restore fire dependent ecosystems to natural species diversity and stand characteristics.**

***Objective: Employ mechanical manipulation and prescribed fire to control invasive brush, promote a natural herbaceous ground cover, restore Longleaf Pine as the dominate canopy species, control of exotic plant species, and improve wildlife habitat.***

***Strategies:***

- Maintain cooperative fire agreements with neighboring agencies to aid in the completion of annual prescribed fire goals: the Texas Forest Service, Texas Parks and Wildlife, National Forests of Texas (Sabine NF, Sam Houston NF, San Jacinto NF, Angelina NF), McFadden & Anahuac Reserves, the Alabama - Coushatta Indian Reservation, and the Sandyland Sanctuary and other lands administered by the Nature Conservancy of Texas.
- Train park staff to help plan and participate in prescribed fire operations.
- Integrate prescribed fire use into the public interpretive program.

## C. Wildland Fire Management Options

1. <u>Wildland Fire Suppression</u>

Big Thicket National Preserve consists of 15 management units totaling approximately 100,000 acres within 1,825 square miles of Southeast Texas. The preserve has approximately 530 miles of boundary due to the disjunct arrangement of the land units, and the long configuration of the corridor units. Initial attack of wildfires must consider the protection of adjacent values-at-risk as the highest priority when selecting the Appropriate Management Action. Commercial timber management is the most prevalent adjacent land-use activity, occurring along approximately 318 miles of boundary. Rural homesite developments occur on about 26 miles of boundary, and residential subdivisions occur along 12 additional miles. Oil and gas production fields and 80 miles of pipeline occur within or near the preserve. In corridor units, and high-risk boundary areas an aggressive suppression response is needed. The Appropriate Management Action will include use of natural barriers (all corridor units have waterways), and indirect attack where feasible. Direct attack with handtools or ATV pump units is preferred, but short handlines are acceptable if time permits. Plow lines are acceptable along the boundary (when essential) but will require rehabilitation. Burnout operations to strengthen lines must be considered. An interior dozer-plow line will be considered as a 'last-resort' alternative due to resource damage, and may be considered if staffing shortage, high values at risk, or fire behavior considerations (i.e. drought conditions) create a low potential of success.

Areas intensively managed by prescribed burns may have high values-at-risk adjacent to the boundary, but will have reduced fuel loads, and less fire intensity. The appropriate management action is to maximize the use of natural and existing man-made barriers, minimize the use of interior handline, and show a preference for handline over plowed line along the boundary. Indirect attack with burnout operations must be considered as a suppression option.

In floodplain vegetation areas within the interior of the units the Appropriate Management Action will utilize natural barriers, and minimize handline construction. Direct Attack with handtools and ATV pump units may be more cost effective on small fires and meet the goals of external cooperators.

2. Prescribed Fire

Of the 100,000 acres within the Preserve, approximately 13,500 acres contain various mixes of highly fire dependent ecosystems. Over one hundred years of logging and fire suppression prior to NPS acquisition has resulted in numerous vegetation changes. Fire dependent communities such as open pine savannahs and sandhills with dense herbaceous ground cover are becoming mixed pine/hardwood with dense brush understory. The absence of fire has disrupted the natural processes of plant succession and allowed fire tolerant shrub species [principally Yaupon and Wax Myrtle] to migrate upslope and dominate the understory of upland vegetation types. Loblolly Pine has also moved upslope from the floodplains and replaced Longleaf Pine as the dominant canopy tree. The preserves prescribed burn program has demonstrated that frequent prescribed burns, over a 20-year period, will control the brush and has replaced Loblolly Pine with Longleaf Pine in the seedling and sapling classes. Maintaining and expanding the prescribed fire program is essential to restoring the Longleaf Pine ecosystems. Fire regimes and condition class are discussed within the individual FMU's.

3. Wildland Fire Use

Wildland Fire Use is not an appropriate management designation because of the size, irregular shapes, non-contiguous jurisdictional landbase, community and interface issues, and expected fire behavior of the Fire Management Units. The extensive floodplain and flatland hardwood forests of the Neches River and Pine Island Bayou drainages have less intense fires, but are not considered fire dependent, so resource benefits cannot be assumed. The ridge and drainage pattern has historically contained wildfires, and several 'natural outs' are documented in the preserve's fire history. The appropriate management response will utilize natural barriers, stress MIST tactics (i.e. rakes and leaf blowers when possible), and minimizing cost.

4. Non-Fire Applications

   Mechanical treatments will accelerate restoration goals and reduce hazardous fuel loading in urban interface zones.

**D. Description of Fire Management Units**

Big Thicket National Preserve protects a complex mosaic of 12 vegetation types within nine land units and six corridor units. Each unit was originally selected because of its unique characteristics. The Fire Management Units group these by location, similarity, and dominant vegetation types.

The first three FMU's have the preponderance of fire dependant ecosystems (Upland Pine, Wetland Pine Savannah, Sandhill Pine, and Upper-Slope Pine-Oak), and are the main focus of planned ignitions for resource management and hazardous fuel reduction goals.

The **Big Sandy FMU** includes the Big Sandy Creek Unit and the adjacent portion of Menard Creek Corridor that is north of FM943. It has the largest areas of Upland Pine and Upper-Slope Pine-Oak vegetation types. The Alabama - Coushatta Indian Reservation adjoins the northern boundary.

The **Hickory Creek FMU** is the Hickory Creek Unit. It has the most critical Urban Interface [Wildwood Resort Community] in the preserve.

The **Turkey Creek FMU** is the Turkey Creek Unit. It contains the most diverse mix of vegetation types.

The **West Hardin FMU** includes the Lance Rosier Unit and Loblolly Unit. The Lance Rosier Unit is the largest unit, has extensive flatland hardwood forest, and contains wetland pine savannahs in the northeast corner that are fire dependent and managed by prescribed burning. The Loblolly Unit is one of the smallest units, and supports flatland hardwoods.

The **Beech Creek FMU** is the Beech Creek Unit. It is similar to the Neches River Bottoms FMU, but has a more defined drainage pattern as it is west of the floodplain. Lower-Slope Hardwood-Pine is dominant with large areas of midslope and Upper-Slope vegetation in the northeastern half of the unit.

The **Canyonlands FMU** is the Canyonlands Unit (adjacent to the Upper Neches River Corridor) is a recent expansion of the preserve (i.e. a legislated boundary), but not purchased. It has steep slopes to the Neches River floodplains that support hardwood forests. Areas west of the slopes are in Loblolly Pine plantations and will require extensive restoration.

The **Neches River Bottoms FMU** includes the Jack Gore Baygall & Neches Bottom Unit, and the Beaumont Unit. They are within the Neches River floodplain and support hardwood forest that are broken up by numerous perennial and intermittent drainages.

The **Corridor FMU** includes existing corridors [Upper Neches River, Lower Neches River, Little Pine Island Bayou, and Menard Creek] and expansion areas [Big Sandy Creek Corridor, and Village Creek Corridor]. While they are generally narrow and incised into hardwood floodplains, some have steep slopes that support more flammable vegetation types. Several high-density communities are adjacent to these waterways.

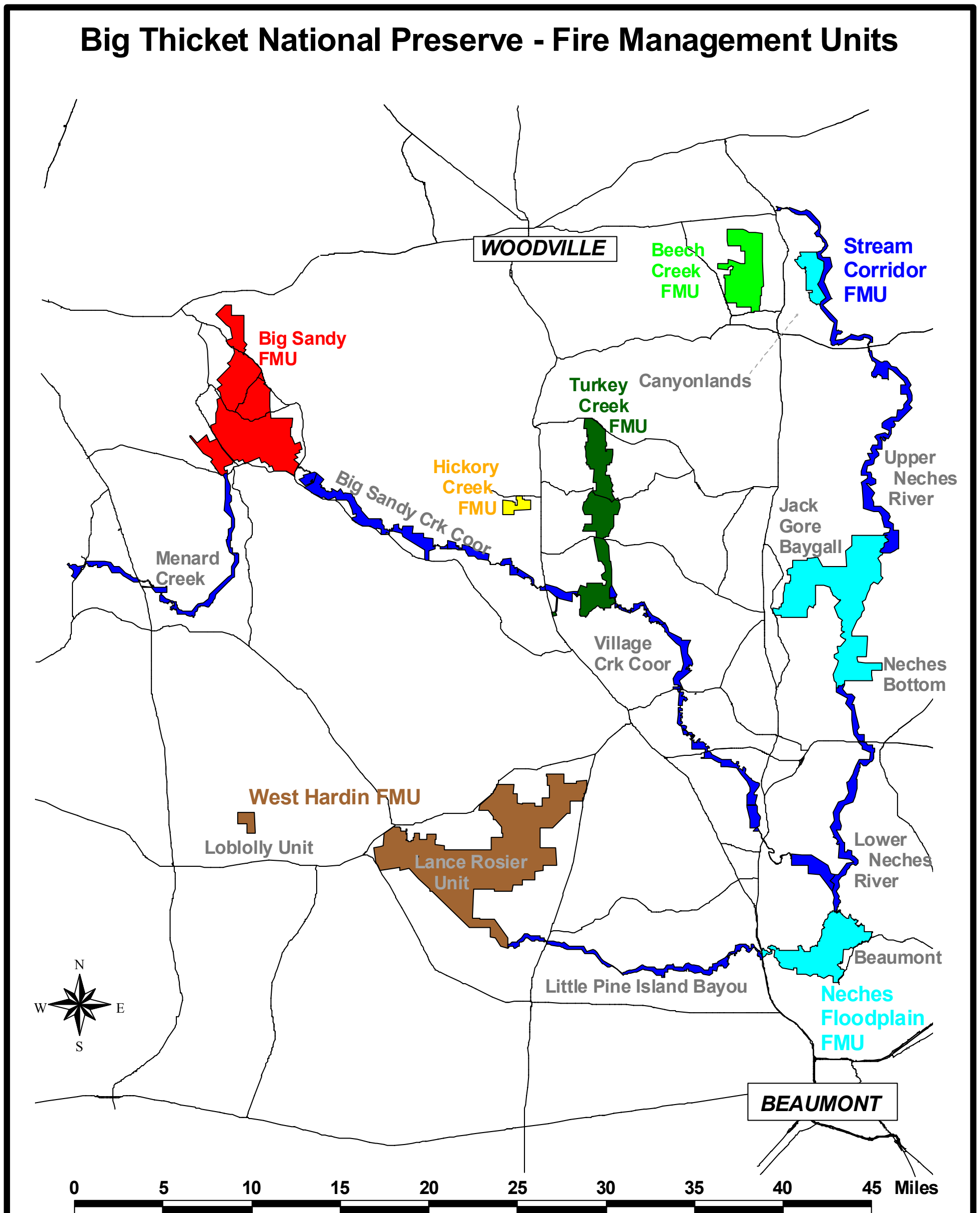


Figure 1

| Approximate area of each FMU | | |
|---|---|---|
| Big Sandy Creek FMU | | 15,141 |
| Hickory Creek FMU | | 677 |
| Turkey Creek FMU | | 7,846 |
| Beech Creek Unit | | 4,926 |
| West Hardin FMU | | 26,399 |
| *Lance Rosier Unit* | *25,826* | |
| *Loblolly Unit* | *573* | |
| Neches River Floodplain FMU | | 20,885 |
| *Canyonlands Unit ** | *1,704* | |
| *Jack Gore Baygall & Neches Bottom Unit* | *12,852* | |
| *Beaumont Unit* | *6,329* | |
| Stream Corridors FMU | | 20,792 |
| *Upper Neches River Corridor* | *4,575* | |
| *Lower Neches River Corridor* | *2,523* | |
| *Little Pine Island Bayou Unit* | *2,153* | |
| *Menard Creek Corridor* | *2,644* | |
| *Big Sandy Creek Corridor ** | *4,788* | |
| *Village Creek Corridor ** | *4,109* | |
| | TOTAL | 96,666 |

Table 1a

## 1. GENERAL AREA

PHYSIOGRAPHY AND SOILS

Big Thicket National Preserve is located on the geologically young Coastal Plain of Southeast Texas. Streams deposited alluvial plains and deltas as surface formations during interglacial periods of the Pleistocene epoch. Soils reflect differences in geology and drainage conditions. The oldest geologic formations occur in the northern Big Thicket area and include the Flemming and Willis formations. Sandy loams and silty loams dominate the upper preserve. Northern areas are undulating and well drained compared to the low, flat, poorly drained areas of the southern portion. The youngest formations occur in the central and southern Big Thicket area and include the Bentley, Montgomery, and Beaumont formations. The sediments of these formations are mainly comprised of fluviatile-to-marine gravels, sands, silts, clays, and marls in strata dipping towards the coast. Urbo and Mantachie are the most common floodplain series and Bowie and Kirbyville predominate elsewhere. Elevation reaches a maximum of 365 feet in the Big Sandy Creek Unit and then drops southward until it is near sea level in the vicinity of Pine Island Bayou. Deshotels (1978) lists 51 soil-mapping units in Big Thicket National Preserve.

Slow-moving waters in streams and rivers dissect the Big Thicket area, generally towards the southeast. The preserve lies almost entirely within the Neches River drainage, and includes the Neches River south of Steinhagen Reservoir to Beaumont. It also includes portions of the two major stream systems of the area, Village Creek and Pine Island Bayou. Menard Creek is the only stream system associated with the Trinity River to the west (see Figure 1).

CLIMATE

The climate of the Big Thicket region contributes significantly to its floral richness. The southerly latitude and close proximity to the Gulf of Mexico insure a warm, humid climate during most of the year. Average annual temperature is 67.1°F with an average monthly minimum of 51.1°F in January, and an average maximum of 81.7°F in August. The growing season averages between 228 and 250 days from north to south over the region (Trenchard 1977).

Average annual precipitation ranges between 46 to 52 inches from north to south over the region, and is reasonably well distributed through the year. March and July are typically the driest months throughout the region. Winter precipitation is generally associated with frontal activities and uniformly blankets the area. Summer precipitation is generated by the Gulf of Mexico and impacts the southern preserve. Much of the precipitation is of the convective type and excessive rains of short duration are rather frequent. Thunderstorm frequency is high, and thunderstorms occur on an average of 63 - 70 days annually. The most persistent rains are generally associated with warm fronts and stationary fronts during the colder season and with dissipating tropical storms during the summer and early fall.

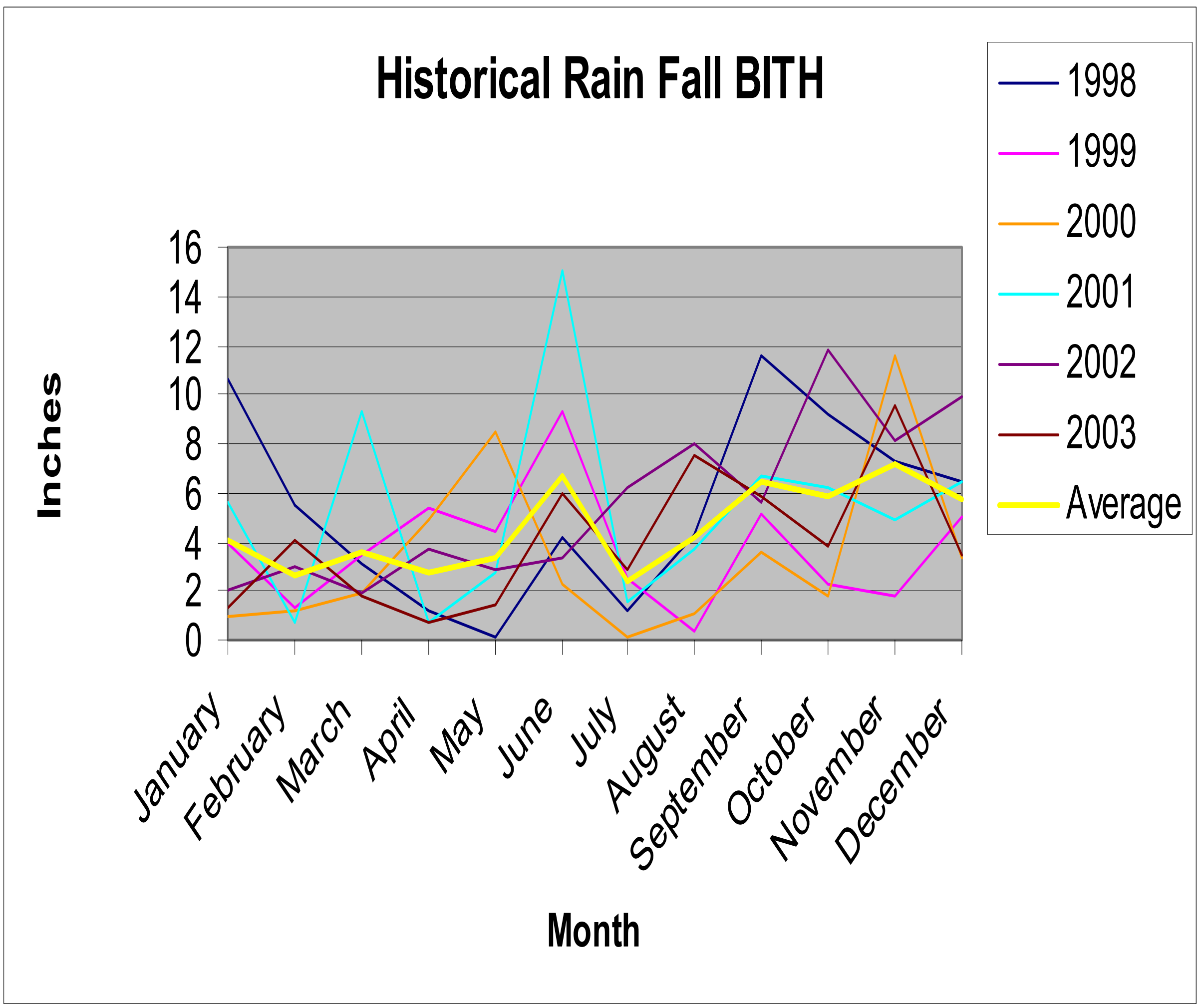



Figure 2

AIR

The Big Thicket National Preserve is a Class II area. The preserve is located in seven counties of Southeast Texas, which has major petroleum refineries along the coast. The southern preserve boundary is with Jefferson County, a non-attainment area. Air quality sampling has demonstrated that ozone pollution from Houston is a significant contributor. Local and state government agencies are striving to avoid restrictions.

Air pollution from forest fires has been a natural ecosystem output for thousands of years, cycling carbon and other materials into the atmosphere (Komarek 1970). However, the subsequent regrowth of forest vegetation balances the carbon cycle. Forest fires, along with natural hydrocarbon emissions from plants, are considered as major sources of natural air pollution.

Burning of forest fuels commonly produces various emissions including carbon dioxide, water, particulates, carbon monoxide, and occasionally low amounts of nitrogen oxides. Carbon dioxide and water are not considered air pollutants. The others are criteria pollutants, particulates, and carbon monoxide being the most important.

Airborne particulates are the primary pollutant of wildland fires (Komarek 1970). Particulate emissions generally range from 0.001 to 10 microns in size, the average smoke particle being about 0.1 microns in diameter. Most of the larger particles gravitate out of the air (Agee 1974). Larger smoke particles, especially those around six microns in diameter, scatter light and produce opaque fogs (Agee 1974). As the size decreases below 5.0 microns in diameter, increasing numbers are deposited in the lower respiratory tract--including over 50 percent of those between 0.01 and 0.1 micron. Many forest fire smoke particles have a potential for being deposited deep in the lungs.

The concentration and size of particulates emitted during forest fires depends on the amount and type of fuel consumed, fuel moisture content, and rate of fire spread. Particulate production from low-intensity fires is significantly less compared to high-intensity wildfires. Low-intensity fires consume less fuel per unit area and produce less particulate per unit weight of fuel. Particulate production from intense wildfire may be ten-times higher than that associated with low-intensity prescribed fire (Agee 1974). High-intensity fires often produce very small particulates; low-intensity fires tend to produce large particulates.

Methods suggested to reduce particulate emissions include (1) use of low-intensity backfires or flank fires because they tend to burn more slowly and consume more fuel, (2) burn when fuel moisture is low to maximize combustion, and (3) conduct burning under favorable dispersal conditions to minimize visibility problems.

Carbon monoxide is given off in substantial quantities (60 lb./ton) when forest fuel is burned, but seems to oxidize quite readily and does not pose a threat to people, plants, or animals (Wright and Bailey 1982). Carbon monoxide emissions also increase with fuel moisture; dry fuels subjected to fire produce much less carbon monoxide than wet fuels (Agee 1974).

Maintaining forest health requires the acceptance of a fire every three to five years. Prescribed fires conducted under this plan would mean that everyday a prescribed burn puts smoke into the airshed; it is contributing 1094 to 1824 days of oxygen to the airshed.

VEGETATION – Ecology

The significant influence exerted by fire on southern forest ecosystem maintenance was recognized by Komarek (1974) when he proposed the name, "southern pine forest lightning fire bio-climatic region", to describe Coastal Plain and Piedmont habitat from southern Virginia to east Texas. Literature strongly supports that fire has been important ecologically for thousands of years in many forest types in the Southeast. Unfortunately, the activities of man have been largely responsible for altering the ecological balance throughout the region (i.e. conversion of mixed forest stands to pine plantations, subdivision development, agricultural clearing, and wildland fire suppression).

The effects of fire vary according to vegetation type, forest structure, species composition, fire frequency and intensity, and seasonality of fire. Each of these variables is briefly addressed in relation to the vegetation types occurring in Big Thicket National Preserve. The basic premise is that, historically, the distribution of vegetation types was controlled primarily by moisture characteristics and soil type related to topography and by fire.

Upland Pine Forests

Aboriginally, longleaf pine was the dominant species occupying the uplands and savannahs throughout the region. Today, longleaf pine is the dominant overstory species in Upland Pine Forest, and commonly occurs in Wetland Pine Savannah and Upper-Slope Pine-Oak Forest (Harcombe and Marks, 1979). Longleaf is also present in the xeric (dry) Sandhill Pine Forest vegetation type.

The relationship between fire and species life-history patterns is perhaps clearest in longleaf pine. The essential role of frequent fire to the growth, development, and maintenance of longleaf pine forests has been known for many years (Chapman 1932, Wahlenberg 1946). Longleaf pines germinate and establish best on mineral soil. After germination, a taproot develops and continues to penetrate the soil for three to five years while in the "grass" stage. During this stage the bud is protected by a sheaf of long needles and fire resistant scales. Following this stage, the seedling rapidly puts on apical (top) growth so that in three to four years the sensitive apical bud is high enough to avoid damage from low-intensity surface fires (Christensen 1981). After the sapling stage it is virtually fire resistant, except to hot fires when new shoot axis or "candles" are expanding in spring and early summer (Komarek 1974).

Longleaf pine is often associated with a dense herb layer rich in species of grasses and forbs, which are highly flammable. Chapman (1932) suggests that lightning-caused fires probably occurred in these forests and savannahs as frequently as three to four years apart. Chapman also notes that five to six years of fire protection may so alter the ecological conditions that seedlings, if established, cannot compete with the herbaceous vegetation. Wright and Bailey (1982) predict that in the absence of fire, longleaf pine forests gradually succeed to a southern mixed hardwood community dominated by fire-intolerant species.

Recent evidence suggests that Upland Pine Forest is indeed beginning to succeed to a more fire-intolerant community. The presence of sweet gum and loblolly pine in the overstory (Table 3), species that should occur in topographically lower vegetation types and areas with low fire frequency, supports this statement. A marked reduction in fire frequency is largely responsible for these species presence. Watson (1979) notes that yaupon, an original member of upland longleaf communities, is now forming dense "thickets" as a result of fire suppression. Upon ignition, these thickets produce an intense fire (80 foot flame lengths), which can kill mature overstory longleaf pine.

Rare fire-dependent herbaceous species typically associated with Upland Pine Forest include puccoon (Lithospermum caroliniense), wine-cup (Callirhoe papaver), bird-foot violet (Viola pedata), bristly sensitive brier (Achrankia hystricina), prairie phlox (Phlox pilosa), butterfly-weed (Asclepias tuberosa), and slender gay-feather (Liatris tenuis) (Ajilvsgi 1979, Watson 1982). The endangered Texas trailing Phlox (Phlox Nivalis) recently appeared in the Big Sandy Unit following a planned ignition.

It is increasingly obvious that frequent low-intensity fires are necessary to maintain longleaf pine upland communities. Fire frequency near that suggested by Chapman (1932) allows longleaf pine to predominate the overstory canopy, regeneration of displaced species is reduced, and a species-rich herb layer is maintained.

Wetland Pine Savannah

The presence of widely scattered longleaf pine and numerous phyric herbaceous species in Wetland Pine Savannah strongly suggests that this community type have long been influenced by frequent fire as well. Coastal Plain savannahs are known to be extraordinarily high in floristic diversity. The herb flora includes numerous species of orchids and other showy wildflowers, and a diverse assemblage of carnivorous plants including the pitcher plant (Sarracenia alata). Most of the several hundred members of the species-rich graminoid forb layer, characteristic of pine savannahs, are shade-intolerant and many disappear within a few years of fire exclusion (Frost et al. 1986). The vast majority of plants occurring in pine savannahs are not only adapted to low, wet, acid areas but also to regular and recurring fires for they cannot compete with either heavy accumulations of dead grasses or the shade and competition of brush species (Komarek 1974).

Rare plant species occurring in this vegetation type consist of the snowy orchid (Hebenaria nivea), yellow fringed orchid (H. ciliaris), grass-pink (Calopogon pulchellus) bearded grass-pink (C. barbatus), rose pogonia (Pogonia ophioglossoides), bottle-gentian (Gentiana saponaria), bartonia (Bartonia texana), spring bartonia (B. verna), prairie rose-gentian (Sabatia campanulata), and blue-star (Amsonia glaberrima) (Ajilvsgi 1979, Watson 1982). Blue-star is currently proposed for inclusion on the federal list of "Endangered and Threatened Plants."

Watson (1979) states that normally, the only trees on the wetland savannahs are stunted bushy black gums and widely spaced longleaf pines. Data presented by Harcombe and Marks (1979) show that the overstory not only consists of scattered longleaf pine and black gum but also loblolly pine and sweet gum contribute significantly to total basal area (Table 3). According to Watson (1979) loblolly pine and sweet gum, fire-intolerant invaders, and sweet bay and wax myrtle, original members of the community, are beginning to dominate the savannahs in the absence of fire.

Streng and Harcombe (1982) substantiated this observation by showing that declining fire frequency in the Hickory Creek Savannah Unit is accompanied by an increase in hardwood species and loblolly pine. They further show that increasing canopy cover is causing a decline in herbaceous cover, an increase in hardwood leaf litter, resulting in lower flammability and reduced fire probability.

It is widely accepted that fire suppression in pine savannah ecosystems leads to virtually irrevocable conversion from fire communities to non-pyrophytic shrubland or forest. Vegetation community structure and composition in Wetland Pine Savannahs are strongly dependent on both soil saturation and the occurrence of frequent, low-intensity fires. Christensen (1981) suggests that the natural fire frequency for Coastal Plain savannahs was probably two to eight years based upon the life histories of many of the dominant species and rates of fuel accumulation (Appendix H.).

Fire chronologies constructed from basal disks taken from three large longleaf pines in the Hickory Creek Savannah Unit indicate that the mean fire interval was 3.9 years, ranging from two to seven years, during the period 1928-1967 (Glitzenstein and Harcombe 1986). Fire scars are absent after 1967. Thus, pine savannahs are typified by fire frequencies similar to Upland Pine Forest.

<u>Sandhill Pine Forest</u>

The presence of longleaf pine in Sandhill Pine Forest implies that this vegetation type was historically influenced by fire. As previously noted, the currently dominant species are dwarf-like bluejack oak and post oak with an emergent overstory of scattered loblolly, shortleaf, and longleaf pine. These areas were probably once dominated by denser pine overstories (longleaf and shortleaf pine) with sparser hardwood understories (Christensen 1981). Christensen suggested that the current structure and composition of Sandhill Pine Forest might be a historical artifact reflecting past abuses. This theory is plausible considering the extensive logging and grazing which occurred historically throughout the region.

Since fire frequency is dependent on the accumulation of ground fuels, it is reasonable to conclude that the logging of pines and the reduction of grasses through grazing activity directly resulted in decreased fire frequency. This conclusion may explain the present dominance by xeric oaks, the highly unusual presence of loblolly pine, which currently dominates all other pine species, and the occurrence of sweet gum (Table 3). Loblolly pine and sweet gum are river bottom and creek bottom species that often invade disturbed areas because of good seed dispersal and wide tolerance of habitats in the absence of fire (Harcombe and Marks 1979).

The presence of remnant longleaf pine and the xeric oaks suggests that historically low-intensity fire occurred frequently enough to maintain the longleaf while enabling bluejack oak and post oak to exist in the understory. Some xeric sandhill forests in the Coastal Plain accumulate sufficient pine litter and ground fuel within a three to five year period to carry low-intensity fires (Christensen 1981). This forest type most likely experienced natural fire every four to seven years (Table II). In its present condition, it may not burn this frequently due to the rather slow accumulation of flammable fuels. Rare phyric herbaceous species occurring in Sandhill Pine Forest include wahlenbergia (<u>Wahlenbergia</u> <u>marginata</u>), rose vervain (<u>Verbena</u> <u>canadensis</u>), Oklahoma prairie clover (<u>Petalostemum</u> <u>griseum</u>), reverchon palafoxia (<u>Palafoxia</u> <u>reverchonii</u>), clammy-weed (<u>Polanisia</u> <u>erosa</u>), whitlow-wort (<u>Paronychia</u> <u>drummondii</u>), catchfly (<u>Silene</u> <u>subciliata</u>), Winkler gaillardia (<u>Gaillardia</u> <u>aestivalis</u>), and trailing phlox (<u>Phlox</u> <u>nivalis</u> <u>texensis</u>) (Ajilvsgi 1979, Watson 1982). A community of Trailing phlox is being established under a separate recovery plan.

Upper-Slope Pine-Oak Forest

Slope forests adjacent to longleaf pine uplands are actually transitional zones between uplands and floodplains. Species composition of these forest types is largely dependent upon topographic position, soil type, moisture gradient, and fire frequency. It is reasonable to assume that Upper-Slope areas should be dominated by species that require periodic fire, whereas the Lower-Slope areas near creek bottoms and floodplains should be dominated primarily by fire-intolerant species. However, fire suppression has resulted in an upslope migration of Lower-Slope species, and has also allowed the development of a rather dense hardwood understory and shrub stratum, particularly on the Upper-Slopes.

Shortleaf pine and longleaf pine are the dominant "fire-indicator" canopy species in Upper-Slope Pine-Oak Forest (Table 3). In fact, shortleaf pine reaches its peak importance in this type (Harcombe and Marks 1979). The very presence of shortleaf and longleaf pine is evidence that low-intensity fires occurred historically in this vegetation type. Schafale and Harcombe (1983) conclude that this vegetation type shows characteristics that indicate a strong fire influence occurred in the past. A reduction in fire frequency due to aggressive suppression during the last 40 - 50 years may explain the conspicuous presence of loblolly pine, sweet gum and black gum in the canopy today (Table 3).

Shortleaf pine probably dominated the canopy historically, as it does today, and longleaf pine, blackjack oak, and post oak were more than likely codominant. In order for shortleaf pine to have maintained its dominant position in this type, fire must have occurred less frequently than in upland longleaf pine forests and savannahs (3-4 yr.), but frequently enough to preclude establishment of loblolly pine and other creek bottom species which are less fire-tolerant.

Chapman (1944) states that shortleaf pine became established and grew best on sites where fire intervals were less than 10 years. Once fire frequencies approach a 10-year interval, loblolly pine overtakes shortleaf pine (Wright and Bailey 1982). Thus the evidence suggests that a fire interval ranging from six to eight years maintains the proper forest structure and species composition in Upper-Slope Pine-Oak Forest (Table 3). The suggested fire frequency favors shortleaf pine while providing for regeneration of longleaf pine and fire-tolerant hardwoods, and maintenance of a relatively open understory and shrub stratum.

Mid-Slope Oak-Pine Forest

The importance of fire in maintaining Mid-Slope Oak-Pine Forest is less clear. However, the presence of shortleaf pine in the canopy indicates that fire historically influenced this vegetation association. Loblolly pine currently dominates the canopy, followed by southern red oak, shortleaf pine, and white oak (Harcombe and Marks 1979). The significant contribution of Lower-Slope and floodplain hardwood species (i.e. sweet gum, black gum, red maple, willow oak, and water oak) to tree basal area (Table 3) indeed confirms an upslope migration of fire-intolerant species as noted by Watson (1979).

Fire occurrence about every eight to ten years prevents vigorous invasion by Lower-Slope and floodplain hardwoods while allowing shortleaf and loblolly pine to thrive (Chapman 1944, Wright and Bailey 1982). If fire occurs more frequently, favorable conditions for establishment of longleaf pine result. Conversely, fire frequencies in excess of 10 years favor invasion of loblolly pine and associated floodplain hardwoods.
Therefore, natural fire frequencies in Mid-Slope Oak-Pine Forest were probably eight to 10 years.

Lower-Slope Hardwood-Pine Forest

Lower-Slope Hardwood-Pine Forest is a mesic vegetation association dominated by fire-intolerant hardwoods and loblolly pine. Clearly, the problem of post-fire succession is less critical in this type compared to the other communities. Edaphic influences are of extreme importance in these beech-magnolia-loblolly pine forests. However, the continued presence of loblolly pine may be related to infrequent fire since this species requires mineral soil for successful germination (Table II). A fire scar at the base of hardwoods, especially beech, is evidence that fires historically occurred in this vegetation type, possibly during cycles of extreme drought (Watson 1986). It should be noted that Big Thicket National Preserve is not intending to directly ignite this vegetation type.

The discussion of fire effects this far has focused primarily on fire frequencies necessary to maintain dominant species in representative vegetation types. Equally important factors include fire intensity, resistance of vegetation to fire, reproductive mechanisms, recovery characteristics, and season of burning.

The literature indicates that frequent low-intensity fires were common throughout the southeast Coastal Plain. Fires involving the crown of overstory trees were undoubtedly very rare. Therefore, a species survival and persistence in southeast phyric ecosystems must be equated to its ability to resist damage from low-intensity heat coupled with efficient post-fire reproductive and recovery mechanisms.

Species differ in fire resistance because of inherent differences in insulating efficiency and thickness of bark. As an example, longleaf pine can withstand up to twice as much external heat as can sweet gum and American holly for a given bark thickness (Hare 1965). In general, pines are much more tolerant of heat than are hardwoods. However, fires at high intensities can be damaging to all understory and canopy species.

Dormant and adventitious buds are common survival mechanisms for some species of pine and numerous species of hardwoods and shrubs (Langdon 1981). Shortleaf and longleaf pine can sprout from dormant buds after being top-killed by a low-intensity fire. Loblolly pine does not exhibit this characteristic. Many hardwoods, such as sweet gum, black gum, red maple, American holly, flowering dogwood, and most of the oaks stump from basal sprouts rather prolifically after being top-killed by a low-intensity fire (Langdon 1981). Various shrubs, including blackberry, wax myrtle, and gallberry also sprout prolifically after being top-killed by fire. However, many of these species may be completely killed by a single high-severity wildland fire. After many years of fire suppression, the accumulation of organic material on the forest floor may move the reproductive structures out of the soil into the flammable litter and organic layers. The additional fuel alone can provide a significant heat pulse through the soil to the reproductive structures. By burning during higher duff moisture levels, this accumulation can be peeled away until natural conditions are obtained.

Langdon (1981) conducted a replicate study to determine the effects of low intensity-fire on understory hardwoods that commonly invade commercial loblolly pine stands. The burning treatments were conducted at varying frequencies and seasons (i.e. periodic winter, periodic summer, annual winter, annual summer and biennial summer). In terms of fire effects on small hardwoods, he determined that periodic winter and summer burns increased the number of 0-2.5cm diameter hardwood stems by 26% and 66%, respectively. The largest increases were noted in sweet gum, black gum and the oaks. Thirty annual winter burns increased small hardwood stems four-fold. In contrast, 30 annual summer burns resulted in a substantial decrease in small hardwoods of all species. Larger hardwood stems (5-10cm dbh) were significantly decreased by all burning treatments. Langdon noted that many of the top-killed stems in the periodic burn and annual winter burn plots provided the rootstocks for sprouting 2.5cm stems. Annual summer fires completely killed nearly all hardwoods in the size class and prevented stems from growing into the class. A single fire, winter or summer, does not usually completely kill a high percentage of hardwoods (Langdon 1981), and winter fires kill much fewer stems than summer fires. Mortality from a fire in a particular season varies with fire intensity, burn severity, and species present; but even so, mortality from a single summer fire of moderate intensity is usually less than 25% (Langdon 1981). To effectively eliminate a large proportion of the understory hardwoods, it is necessary to top-kill the stem first and then use a series of summer fires to kill the rootstock (Langdon 1981).

Langdon's investigation also shows that frequency and season of fire had differing effects on the shrub component. Periodic (frequency greater than three years) low-intensity winter and summer fires increased the number of shrub stems by 1.2 and 1.4 times the control treatment, respectively. In contrast, annual winter burns decreased the number of shrubs to 54% of the control, and biennial summer fires were slightly more effective. Annual summer fires decreased shrubs to less than 10% of the control.

Watson (1982) presented a list of species within Big Thicket National Preserve noting individual species tolerance for low-intensity fire. Species well adapted to frequent fire include longleaf pine, most grasses, forbs, legumes, and pitcher plants. Species that can withstand occasional fire (every 5 - 10 years) because of inherent reproductive, survival, or recovery characteristics include shortleaf pine, black gum, flowering dogwood, bluejack oak, post oak, American holly, red bay, sweet bay, sassafras, titi, wax-myrtle, yaupon, and American beautyberry. The majority of species normally associated with more mesic environments are basically fire-intolerant. Such typical species consist of loblolly pine, American beech, southern magnolia, ironwood, red maple, and many of the oaks. However, infrequent low-intensity fires will not result in severe damage to these species.

VEGETATION – Current conditions

The following descriptions of vegetation types are taken from Harcombe and Marks (1979). Greater detail is afforded to those types that consist of phyric (fire-adapted) species and are considered to be fire-dependent. Scientific names are generally listed after the common name, and are also listed in Appendix C. The distribution and approximate area of **potential** vegetation types within existing Big Thicket National Preserve management units are presented in the following table. Expansion lands have not been classified. Actual vegetation is dependant upon land use history, and is described under each Treatment Unit.

**Acreage by Vegetation Type**

**Vegetation Type by Fire Management Unit**

| | | Big Sandy | Turkey Creek | Hickory Creek | Beech Creek | West Hardin | Neches River Floodplain | Stream Corridors | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| Upland Veg Types | *Upland Pine* | 960 | 176 | | | | | | 1136 |
| | *Wetland Pine Savannah* | | 521 | 367 | | 925 | | | 1813 |
| | *Sandhill Pine* | 22 | 110 | | | | | 25 | 157 |
| Slope Veg Types | *Upper Slope Pine Oak* | 5113 | 3029 | 290 | 63 | | 1563 | 764 | 10822 |
| | *Mid Slope Pine Oak* | 3228 | 569 | | 767 | | 703 | | 5267 |
| | *Lower Slope Hardwood Pine* | 4538 | 588 | | 3479 | 15303 | 3832 | 2582 | 30322 |
| Floodplain Vegetation Types | *Flatland Hardwoods* | | | | | 7367 | | 798 | 8165 |
| | *Stream Floodplain Forest* | 98 | 2194 | | 391 | | | 8872 | 11555 |
| | *River Floodplain Forest* | 926 | 212 | | 174 | 448 | 13481 | 7741 | 22982 |
| | *Cypress Tupelo* | 51 | 12 | | | | 1306 | 10 | 1379 |
| | *Baygall* | 205 | 435 | 20 | 52 | 2356 | | | 3068 |
| | TOTAL | 15141 | 7846 | 677 | 4926 | 26399 | 20885 | 20792 | 96666 |

Table 2

UPLANDS

Upland Pine Forest consists of open stands of longleaf pine that vary considerably in height and density. Loblolly pine and shortleaf pine are common overstory associates. Additional overstory species that may be present include bluejack oak, blackjack oak (Q. marilandica), southern red oak (Q. falcata), post oak, and sweet gum (Table 3). The understory is highly variable, depending upon fire history, and is dominated by saplings of the above species, roughly in the order indicated. Flowering dogwood (Cornus florida), American beautyberry (Callicarpa americana), Wax myrtle (Myrica cerifera), and winged sumac (Rhus copallina) are additional common understory species. Where woody species are absent from the understory due to fire, the herb layer is dense and consists of many species of grasses and forbs. Bluestem grasses (Andropogon spp.) are usually dominant in such areas. Upland Pine Forest is distinguished from Sandhill Pine on the basis of greater density and height of longleaf pine, lower importance of scrub oaks, and greater vigor and diversity of forbs and/or low shrubs.

Sandhill Pine Forest is short, open woodland with low tree density and basal area, low shrub density, and a relatively sparse herb layer. Bluejack oak (Quercus incana) and post oak (Q. stellata) are dominant, and there is an emergent overstory of widely scattered loblolly pine (Pinus taeda), shortleaf pine (P. echinata), and longleaf pine (P.palustris). Bluejack oak and post oak reach their maximum importance in this type and are relatively unimportant in any of the other types (Table 3). In spite of the openness of the tree canopy, there are no distinctive small tree or shrub species although red bay (Persea borbonia), flowering dogwood (Cornus florida), sweet gum (Liquidambar styraciflua), and yaupon (Ilex vomitoria) do occur. Rare phyric herbaceous species occurring in Sandhill Pine Forest include wahlenbergia (Wahlenbergia marginata), rose vervain (Verbena canadensis), Oklahoma prairie clover (Petalostemum griseum), reverchon palafoxia (Palafoxia reverchonii), clammy-weed (Polanisia erosa), whitlow-wort (Paronychia drummondii), catchfly (Silene subciliata), Winkler gaillardia (Gaillardia aestivalis), and trailing phlox (Phlox nivalis texensis) (Ajilvsgi 1979, Watson 1982).

Wetland Pine Savannah occurs in areas with poor drainage, ranging from small depressions or swales in Upland Pine Forest to broad, swampy, interdistributary flats. It is normally savannah, containing widely scattered longleaf pine or loblolly pine with little else in the overstory. Stunted individuals of black gum (Nyssa sylvatica), sweet gum, and southern red oak often occur (Table 3). Common understory shrubs include sweet bay (Magnolia virginiana), wax myrtle, and titi (Cyrilla racemiflora) that may occur in dense patches interspersed with grassy meadows that include sedges, insectivorous plants such as the pitcher plant (Sarracenia alata), and orchids. Wetland Pine Savannah is distinguished from Upland Pine Forest by the open tree layer and presence of wetland herbs and shrubs.

According to Watson (1979) the only trees that should occur in Wetland Pine Savannah are stunted black gum and widely spaced longleaf pine. Loblolly pine and sweet gum, fire intolerant invaders, and sweet bay and wax myrtle, original members of the community are beginning to dominate the savannahs, crowding out the herbaceous species and forming dense thickets.

SLOPES

Upper-Slope Pine-Oak Forest is a closed canopy forest with a moderately well developed shrub layer. Shortleaf pine is usually dominant, and southern red oak, longleaf pine, loblolly pine, and blackjack oak in some combination often are codominant (Table 3). Associated species include post oak, sweet gum, white oak, and black gum, all of which reach maximum importance in other types. Usually pines are more important than the hardwoods. The most dominant understory species are yaupon, flowering dogwood, and American beautyberry.

Upper-Slope Pine-Oak Forest is distinguished from Upland Pine Forest by the abundance of shortleaf pine, which reaches its peak importance in this type, and by the importance of oaks in the canopy. Several species, including mockernut hickory (Carya tomentosa), yaupon, blackjack oak, American beautyberry, and sassafras (Sassafras albidum) reach their maximum importance in this type.

Mid-Slope Oak-Pine Forest is generally taller, has a more closed canopy, and a greater proportion of hardwoods in the overstory than Upper-Slope Pine-Oak. Overstory dominants are loblolly pine, southern red oak, shortleaf pine, and white oak (Table 3). Sweet gum, black gum, and red maple (Acer rubrum) are next in tree basal area. In these forests the understory is dominated by understory species rather than canopy tree saplings, and the most important understory species are flowering dogwood, yaupon, American holly (Ilex opaca), and red maple. Southern red oak, white oak, flowering dogwood, and yaupon reach their maximum importance in this type. Foresters usually classify mid-Slope Oak-Pine Forest as loblolly-shortleaf type.

Lower-Slope Hardwood-Pine Forest generally occupies gentle-to-steep slopes near creeks. It has greater canopy density and hardwood abundance than does Mid-Slope Oak-Pine Forest although stand history will greatly influence the proportion of pine. In the northern part of the Big Thicket National Preserve American beech (Fagus grandifolia) is a conspicuous dominant; whereas, in the southern part it is absent. Southern magnolia (Magnolia grandiflora), loblolly pine, white oak, and water oak (Quercus nigra) are codominants. Other important species include laurel oak (Q. laurifolia), willow oak (Q. phellos) and American holly (Table 3). In the understory stratum, American holly and yaupon are most important. Lower-Slope Hardwood-Pine is widely recognized as a beech-magnolia-loblolly type.

FLOODPLAINS

Floodplain vegetation types occur on broad, flat terraces between the bluffs of the Neches River and along some of the major streams. Smaller streams support Floodplain Hardwood-Pine Forest dominated by loblolly pine, American beech, sweet gum, black gum, southern magnolia, and water oak (Table 3). The principal distinguishing features are the openness of the understory and the lack of shrubs. Floodplain Hardwood Forest occurs on active floodplains of larger streams and the Neches River. Water oak and sweet gum are the dominant overstory species, and ironwood (Carpinus caroliniana) also contributes significantly to tree basal area. Swamp Cypress Tupelo Forest occurs in deep sloughs and oxbow lakes and is dominated by bald cypress (Taxodium distichum) and tupelo (Nyssa aquatica).

Wetland Baygall Shrub Thicket occurs in uplands, slopes, and floodplains, apparently in response to the availability of seepage water. Stands of this type frequently occur in depressional areas where water stands much of the year. The overstory dominants are laurel oak and/or black gum. Sweet bay and red maple are characteristic associated species (Table 3). Titi and gallberry holly (Ilex coriacea) are the important understory species.

FLATLANDS

Flatland Hardwood Forest is found on low, wide, interdistributary flats in the southern and western part of Big Thicket National Preserve. Basket oak (Quercus michauxii) is most frequently dominant along with willow oak, laurel oak, overcup oak (Q. lyrata), sweet gum, black gum, and red maple (Table 3). Frequently the shrub stratum contains a dense cover of palmetto (Sabal minor) or arrowwood (Viburnum dentatum).

## Relative Abundance of Dominant Species by Vegetation Type

| | SH | UP | WPS | USPO | MSOP | LSHP | SFF | RFF | FH | BG | CT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bluejack oak | 4.7 | 0.5 | | | | | | | | | |
| Bluejack oak | | 0.2 | | 2.4 | | | | | | | |
| Post oak | 3.7 | 0.1 | | 1.3 | 0.2 | | | | | | |
| Longleaf Pine | 0.6 | 9.5 | 6.6 | 2.6 | | | | | | | |
| Shortleaf Pine | 1.3 | 0.4 | | 7.3 | 4.1 | | | | | | |
| Wax-myrtle | | | 0.1 | | | | | | | | |
| Mockernut | | | | 0.2 | 0.1 | | | | | | |
| Southern red oak | | 0.2 | 0.3 | 3.0 | 4.6 | 1.0 | | | | | |
| Flowering Dogwood | 0.1 | | | 0.2 | 0.9 | 0.2 | 0.2 | | | | |
| American Beautyberry | | | | 0.1 | | | | | | | |
| Yaupon | 0.2 | | | 0.7 | 0.5 | 0.2 | | | 0.1 | | |
| Loblolly Pine | 2.4 | 0.7 | 1.3 | 3.4 | 6.5 | 5.1 | 10.2 | 1.4 | 2.7 | 0.4 | |
| White Oak | | | | 0.5 | 3.9 | 3.0 | 1.6 | | 1.3 | 0.1 | |
| Red bay | | | | | 0.1 | 0.1 | | | | | |
| Horse-sugar | | | | | 1.4 | 0.2 | | | | | |
| Sassasfras | | | | 0.1 | 0.1 | 0.1 | | | | | |
| Southern Magnolia | | | | | 0.1 | 3.0 | 2.3 | 0.2 | | | |
| American Hop-hornbean | | | | | | 0.1 | 0.4 | | | | |
| Titi | | | 0.1 | | | | | | | 0.3 | |
| American beech | | | | | | 4.7 | 7.3 | 1.2 | | | |
| American holly | | | | 0.2 | 1.1 | 1.6 | 0.9 | 1.1 | 0.1 | 0.3 | |
| Sweet bay | | | 0.1 | | | 0.4 | 1.1 | | | 2.9 | |
| Black gum | | | 0.6 | 0.4 | 1.1 | 0.9 | 3.1 | 1.3 | 1.8 | 15.7 | 10.8 |
| Laurel oak | | | | 0.1 | 0.7 | 1.3 | 1.0 | 0.3 | 1.0 | 8.0 | |
| Red maple | | | | 0.1 | 1.2 | 0.4 | 0.2 | 1.1 | 7.3 | 3.1 | 2.5 |
| Sweet gum | 0.1 | 0.1 | 0.6 | 0.8 | 1.1 | 1.0 | 2.3 | 5.8 | 2.1 | 1.8 | 0.6 |
| Willow oak | | | | | 0.6 | 1.2 | | 0.9 | 3.6 | | |
| Water oak | | | 0.1 | | 0.5 | 2.7 | 1.9 | 6.0 | 1.3 | 0.4 | |
| Cherrybark oak | | | | | | | | 0.9 | 2.3 | | |
| Basket oak | | | | | | 0.1 | 0.6 | 2.2 | 3.6 | 0.6 | |
| English dogwood | | | | | | | | 0.1 | 0.1 | | |
| Green ash | | | | | 0.1 | 0.1 | 0.4 | 0.4 | 2.4 | 0.4 | |
| Winged-elm | | | | | | | 0.2 | 0.2 | 0.3 | | |
| Two-winged silverbell | | | | | | | | 0.1 | | | |
| Ironwood | | | | | | 0.1 | 1.4 | 4.2 | 0.2 | 0.1 | |
| Palmetto | | | | | | | | | 0.1 | | |
| Persimmon | | | | | | | | | | | 0.1 |
| Water hickory | | | | | | | 0.1 | 1.1 | 0.4 | 0.3 | |
| Decidous holly | | | | | | | | 0.1 | | | |
| Bald cypress | | | | | | | | 0.1 | 0.3 | 0.6 | 22.5 |
| Overcup oak | | | | | | | | | 0.5 | 1.9 | 0.4 |
| Hawthorn | | | | | | | | 0.1 | | | |
| Pignut hickory | | | | | | | 0.4 | | 0.2 | 0.1 | |
| Tupelo | | | | | | | | | | | 95.1 |
| Water elm | | | | | | | | | | | 0.3 |
| Buttonbush | | | | | | | | | | | 0.6 |
| Carolina ash | | | | | | | | | | | 4.9 |
| TOTAL | 13.1 | 11.7 | 9.8 | 23.4 | 28.6 | 29.5 | 35.3 | 29.6 | 33.8 | 34.7 | 130.1 |

SH = Sandhill Pine
UP = Upland Pine
USPO = Upper Slope Pine Oak
MSOP = Mid-Slope Oak Pine
LSHP = Lower Slope Hardwood Pine
SFF = Stream Floodplain Forest
RFF = River FLoodplain Forest
FH = Flatland Hardwood
BG = Baygall
CT = Cypress Tupelo

Table 3

WILDLIFE

Davis (1974) presented mammal species distribution in the State of Texas, including the Big Thicket region. A detailed investigation of mammals occurring in Big Thicket National Preserve was conducted by Schmidly et al. (1979). Brown (1950) and Thomas (1974) have presented the statewide distribution of herpto fauna. Amphibians and reptiles inhabiting specific vegetation habitat types in Big Thicket National Preserve were documented by Fisher and Rainwater (1978). Avian population community structure and distribution within Big Thicket National Preserve have been determined by Bryan et al. (1976) and Deuel and Fisher (1977). McCollough (1974) and Harcombe and Hughes (1982) presented the more common invertebrates inhabiting the area.

Other wildlife species currently on the federal list of endangered and threatened species (United States Department of the Interior Fish and Wildlife Service 1986) which occur, or have historically occurred in the Big Thicket region, include the red wolf (Canus rufus), bald eagle (Haliaeetus leucocephalus), Arctic peregrine falcon (Falco peregrinus tundrius), wood stork (Mycteria americana), ivory-billed woodpecker (Campephilus principalis), and Houston toad (Bufo houstonensis). The red wolf and ivory-billed woodpecker are considered to be biologically extinct in the area. The Houston toad could possibly exist; however, no documentation is available to indicate the presence of this species within the preserve. Sightings of the Arctic peregrine falcon occur very rarely and only during migration periods. The wood stork and bald eagle are observed occasionally.

A checklist of mammals, birds, amphibians, and reptiles is available in the Resource Management Plan.

Historical & Archeological Resources

Historic resource surveys of structures within the preserve were conducted to determine if any of the structures qualified for listing in the National Register for Historic Places (Dethloff and Treat 1975, Treat and Dethloff 1978). The results of the investigations revealed that no historic sites or structures of "national significance" are within the preserve.

The results of the survey indicate that archeological resources are present, but are not outstanding examples of aboriginal inhabitation (Shafer et al. 1975). The investigators note that the development and management of the preserve should not have adverse effects on the archeological resources, except in possible instances where the construction of public facilities, roads, or trails, etc., might endanger the sites.

In 1999 Moore Archeological Consulting (Houston, Texas) compiled site index material and site maps of 64 cultural resource surveys and 91 archeological sites within a 2-mile radius of the preserve units (excluding expansion lands), and presented the material in a 'Gazetteer'. It is considered sensitive material and is secured from general access in the fire manager's office.

Seismic surveys that include 'shovel tests' for archeological sites have occurred in the Lance Rosier Unit, and are ongoing in the Big Sandy Creek Unit. Numerous positive sites have been informally reported, and are being avoided by the seismic crews. The archeological information will be added to the preserves archeological database when it is compiled in their final report.

The fire program will use the complete archeological inventory data to avoid impacting sites during project implementation.

Historic Role Of Fire

The following history was excerpted from the Categorical Exclusion (see appendix C):

The original forest types of East Texas were a mosaic of upland pine separated by bottomland hardwood forests. The pine forest being very open and grassy forest floor, separated by dense bay-gall drainages called “thickets”. It was said by many of the time that a horse could be ridden anywhere. William Bartram a Naturalist traveling the South in the 1770’s said “A level, open, airy pine forest, the stately trees shatteringly planted by nature, arising straight and erect from the green carpet, embellished with various grasses and flowering plants” (Harper, Bartram’s Travels Page 253-254). Texas’s eminent forest historian Robert S. Maxwell and his colleague Robert D. Baker tell of the virgin tracts of the eastern pineries of that state: “The towering pine forest was almost over powering. Travelers often described the magnificent pines {probably longleaf} soaring 100 to 150 feet in the air with bases 4 or 5 feet in diameter. The forest floor under the great longleaf trees was clean, and the forest was…park like…the combination of sandy soil and wood fires had eliminated most competing growth… Majestic trunks pointing skyward, often 50 or 60 feet to the lowest limb, were a spectacular sight”(Sawdust Empire, College Station Press, A&M University, 1983, pg.5).

Gulf- Brazos Navigation Survey, Tyler Co.,
12 miles NE of Doucette, 1907-1908

D. Herrar Survey, Tyler Co. 1907

The pictures (Texas Forestry Association Museum, Thompson–Ford Photo Collection) also indicate that there was very little bush, only tree trunks to obstruct your view. A full canopy shading the forest floor, and periodic ground fires maintained an open forest. Indians and early settlers maintained a free use of fire for improving forage for their open range livestock. The industrialization of the country led to the harvest of all the mature forest of East Texas for timber production. Railroads partnered with timber barrens to move the logs on a system of trams (narrow gage rail ways) from the forest to the mills. The cut over lands were simply left to naturally regenerate. The large-scale opening of the forest floor to sunlight allowed brush species to increase. The second-generation forest changed in species composition, as loblolly and shortleaf pine species regenerated more readily than longleaf. Fire was beginning to be excluded from the forest as more people moved into East Texas. By the time the second-generation forest was being harvested (beginning in the in the 1940's) the timber industry began employing principles of silviculture by replanting with varieties of loblolly and slash pine species. The 2nd massive opening of the forest floor allowed more invasions of under story brush species.

Increased under story brush made fire more catastrophic, and fire suppression became a dominant theme. The Texas Forest Service was established with the responsibility for fire suppression. The Big Thicket National Preserve was established in the 1970's from second and third generation timber company lands that already had established understory brush. Fire had all but been excluded. Only remnants of second-generation longleaf pines mixed with loblolly and shortleaf existed.

Restoration of phyric ecosystems with prescribed fire has been most successful where fire is used most frequently. Monitoring measurements indicate that while the height of under story brush is controlled, the number of stems is not reduced. Yaupon and other brush species are a dominant force in East Texas forest today that has caused a reduction in the diversity of plants and animals species that historically inhabited the Big Thicket.

The vegetation of the area has undergone considerable change as a result of logging, fire suppression, and Southern Pine Beetle infestations. The logging industry removed most of the canopy Longleaf Pine and encouraged Loblolly pine as it was considered a faster growing species. The timber industry also developed fire prevention programs. Without the natural role of fire in the Southeast during the past 50 years, there has been a dramatic reduction in the acreage of longleaf pine and an increase of loblolly pine invasion on sites formerly dominated by longleaf pine (Wright and Bailey 1982). According to Watson (1986) fire suppression, particularly in longleaf pine uplands, is resulting in an upslope migration of the Lower-Slope vegetation community (beech-magnolia-loblolly), significantly altering the structure and composition of the longleaf pine forest type. Fire suppression is also largely responsible for increasing understory and shrub stratum density in phyric communities, primarily upland vegetation types, formally composed of a moderate to well developed herb layer and open understory.

<u>Fire Management Program History</u>

Preserve staff began prescribed burning in 1982 with 25 Treatment Areas being burned up to 9 times in the past 22 years. Vegetation monitoring plots indicate that grasses and forbs are returning, Longleaf Pine is regenerating, Loblolly Pine regeneration is decreasing, and yaupon brush growth is being controlled in frequently burned areas. Adjacent communities and rural homesites create urban interface issues due to extreme fire behavior as a result of yaupon brush invasion. Details are presented in each Treatment Unit section.

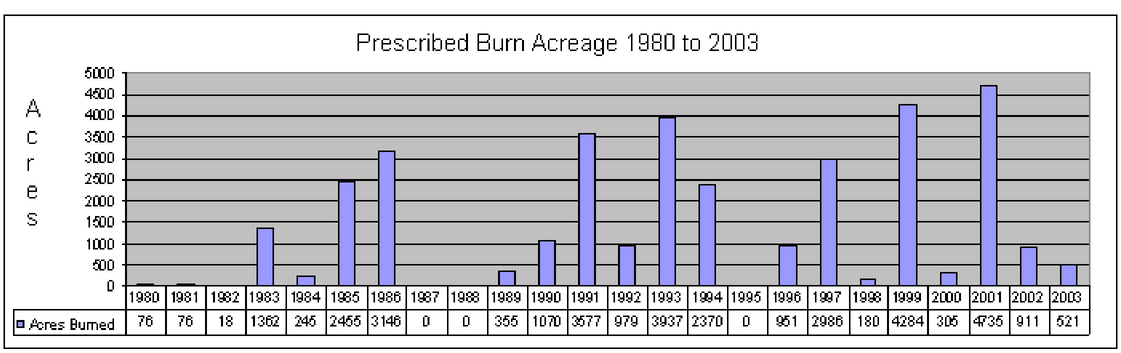



Figure 3

<u>Fire Season</u>

A winter fire season (January to April) occurs due to rainfall patterns associated with cold front passage, and increased fuel availability due to the curing of grass and hardwood leaf fall. Ignition sources are generally human caused (arson & accidental), and natural (lightning if heavy fuels are dry). A summer fire season (July through September) occurs due to reduced precipitation high temperatures, and long drying days. Wildfires can occur during any month as drought conditions happen quickly (1 month without rain) as dense vegetation moves significant amounts of water and the sandy soils drain quickly. Figure 4 shows Texas Forest Service statistics for the area including the preserve.

Wildfire Occurance in the Mutual Aid Zone 1995 to 2003

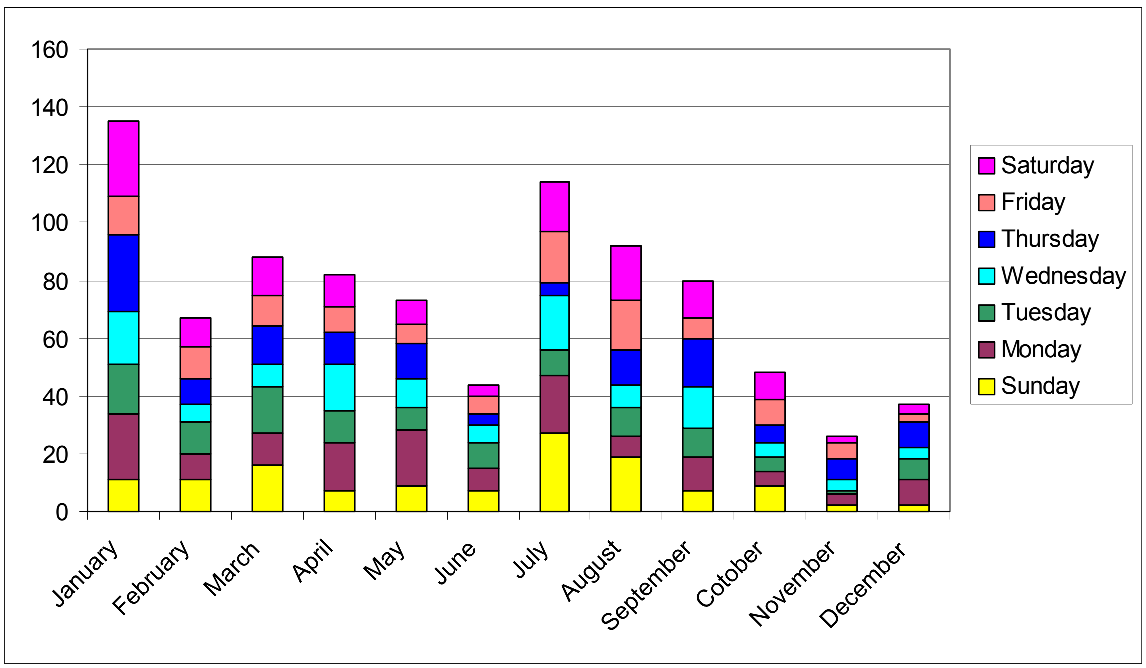
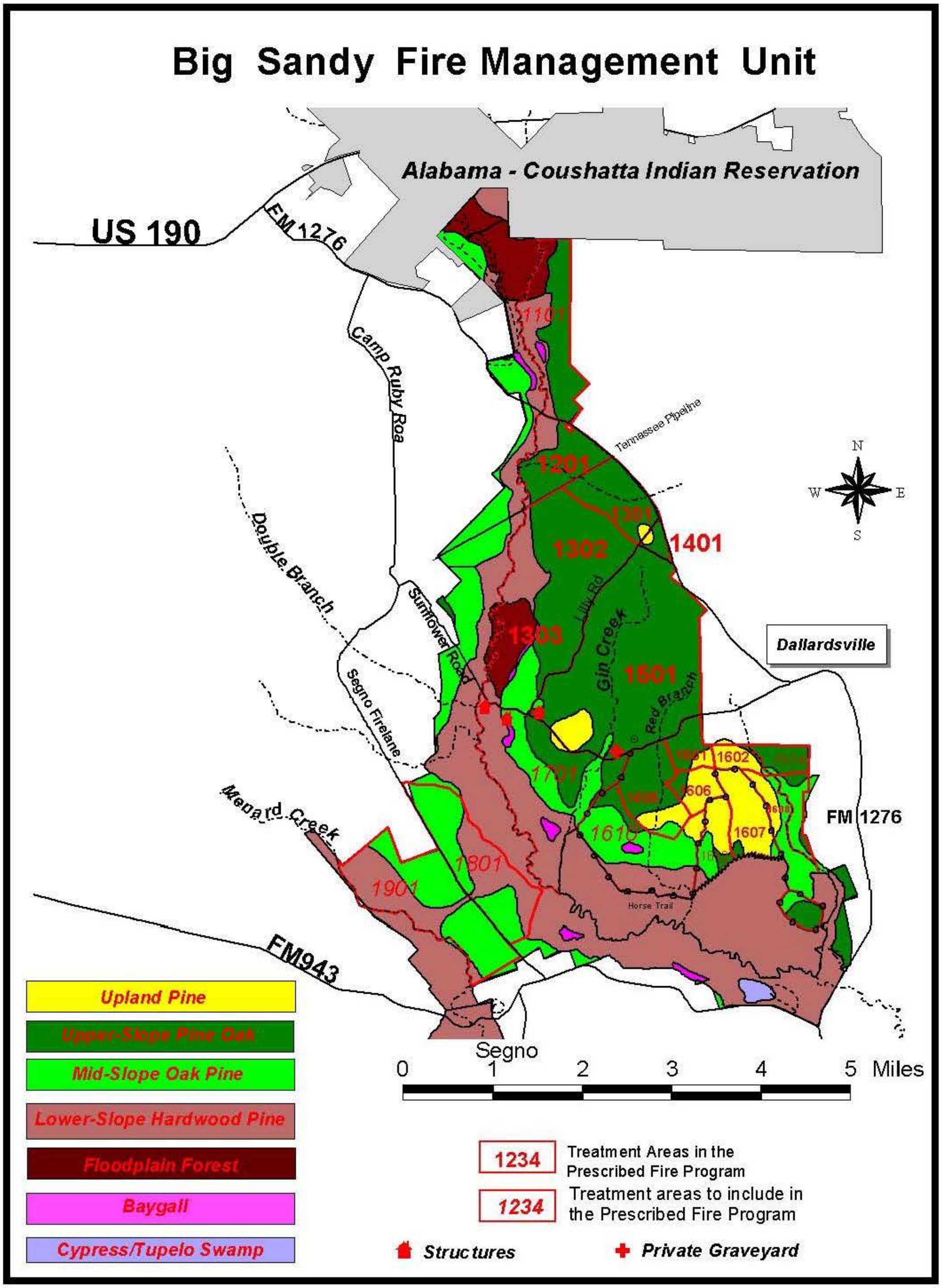



Figure 4

**2. BIG SANDY FIRE MANAGEMNET UNIT**



**a) Physical and Biotic Characteristics**

**General:**

The Big Sandy Creek FMU is 15,220 acres within a 23 square mile area between the Alabama - Coushatta Reservation and the towns of Dallardsville and Segno. The Woodlands and Beaver Slide trails provide hiking opportunities, and this area has the only horse trail in the preserve. Administrative use of All-Terrain-Vehicles (ATVs) is permitted on these trails, and several old logging roads. It has paved county roads, FM1276 and FM943, as a portion of the boundary, and three dirt county roads cross the unit (Segno Firelane, Sunflower Road, and Lilly Road). A transcontinental pipeline system also crosses the unit.

**Vegetation:**

The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions:

Upland Pine Forest

The largest area [834 acres] of Upland Pine Forest occurs in the southeastern corner of the unit in Treatment Areas 1601-1610's (see map in appendix G). The overstory is dominated by Loblolly Pine, moving upslope from the floodplain, instead of Longleaf Pine; however, there is sufficient Longleaf in the canopy to restock the stand over time. Shortleaf Pine and scattered hardwoods [bluejack oak, blackjack oak (Q. marilandica), southern red oak (Q. falcata), post oak, and sweet gum] are also present. The area varies in density and height due to historic uses (i.e. logging). Mid-story hardwoods are being removed due to the prescribed burning program. The understory is dominated by flammable brush [Wax myrtle (Myrica cerifera), and Yaupon (Ilex vomitoria)], exceeding natural occurrence levels. Open pockets may support remnants of a once widespread herb layer that consists of many species of grasses [Bluestem (Andropogon spp.) is dominant] and forbs.

A second Upland Pine area [106 acres] is adjacent to Sunflower Road in Treatment unit 1501. It is an open stand of Loblolly, Shortleaf, and Longleaf Pine, with minimal mid-story. The understory is dense Yaupon and Wax Myrtle. An opening in the canopy was created along the driveway to the Kennedy home site, due to high fire intensity during the initial prescribed burns, which is being used as a site for the Texas Trailing Phlox Recovery Program (T & E Species).

The smallest Upland Pine area [20 acres] is near the junction of Lilly Road and FM1276 in Treatment unit 1401. It has an open canopy of Loblolly, Longleaf, and Shortleaf Pine, a sparse mid-story of hardwoods, and an open understory with patches of brush and resprouting Shortleaf Pine. A ground cover of grasses and forbs is developing.

Upper-Slope Pine-Oak Forest

Moving down-slope toward the floodplains the next vegetation type is classified as Upper-Slope Pine-Oak Forest [5,113 acres]. It has a closed canopy of Shortleaf, Loblolly, and Longleaf Pine. Some hardwoods (southern red oak, blackjack oak, post oak, sweet gum, white oak, and black gum) remain in the overstory, but are being reduced by repetitive prescribed burning. The understory is dominated by yaupon, with flowering dogwood, American beautyberry and sassafras (Sassafras albidum) prevalent. The surface fuel is typically a needle/leaf mat with scattered pockets of grass.

Mid-Slope Oak-Pine Forest

A transition zone to the floodplains is classified as Mid-Slope Oak-Pine [3,335 acres] with a tall, dense canopy dominated by oaks (southern red oak and white oak), with Loblolly and Shortleaf Pine also represented. Sweet gum, black gum, and red maple (Acer rubrum) are also present. The understory is more open than Upland Pine or Upper-Slope Pine-Oak vegetative communities, and has flowering dogwood, yaupon, American holly (Ilex opaca), and red maple. The ground fuel is typically a uniform layer of hardwood leaves with moist soils.

Lower-Slope Hardwood-Pine Forest, Stream Floodplain, and River Floodplain Forest vegetation types [5507 acres] occur on the gentle slopes and flat terraces adjacent to creeks. Oaks [white oak, water oak (Quercus nigra), laurel oak (Q. laurifolia), willow oak (Q. phellos)] with other hardwoods [American beech (Fagus grandifolia) Southern magnolia (Magnolia grandiflora), sweet gum, black gum, ironwood (Carpinus caroliniana) and American holly] provide a dense canopy. Loblolly Pine may be present depending upon historic logging use. A sparse mid-story of canopy species is present with an open understory of American holly and yaupon. Ground fuels are a uniform mat of hardwood leaves with moist soils.

Swamp Cypress Tupelo Forest [51 acres] occurs in deep sloughs and abandoned stream channels, with an open canopy of bald cypress (Taxodium distichum) and tupelo (Nyssa aquatica). These stands typically do not have an understory due to standing water.

Wetland Baygall Shrub Thicket [205 acres] occurs in depressional areas where seepage of water from slopes maintains saturated soil conditions. Overstory is open with laurel oak, black gum, sweet bay and red maple present. A thick understory of Titi and gallberry holly (Ilex coriacea) is not typically flammable. Surface fuels are a thin layer of hardwood leaves that are typically covered by standing water.

**Soil and Topography:**

The topography is described as undulating with elevations ranging from 153 to 310 feet. While it is well drained, streams are slow moving and spring fed during droughts.

Soils reflect differences in geology and drainage conditions. Well-drained sandy loams and silty loams (Bowie and Kirbyville) are dominant.

**Water/Aquatic:**

Big Sandy Creek lies within the Neches River drainage, while Menard Creek is associated with the Trinity River drainage (Figure 1). Mill Creek and Big Sandy Creek flow out of the Alabama - Coushatta Indian Reservation and combine in the preserve. During the 10.5 miles it travels through the unit, Big Sandy Creek passes under FM1276 and Lilly Road (county maintained paved/dirt), and exits at FM1276 (near FM943) where it becomes a corridor unit. It is fed by both springs and run-off, and is a well incised creek [vertical banks, 8 to 12 feet high] and averages 25 feet wide. The floodplain includes old meander channels and a large beaver pond.

**Air:**

Sensitive smoke receptor sites include the Alabama and Coushatta Indian Reservation (adjacent to the northern boundary), the Dallardsville community (1 mile from the eastern boundary), scattered rural residences, and Farm-to-Market roads FM1276 and FM943.

**Wildlife:**

Development of Red Cockaded woodpecker (Picoides borealis) habitat is a goal for fuels treatment. An abandoned colony is located within an Upper-Slope Pine-Oak Forest type in Treatment unit 1201. An active prescribed fire program has been successful at reducing the dense hardwood understory, however additional burning is needed to promote a grass/forb ground cover. Brush reduction on a landscape scale (i.e. adjacent Treatment Areas) is required to provide sufficient habitat for the US Fish and Wildlife to provide 'surplus birds' from existing colonies.

**Arch/Cultural/Historic:**

Three historic sites are documented within the boundaries of the Big Sandy Creek FMU:

41 PK 132 is the Charles Lilly Cabin, built in the 1930's along Sunflower road. It is badly deteriorated and was not 'recommended for restoration for historical purposes' when surveyed during the acquision period. It is currently a pile of rotting timbers, with one corner recognizable as a log style structure.

41 PK 133 is identified as the Kennedy House; however the description fits a separate site north of Charley Lilly's cabin. This site had a log cabin that was burned by arsonist during land acquision. The site is growing up with vegetation, with only a concrete well and some wood fence post remaining.

41 PK ??? The Kennedy house was a log structure, built about 1900, that was later incorporated into a modern building. The acquision survey indicated that it 'had little, or no historic value', and was removed.

### b) Additional Fire Management Objectives

Treatment Areas are grouped into three cost-effective clusters. Each group will be prescribed burned on a 3-year rotation (minimum).

1. 1200, 1401, 1300s
2. 1501 and 1701
3. 1601 through 1610

### c) Management Considerations

1. Upland Pine and Upper-Slope Pine-Oak Forests are fire dependant vegetation types that have been managed with frequent prescribed burns to reduce hazardous fuels and restore/maintain fire dependent ecosystems. Suppression actions will favor burnout operations and limit line construction.
2. Special management consideration must be given to the Phlox Nivalis (Texas Trailing Phlox) populations (see Appendix G) to avoid mechanical damage.
3. Consider air quality impacts to the Alabama - Coushatta Indian Reservation and Dallardsville when developing implementation plans.
4. Administrative ATV use is permitted on trails, old logging roads, and the boundary if it has been cleared of brush.
5. The Dallardsville municipal water system does not have sufficient capacity to fill fire engines.

**d) Historic Role of Fire**

The Texas Forest Service (TFS) and local Volunteer Fire Departments (VFDs) effectively suppressed wildland fires for many decades. The preserve's records indicate 16 wildfires occurred since 1977, totaling 40 acres. The TFS and VFDs suppressed 11 of these, with the remainder being suppressed by the preserve. A particularly notable fire [2000-49] started near the boundary and burned over 600 acres of pine plantation, forcing the evacuation of Big Thicket Lake Estates. The prescribed fire program focuses on the area north and east of Big Sandy Creek, and has conducted 19 prescribed burns totaling 15,000 acres since 1983.

During the late 1970s and 1980s large Southern Pine Beetle infestations killed hundreds of acres of mature pines. Loss of the canopy pines increased available sunlight for the understory, so dense brush quickly dominated the sites. These can burn with high intensity, killing any emerging pine saplings and maintaining the brushy condition.

**e) Specifics of the FMU**

1. Historical weather analysis

   The average annual precipitation of 46 inches is reasonably well distributed through the year, with the driest typically being March and July (3.2 inches). Winter precipitation is generally associated with frontal activities and uniformly blankets the area. Cold fronts lift surface moisture higher into the atmosphere and generate severe thunderstorm lines. Occasional tornados and other wind events blow down trees, and ice storms break off limbs creating abnormal fuel conditions. Warm fronts move back across the area bringing soaking rains that may persist for several days. Summer precipitation is generally thunderstorms generated by the Gulf of Mexico that move inland on the sea breeze. Few of these will reach into this unit. Occasional hurricanes and tropical storms can bring high winds and copious rains (peaking at 6"/hr) during late summer & early fall.

2. Fire season

   The winter fire season (January to April) provides increased fuel availability due to the curing of surface fuels and highly flammable brush. The spring flush of new growth reduces brush volatility, but high intensity fires can occur during drought cycles. The fuel bed of pine needles is readily cured by the high temperatures, long drying days, and reduced rainfall during the summer fire season, and provides sufficient pre-heating to negate any moisture in green grasses. A fall fire season can also occur if rainfall does not accompany frontal events. Wildfires can occur during any month. Drying conditions happen quickly (2 weeks without rain) as dense vegetation moves significant amounts of water and sandy soils drain quickly.

3. Fuel characteristics

This unit is a complex mosaic of vegetation types that exhibit variability in composition and structure. Fire behavior is a function of fuel type, fuel load, fuel moisture content, relative humidity, and wind speed. Variation in these factors influences the rate of fire spread and fireline intensity. The type of fire (backing fire, head fire, or flank fire) also significantly affects fire behavior characteristics (see table 5).

<u>Upland Pine & Upper-slope Pine-Oak Forest – Fuel Model 4</u>

The UP & USPO areas have a dense understory of highly flammable brush (Yaupon and Wax Myrtle) due to many decades of fire suppression. Fire Behavior is represented by Fuel Model 4 when over 6' in height, and Fuel Model 7 (see below) when less than 6'. Pine needles often drape the understory and shrubs.

Predicted intensity and rate of spread is highest in this fuel type. The effect of wind speed on rate of spread is critically important. The computer model predicts that mid-flame wind speeds of 1, 4, 6, and 10 mph will produce head fire rate of spread at 3, 60, 90, and 130 chains/hour, respectively. Predicted fireline intensity is 3682-7123 BTU's/foot/second with flame heights in excess of 20 feet. Head fire flame heights of 40-70 feet have been observed, but are short in duration. Fortunately the mature canopy prevents most of the surface wind from reaching the fire; however, when dense brush pockets provide the impetus for flames to reach into the canopy exceptional fire behavior can occur. While the lack of continuous ladder fuels typically prevents a sustained, independent, crownfire, the spot fire potential dramatically increases.

Behavior of flank fires in this fuel type is equally dependent upon wind speed. A slow low-intensity fire with flame heights of two to four feet normally occurs during calm to very low wind conditions. However, flame height will increase when a flank fire moves through extremely dense understory and shrubs. Wind speed near five mph or greater will increase flank fire rate of spread and intensity, consuming the majority of shrubs. Flame height may reach 20-30 feet. Backing fires exhibit slow rate of spread, and flame height is generally two to four feet except when extremely dense flammable shrubs are encountered.

<u>Upland Pine & Upper-Slope Pine-Oak Forest – Fuel Model 7</u>

Moderately dense stands of flammable shrubs between two and six feet high, below a mature pine or mixed pine-hardwood canopy closely correspond to Fuel Model 7. Shrub density and height is largely dependent upon fire history. Fire behavior in this fuel type is much less severe compared to Fuel Model 4. Predicted headfire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 11-16 chains/hour and 98-152 BTU's/foot/second, respectively. The computer model predicts that head fire rate of spread can exceed 60 chains/hour.

Typical head fire rate of spread during a five mph wind speed is near seven chains/hour with fireline intensity at approximately 100 BTU's/foot/second. Headfire flame height is generally four feet, and occasionally reaches 15 - 20 feet depending upon shrub density

and height. Occasional "flare-ups" are short in duration, but increase crown scorch and spot fire potential.

Flank fires and backing fires exhibit significantly lower intensity and slower rate of spread. Fire spread is largely dependent on soil moisture availability, due to water wicking up into the surface fuel bed. Flame height increases briefly when shrubs are encountered.

<u>Slope Forests - Fuel Model 9</u>

Mixed pine-hardwood forests, dominated by hardwoods in the canopy with a moderately well developed hardwood understory and scattered shrubs (Mid-Slope Oak-Pine Forest and Lower-Slope Hardwood-Pine Forest) are best represented by Fuel Model 9. Some areas within Upper-Slope Pine-Oak Forest dominated by hardwoods are also included in this fuel type. The fuel bed is a hardwood leaf-pine needle mat.

Predicted head fire rate of spread during typical weather and fuel moisture conditions is one to two chains/hour with fireline intensity at 8 to 14 BTU's/foot/second. The computer model predicts that head fire rate of spread can approach 40 chains/hour during 10 mph mid-flame wind speed. Observed rate of spread has been two chains/hour or less with an average flame height of two feet. When a head fire encounters scattered flammable shrub thickets (Fuel Model 4 or 7), brief flare-ups occur as previously described.

Flank fires and backing fires exhibit very low intensity and slow rate of spread. Fire spread is largely dependent upon fuel continuity. Rate of spread is normally less than one chain/hour, and flame height generally does not exceed one foot. Flame height increases briefly when shrubs are encountered.

<u>Floodplain Hardwood Forests - Fuel Model 8</u>

The floodplain vegetation type is conspicuously dominated by hardwoods, and is best represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat. Intermittent drainages and permanent stream channels often dissect this fuel type. Fuel moistures are relatively high throughout the year, allowing creeping ground fires that consume only the top layer of forest duff. Flame height seldom exceeds six inches. Fires often naturally stop near slight depressions and drainages. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content. The low flammability of this vegetation significantly reduces the potential of wildland fires. It exhibits significantly less flammability than the Upper-Slope Pine-Oak or Upland Pine, and correspondingly less wildland fire potential. This fuel type is typically used as a natural firebreak unless drought conditions are present.

4. Fire Regime Alteration

The phyric vegetation types [Upland Pine, Upper-Slope Pine-Oak] comprise 38% of the area. The goal is to return the area to its natural condition [Fire Regime I (low intensity – frequent fire)]; however, the area has been significantly altered by logging and fire suppression (Condition Class 3) and is classified as Fire Regime II category (high intensity - stand replacing fire). The remaining vegetation types (floodplains,

Lower-Slope hardwood-pine, etc.) have been less altered by logging and fire suppression and are classified as Fire Regime III, Condition Class 1.

5. Control Problems

The Big Sandy Creek has large contiguous areas of highly flammable vegetation, and wildfires could expand to 5600 acres. Fortunately the area is divided by small drainages and dirt roads that will assist suppression efforts. Big Sandy Creek is the dominate topographic feature, and (with its wide floodplain) sufficient to stop most fires.

Direct suppression of a head fire with hand equipment is not practical, nor safe, in the Upland Pine or Upper-Slope Pine-Oak vegetation types. Indirect suppression action utilizing natural and constructed barriers is a prudent management action. Ignition of "burn-outs" from the perimeter reduces headfire intensity and spotfire potential near the fireline. Direct (handtool) suppression of flanking or backing fires may be considered if weather conditions are steady or the afternoon burning peak has passed. Spot fire potential downwind from shrub thickets must be considered during handline construction.

Direct suppression of a head fire with handtools in Mid-Slope Oak-Pine, Lower-Slope Hardwood-Pine, and Floodplain Forests can usually be accomplished. Spot fire potential is low, but must be considered when using natural barriers. Constructed barriers (handline or plowed line) must avoid concentrations of flammable shrubs to insure fireline security.

6. Other Elements of the Fire Environment

Fire management units have been treated with prescribed burns throughout the 1990's, converting Fuel Model 4 areas to Fuel Model 7, if the burn cycles are maintained. Brush levels quickly recover, growing about 1' per year. Maintaining the prescribed burn rotation is essential to controlling hazardous fuels, and will ultimately convert the understory of a grass/forb ground cover (Fuel Model 2 – natural condition).

7. Values at risk

The boundary interface with the Reservation includes a floodplain area between Big Sandy Creek and Mill Creek, and pine plantations along our northeast corner. Urban interface includes tribal residences, administration buildings, and a casino is being planned. Private timberlands, rural residences scattered along the county roads, and pasturelands are also adjacent to the Preserve.

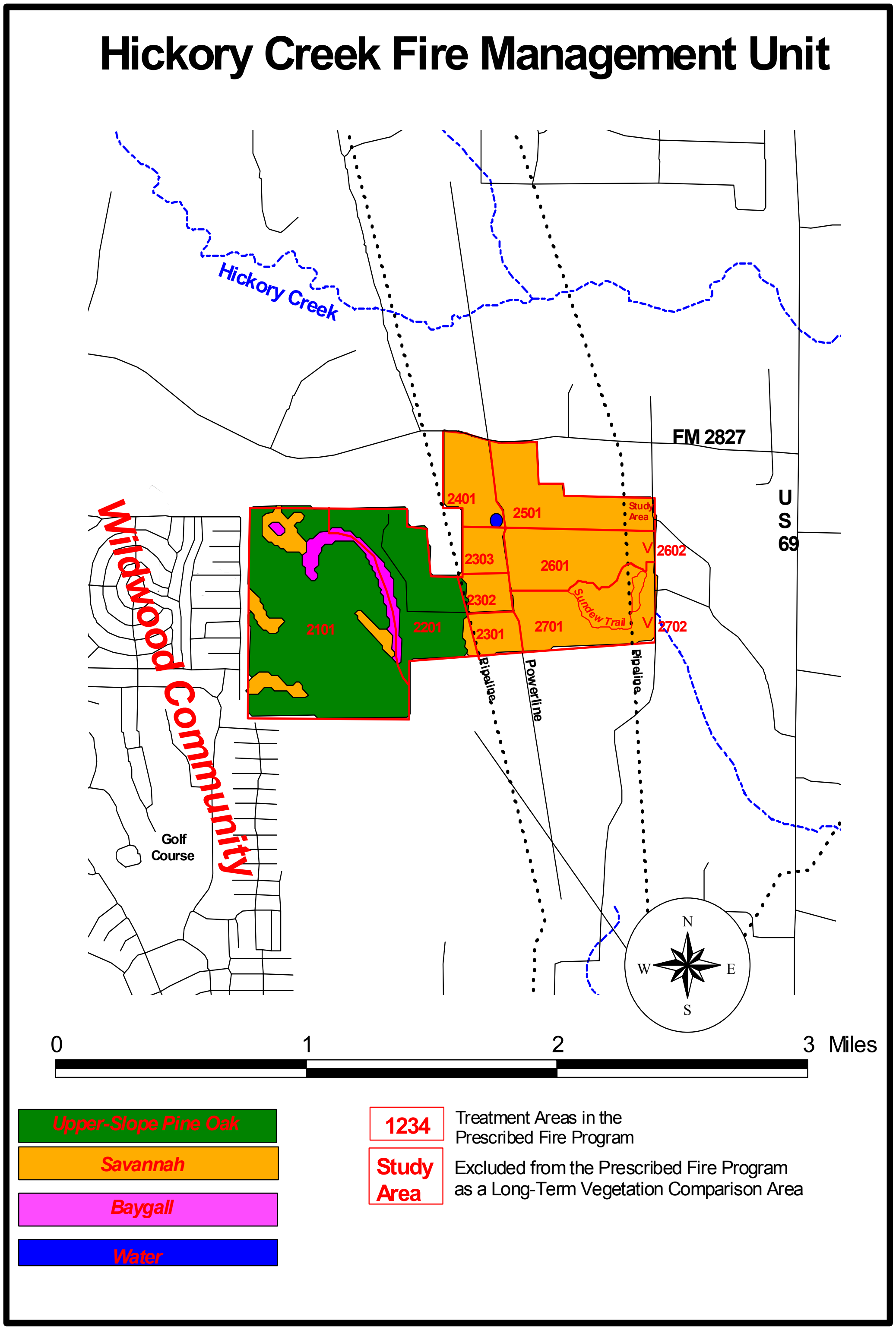
The Lilly and Sunflower Roads (county maintained-dirt/paved) provide resident and public access through the area. Camp Ruby Road provides some access to the west side of the unit, across timber company roads, and becomes the Segno Firelane Road when it crosses Sunflower road. The small community of Segno is tucked into the southwest corner of the unit. Visitor use facilities are located at the Horse Trail, Woodlands trail, and Beaver Slide Trail.

A small private graveyard is located along Sunflower Road, near the Horse Trail, which must be protected from fire. A fireline is generally constructed around the perimeter, and all ATV equipment is banned from the interior.

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I Community | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 21.5 miles | 4.8 miles | .6 miles | 6.9 miles | .2 miles | 25 miles | .8 miles | 6.6 miles | 1 adjacent | 24.9 miles |

Table 6a

## 3. HICKORY CREEK SAVANNAH



**a. Physical and Biotic Characteristics**

**General:**

The Hickory Creek unit contains areas of wetland pine savannah south of Hickory Creek. A county road (dirt) provides access along the east boundary to scattered rural residences and the Sundew Trail parking area. The trailhead includes interpretive displays, an outdoor pavilion, and toilet. Numerous elevated boardwalks provide visitor access on the trails, and must be protected from wildland fires. A paved road (FM2827) is adjacent to the north boundary, with scattered residences and pastures. The eastern half of the unit has a network of pipelines, old roads, and a high voltage powerline, which are used for firebreaks and ATV travel. The western boundary is adjacent to the Wildwood Community. It began as a restricted access subdivision, and catered to retiree's and weekend/summer homes. Recent increases in commuter residents have swelled the community to over 600 homes, with new homes constantly being added. Wildland fuels are continuous across the preserve boundary and create a significant urban interface. While most homes have adequate defensible space (yards), large blocks of unmanaged fuels (flammable brush 30' high) could produce extreme fire behavior. Fortunately the area has many roads, a large golf course, and an aircraft landing strip, which provide fuel breaks. Commercial timberland is south of the unit.

**Vegetation:**

This unit is a complex mosaic of Upper-Slope Pine-Oak with imbedded Wetland Pine Savannah. Aerial photography from the 1930's shows numerous logging trails, and removal of mature Longleaf Pine trees throughout the unit.

Upper-Slope Pine-Oak

A younger, denser stand of Loblolly Pines followed the initial logging, and was selectively cut. Frequent prescribed burning has purged most of the hardwoods from the canopy and mid-story of the pine dominated areas; while less frequent, and lower intensity fires, have allowed hardwoods to remain within several drainages. Loblolly Pine (invasive) is currently the dominant canopy tree, but is replaced by Longleaf Pine (desired) in the seedling and sapling population. Understory brush, principally Yaupon & Wax Myrtle, is being controlled by frequent prescribed burns, but quickly resprouts and maintains a strong presence. A ground cover of grasses and forbs is developing in some areas, and will out grow the brush for several years after a burn.

Wetland Pine Savannah

Shallow depressions and broad drainage patterns permit the growth of savannah vegetation, and are generally in good condition due to frequent prescribed burns.

**Soil:**

Heavy equipment used in modern timbering operations cause surface rutting; however, the soils are very 'plastic' and few scars are evident. The soft soils in this unit would not support the heavy equipment used for oil extraction activities, so 'shell' surfacing material was brought into several locations. Soil disturbance is also associated with the several pipelines that cross the eastern side of the unit. Plowed firelines disturb the upper 6" of soil, but is readily rolled back into place during rehabilitation if the berms are not compressed by vehicle or foot travel.

**Water/Aquatic:**

Numerous roads have been constructed for timber removal (Tram Road), oil production, and development. The prior landowner attempted to increase land valuation during acquision by sub-dividing the area with dirt roads using fill material from adjacent ditches. This alteration of the natural drainage pattern has affected water flow and vegetation placement. A perennial pond occurs along the high voltage powerline.

**Air:**

A major highway [US69] is being upgraded to 4 lanes, and the increasing traffic may affect air quality in the future. Smoke management during prescribed burns is critical to avoid impact to the highway, FM2827, the Wildwood Community, and scattered rural housing.

**Wildlife:** This unit is closed to hunting.

**Arch/Cultural/Historic:**

An elevated roadbed from a historic Tram Road (narrow gauge rail) from the Village Mills lumber mill crosses the southwestern portion of the unit. Two earthen pits from oil production operations are within the unit. A residential water well (4" pipe, capped about 3' above the ground) is southwest of the visitor use pavilion.

**b. Additional Fire Management Objectives**

1. While this unit is divided into active treatment areas with a wildland fire management objective of reducing unnatural disturbance, it is trumped by the critical urban interface values. The Appropriate Management Action will stress prevention of wildland fires from exiting preserve lands (i.e. aggressive actions along the boundary, with MIST tactics employed in the interior when possible).

2. Treatment Areas are prescribed burned on a 2 or 3-year rotation to control hazardous fuels, and restore/maintain fire dependent ecosystems.

**c. Management Considerations**

1. Upper-Slope Pine-Oak Forests and Wetland Pine Savannahs are fire dependant vegetation types that have been managed with frequent prescribed burns to achieve resource management objectives. Suppression actions should favor burnout operations and limit heavy equipment to line construction along the boundary or existing roads.

2. Maintenance of the planned ignition schedule is essential to continue restoration of natural community structure, control hazardous fuels, and reduce risks toward rural housing that surrounds the unit.

3. Administrative ATV use is permitted on trails, old roads, and the boundary if cleared of brush.

4. Consider air quality impacts to the Wildwood Community, scattered rural housing, and Highway 69 when developing implementation plans.

**d. Historic Role of Fire**

Aerial photography from the 1930's and 1950's show an active timber mill within 2 miles of the unit, a tram road crossing the unit, and the evidence of 'skid trails' and other activities. As this area was being acquired the landowners created roads to increase the price, and used a dozer to 'root rake' an area to make it unattractive for purchase. The owner of a house trailer (on the east boundary), and a small farm west of the powerline, initially accepted a life-estate deal, but later sold it to the government. Acquisition of the Hickory Creek Savannah Unit was completed in the late 1970's, and was the initial focus of the prescribed fire program because it was recognized as a fire dependant ecosystem. Since 1981, thirty-three prescribed burns totaling 3,011 acres have been completed. A three-year burn rotation was intended, with the eastern half of the unit now beginning the 6$^{th}$ to 9$^{th}$ rotation. An overall reduction in brush height and density, and associated increase in grasses, is readily apparent. Fire caused mortality in the Loblolly Pine canopy is allowing sunlight to the surface fuels. As grassy fuels recover faster than brush following a fire, changing to a 2-year rotation will speed restoration. Prescribed burning in the Wildwood Urban Interface was suspended in 1995 because of adjacent risk and lack of hazardous fuel management within the community. New residences are constantly under construction, with hazardous fuels intermixed. A chemical and mechanical treatment (under a separate Environmental Assessment) has reduced hazardous fuels within the preserve, and was expanded east to the power transmission line in 2004. The reduction of spotfire potential will permit resumption of the prescribed burn program to maintain natural fuel levels.

Eight wildfires have occurred since 1976, totaling 530 acres. Noteworthy fires include the 'Cool Luke' on July 9, 2000 caused by the high voltage powerline [208 acres], the 'Kirby Slip' caused by an adjacent Kirby Timber Company prescribed burn [61 acres], and the 'Privy' that was an arson start that burned the public restroom. Three fires on adjacent lands were suppressed, preventing spread onto the preserve.

**e. Specifics of the FMU**

1. Historical weather analysis

   The seasonal weather pattern is similar to the Big Sandy FMU. A Remote Automated Weather Station (RAWS Unit) is located 4 miles east, in the Turkey Creek Unit. A 1983 Tornado twisted and pulled mature pines out of the ground over a 67-acre path from the southwestern boundary east to the perennial stream. It then lifted and permanently bent scattered trees across the remainder of the unit to the Sundew Trail.

2. Fire Season

   While the fire season is similar to the Big Sandy FMU, the well-developed herbaceous ground cover dries faster flowing rain events and can carry a fire earlier. While this FMU has adjacent residences on 3 sides, including the Wildwood Community, most wildfires have spread across the boundary from timber company lands.

3. Fuel Characteristics

Fire behavior is a function of fuel type, fuel load, fuel moisture content, relative humidity, and wind speed. Variation in these factors influences the rate of fire spread and fireline intensity. The type of fire (backing fire, head fire, or flank fire) also significantly affects fire behavior characteristics. The grasses and forbs provide sufficient fuel loading to carry a uniform fire front after one growing season, a moderately intense fire after two growing seasons, and a high intensity fire after three growing seasons as the brush begins to add heat to the fire.

Upper-Slope Pine-Oak Forest – Fuel Model 11

The western half of this FMU has a dense understory of highly flammable brush (Yaupon and Wax Myrtle) that is being chemically and mechanically treated in 2004. Fire Behavior (intensity) is represented by Fuel Model 11, as 5 to 8 tons will be added to the fuel bed. As the grass layer recovers Fuel Model 2 may best represent the Rate-of-Spread. Prescribed burning experience in a similar treatment area demonstrated that high intensities, including 15' high fire whirls and One hundred percent canopy scorch of mature Longleaf Pines, occurred with several days of a 1" rain. Unexpected intensities occurred within minutes of the dew burning off. The open canopy allows wind penetration. Burning with moist soil conditions is essential to avoid girdling trees at the litter layer. Exceptional fire behavior should be expected during the summer. The flaky bark of Longleaf pines provided a ladder fuel to the canopy, and while a crown fire is unlikely due to crown spacing, the spot fire potential dramatically increased with convective lofting.

Upper-Slope Pine-Oak Forest – Fuel Model 7

The eastern half of the FMU has moderately dense stands of flammable shrubs 1 to 4 feet high, below an open mature pine canopy. Shrub density and height is largely dependent upon fire history, with the brush growing about 1 foot a year. Fire behavior in this fuel type is much less severe compared to Fuel Model 4. Predicted headfire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 11-16 chains/hour and 98-152 BTU's/foot/second, respectively. The computer model predicts that head fire rate of spread can exceed 60 chains/hour. Typical head fire rate of spread during a five mph wind speed is near seven chains/hour with fireline intensity at approximately 100 BTU's/foot/second. Headfire flame height is generally four feet, and occasionally reaches 15 - 20 feet depending upon shrub density and height. Occasional "flare-ups" are short in duration, but increase crown scorch, spot fire potential, and canopy tree mortality. Flank fires and backing fires exhibit significantly lower intensity and slower rate of spread. Flame height increases briefly when shrubs are encountered.

Chemical brush treatment is on-going in the eastern half of the FMU, but will not significantly alter the fire behavior as frequent prescribed burns have controlled the brush.

Wetland Pine Savannah

Small pockets of savannah vegetation occur in low areas that hold water for extended periods of time. The grass varies in height and density depending upon the fire return interval, but is typically less than 3' high, and will generally carry a uniform fire front. Predicted headfire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 18 to 24 chains per hour and 400 to 500 BTU's/sq. foot Flame lengths are typically less than 6 feet. Boundary areas with wind exposure may be significantly more intense. Flanking and backing fires exhibit significantly lower intensity and slower rate of spread.

4. Fire Regime Alteration

In the 'natural' condition, the phyric vegetation types (Upper-Slope Pine-Oak and Wetland Pine Savannah) would be classified as Fire Regime I (low intensity – frequent fire); however, they have been significantly altered by logging (Condition Class 3) and should be included in the Fire Regime II category (high intensity - stand replacing fire). Treatment Areas that have been repetitively burned are in Condition Class 2, but will quickly revert back to condition class three if the burn schedule is not maintained. Two drainages are identified as 'baygalls' [a non-phyric vegetation type] and comprise only 3% of the area. They have been significantly altered by land use and are classified as Condition Class 3.

5. Control Problems

This FMU is broken into numerous Treatment Areas by pipelines, a high voltage powerline, old roads, and natural features. It has gentle topographic gradients, and the savannahs hold water for weeks at a time. A perennial stream is a significant topographic feature between Treatment Areas 2101 and 2201, and is typically a natural fire barrier.

Direct suppression of a head fire with hand equipment is not practical, nor safe, in these fuel types. Indirect suppression action utilizing natural and constructed barriers is the typical management action. Ignition of "burn-outs" from the perimeter reduces headfire intensity and spotfire potential near the fireline. Direct (handtool) suppression of flanking or backing fires may be possible, dependent upon rate of spread, fireline intensity, flame height, and weather (wind) variability. Spot fire potential downwind must be considered during handline construction.

6. Other Elements of the fire environment

Commercial timberlands along the southern boundary have been recently logged, and replanted as a plantation using a 'bedding process'. The result is a farm-row effect with elevated rows (1 foot high, by 3 to 4 feet wide) separated by farrow areas [for dirt] that are 4-5 feet wide. The rows have young pine saplings and brush, separated by tall grasses growing in the farrows. This will alter fuels as the farrows will hold water for extended periods, favoring grasses, and the rows will favor brush. Depending upon how the wind lines up with the rows, the grass will control the rate-of-spread while the brush will add intensity. This style of planting will reduce the effectiveness of a dozer-plow unit if having to work across the rows.

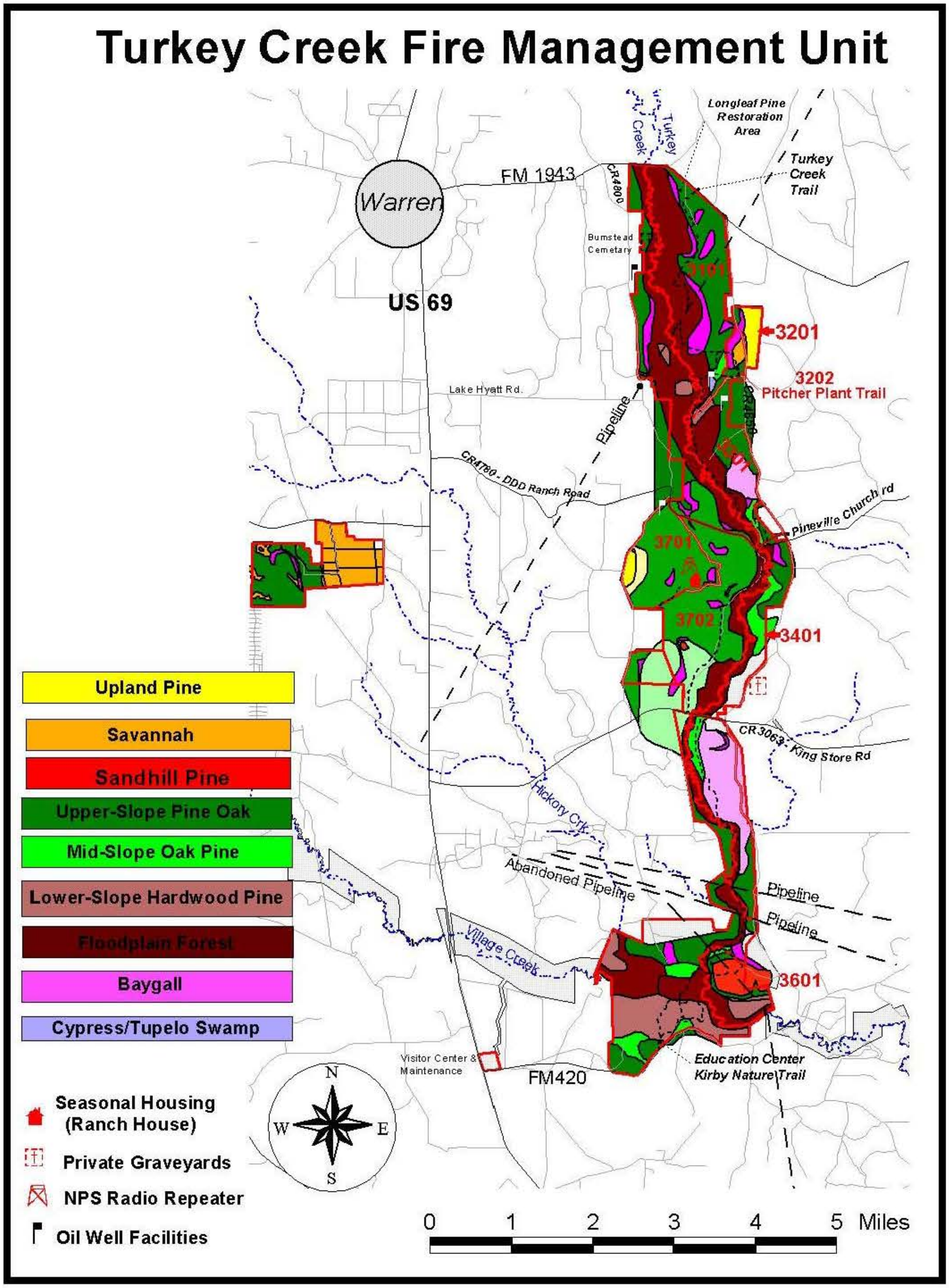
7. Values at risk

The Wildwood Community forms a critical Urban Interface zone with the western boundary. Chemical and mechanical fuel treatments have reduced the risk of a fire crossing the boundary; however, hazardous fuel loading on undeveloped lots increases the risk to adjoining property owners. Continued fuel treatments and maintaining a prescribed burn schedule in treatment unit 2101 is essential. Scattered rural home sites are also adjacent to the north and east sides. The entire FMU is considered an Urban-Interface zone due to the proximity of values at risk, the response time of firefighting personnel, and the potential rate-of-spread and intensity of wildland fires. The Sundew Trail has a public bathroom and pavilion that are at some risk from wildland fires. The numerous trail boardwalks are surrounded by flammable vegetation that puts them at substantial risk of damage or destruction if unprotected.

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I Community | Interior Trails | Interior Paved Road | Interior Dirt Road | High volt powerline | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 1.5 miles | .4 miles | .5 miles | 2.5 miles | .9 miles | 1.1 miles | miles | miles | .8 | .8 miles |

**Table 6b**

## 4. TURKEY CREEK FIRE MANAGEMENT UNIT



**a) Physical and Biotic Characteristics**

**General:**

The Turkey Creek FMU is 7,846 acres within 18 square miles, beginning 3 miles east of Warren on FM1943 and following Turkey Creek south 11 miles to FM420. It averages 1.5 to 2 miles wide and contains the most complex mix of vegetation types, visitor use facilities, oil & gas development, and urban interface. It has gentle topographic gradients, with the exception of a bluff on the south side of Village Creek in the area known as the 'Petty Preserve'.

A semi-paved county road, FM3063 (aka: King Store Road) crosses the unit between the communities of Village Mills and Caney Head.

Areas north of the King Store Road are accessible along county dirt roads adjacent to the unit (CR4800 on the west side, CR4850 on the east side). The Hicksbaugh road (CR6550) provides public access across the unit, while the Muscadyne Oil road and the Ranch House road are for administrative use. Rural residences (with pastures) scattered along the boundary provide an ignition source, and are at risk if a wildland fire escapes the Preserve.

The area south of King Store Road, and west of the creek, is adjacent to timber company land. Limited access is available through their gate. The area east of the creek (south of King Store Road) is accessible by ATV on abandoned logging roads. The area south of Village Creek contains the Visitor Contact Station (on FM420) and the Kirby Trail complex.

The Turkey Creek Trail (18 miles) provides administrative ATV access north to south through the unit, but it is occasionally flooded by high water. The southeast corner of the unit contains the largest sandhill within the preserve. The Sandhill Loop trail (.5 miles) branches off the main hiking trail and passes through the transition zones up from the floodplain. The Sandhill Loop and Pitcher Plant Trail (.5 miles) provide visitor access to areas of special interest, while the Kirby Nature trail (2.4 miles) in the southern portion of the unit is the most heavily visited.

Several oil production wells/facilities have recently been closed down for permit violations, and are currently under litigation. Addition oil facilities are on adjacent lands. Five abandoned oil or gas wells are known. Three active pipelines (17,000 feet), and one abandoned pipeline (8,400 feet) cross this unit.

**Vegetation:**

The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions. This unit has the most vegetative diversity in the preserve. Floodplains cover the greatest portion of the area, particularly in the southern portion due to the convergence of Hickory Creek, Turkey Creek, and Village Creek. The floodplain supports Cypress/Tupelo swamps, cypress sloughs, and baygalls. Vegetation type is dependant upon the topographic placement, with slope forests marking the transition to upland vegetation types (Upland Pine, Upper-Slope Pine-Oak, Wetland Pine Savannah, and Sandhill Pine Forest). The largest Sandhill Pine Forest within the preserve is in the southeast corner of this FMU.

Upland Pine Forest

Two areas of Upland Pine Forest occur within this FMU. The first is a 90-acre section associated with the Pitcher Plant Trail. The overstory is dominated by Loblolly Pine with a significant Longleaf Pine component. The only pine regeneration is Longleaf seedlings and saplings, indicating that the canopy will be restocked with Longleaf Pine over time. Canopy and mid-story hardwoods have been removed (a few scattered individuals remain) due to the prescribed burning program. Understory brush [Wax myrtle (Myrica cerifera), and Yaupon (Ilex vomitoria)] has been controlled by repetitive burns. The open forest floor supports an herb layer that consists of many species of grasses [Bluestem (Andropogon spp.) is dominant] and forbs, with dense pockets occurring at sunny sites.

A second Upland Pine area [86 acres] is adjacent to the west boundary, near the 'Ranch House' and radio repeater. It is a dense stand of mature Longleaf Pine, with minimal mid-story. The understory is dense Yaupon and Wax Myrtle, over six feet high. Ground cover is a thick mat of pine needles.

Wetland Pine Savannah

A Wetland Pine Savannah in the northeast portion of the unit is a nine-acre Pitcher Plant 'Bog' that has been developed for visitor use. The northern edge of the bog is an intermittent stream that has several additional Pitcher Plants Bogs (much smaller) adjacent. Small Pitcher Plant 'Bogs' historically occurred along the entire east side of the unit.

Sandhill Pine Forest

The largest example of a Sandhill Pine Forest occurs in the southeastern portion of this unit, at the confluence of Turkey Creek and Village Creek. About half of the sandhill is in expansion lands, and targeted for purchase in 2004. An active prescribed burn program has controlled the understory hardwoods and a grass/forb ground cover is well established. A recovery program for Texas Trailing Phlox (Phlox Nivalis), a rare and endangered plant that requires a microhabitat on the sandhill, is being attempted. Several populations have been planted in cooperation with the U.S. Fish and Wildlife Service and Houston Garden Club. Future planned ignitions will be conducted in the spring as specified in the Phlox Recovery Plan.

Upper-Slope Pine-Oak Forest

Moving down-slope toward the floodplains the next vegetation type is classified as Upper-Slope Pine-Oak Forest [3,029 acres]. It has a closed canopy of mixed pines (Shortleaf, Loblolly, and Longleaf Pine) and hardwoods (Southern Red Oak, White Oak, Sweet Gum, and Black Gum). The understory is dominated by yaupon, with flowering dogwood, American beautyberry and sassafras (Sassafras albidum) prevalent. The surface fuel is typically a needle/leaf mat. Several large Southern Pine Beetle infestations have removed most of the canopy pines over a significant portion of this forest type. In once mixed pine/hardwood stands, the remaining hardwoods will dominate the canopy for decades and reduce flammability of surface fuels. Areas that were once dominated by pine now have a dense brush understory (Yaupon, Wax Myrtle, and hardwood saplings) due to increased light and reduced competition.

Mid-Slope Oak-Pine Forest

The transition zone to the floodplains is classified as Mid-Slope Oak-Pine [569 acres]. Southern Pine Beetle infestations have removed most of the pine canopy, allowing existing hardwoods to dominate. As the hardwood canopy closes the reduced light will prevent pine regeneration. As the slope becomes more shaded the understory will become more open, and potential fire intensity will drop with the loss of fallen pine needles from the ground fuel layer.

Lower-Slope Hardwood-Pine Forest, Stream Floodplain, and River Floodplain Forest vegetation types [2994 acres] occur on the gentle slopes and flat terraces adjacent to creeks. It typically forms a dense canopy. Loblolly Pine may be present depending upon historic logging use. Competition for sunlight produces a sparse mid-story of canopy species and an open understory. Surface fuels are a uniform mat of hardwood leaves with moist soils.

Swamp Cypress Tupelo Forest [12 acres] are in small depressions in old stream channels, have an open canopy of bald cypress and tupelo, and standing water.

Wetland Baygall Shrub Thicket [435 acres] occurs in depressional areas at the base of slopes, where water seepage maintains saturated soil conditions. The overstory is open with a thick understory of non-flammable species. Surface fuels are thin layer of hardwoods leaves that are typically covered by standing water.

## Soil:

Soil disturbance has occurred due to road building, historic farming & timbering, and oil well & pipeline development.

## Aquatic:

The Turkey Creek drainage is the dominant feature through most of the unit, extending from FM1943, at the northern boundary of the unit, south to Village Creek. The southern portion of the unit has the confluences of Village Creek, a major drainage that flows to the Neches River, with Turkey Creek and Hickory Creek. These perennial creeks are 20 to 40 feet wide, have steep banks, and provide natural barriers to fire spread.

## Air:

Rural residences are scattered along the east and west boundary north of King Store Road, and along FM420. US Highway 69 parallels the unit 1.5 to 2.5 miles west. Smoke management and mitigation will be implemented during fire activities.

**Wildlife:**

No hunting is permitted in this unit; however, hogs from adjacent hunting clubs on timber company lands are frequently in the unit. A beaver pond (6.5 acres) is located south of the Muscadyne Oil production facility.

**Arch/Cultural/Historic:**

Moore Archeological Consulting in "A Gazetteer of Archeological Sites and Cultural Resources Survey" identified several archeological or cultural sites:

41HN16 – This site is a prehistoric open campsite with lithic scatter. It was investigated due to a Christopher Oil well pad, with a recommendation of no further work.

41HN017 – This site is a farmstead known as the Staley Cabin. The building was remodeled and used by the preserve as a visitor center for over 25 years. The site is used as a trailhead for the Kirby Nature Trail.

41HN025 – This site had a historic cabin probably of 1930 or 1940s vintage. Dethloff and Treat surveyed the site in 1975, considered the cabin to have little historic value, and it was removed by the preserve.

41HN28 - This site was a historic hunting camp. Dethloff and Treat surveyed the site in 1975 and found the structure in poor condition and in danger of collapsing. They recommended that it be allowed to deteriorate and remain as a discovery site.

41TL027 – This is the site of a historic sawmill and associated company town. It is not within the Turkey Creek FMU. The Lodwick Lumber Company was in operation from 1918 to 1928; and Hicksbaugh had 250 residents in 1940. Madden surveyed the site in 1985 and found the foundation of the sawmill, tramway, and log pond. Several private residences and a small guest ranch are all that remains. Tram roads (narrow gauge railroads) from the mill are evident in old aerial photography from the 1930's. Some current roads and trails, within the FMU, follow the old tram roads, and abandoned tram roads can still be easily found.

41TL059 – This is the site of a historic home [King House or Richardson House]. It was dismantled and the materials stored for reconstruction as a visitor attraction. Materials disappeared over time.

41TL60 – The Richardson Cemetery is adjacent to the preserve, contains stones dating to 1863 & 1866, and is still in use for burials.

A logging mill was also located on the sandhill in the southeast corner of the unit. The only evidence of it is a large sawdust pile that has been slowly deteriorating over time, and is barely noticeable today.

**b) Additional Fire Management Objectives**

Utilization of prescribed fire and mechanical treatments is essential to continue restoration of natural community structure, control hazardous fuels, and reduce risks toward rural housing that surrounds the unit.

**1.** A 3-year prescribed burn rotation (minimum) will be maintained on the Pitcher Plant Bog and associated Uplands [Treatment Areas 3201 and 3202]; the Longleaf Pine Restoration area [Treatment unit 3101]; and the Sandhill [Treatment unit 3601].
**2.** A three to seven year prescribed burn rotation will be maintained in Treatment Areas 3301, 3401, 3701, and 3702.

**c) Management Considerations**

1. The Pitcher Plant Bog (with associated Upland Pine) and Sandhill Pine Forest are fire dependant vegetation types that have been extensively managed to reduce hazardous fuels and restore/maintain fire dependent ecosystems. Suppression actions will favor burnout operations and limit line construction.

2. Administrative ATV use is permitted on trails, old roads, and the boundary if cleared of brush.

3. Air quality impacts to the Warren Community, scattered rural housing, and Highway 69 will be considered when developing implementation plans.

**d) Historic Role of Fire**

Aerial photography from the 1930's and 1950's show a logging mill along the western boundary of the preserve [Hicksbaugh] and on the sandhill in the southeast corner of the unit. Numerous 'tram' roads are evident and some current roads follow the same routes. During the acquision phase several houses were purchased and sold for salvage. One house was retained for seasonal quarters and is in use as the 'Ranch House'.

The upland pine and wetland pine savannahs in the northeast section have been intensively managed by mechanical brush removal, and planned ignitions of wildland fires since 1981. The sandhill was added to the burn schedule in 1991. The 1993 burn occurred during late summer (dry conditions), and removed significant amounts of duff. Continued burning has exposed the soil, and the grass/forb cover is increasing. These burns opened up the understory brush, and removed the pine overstory in isolated pockets. Several prescribed burns on the east side of the unit, between FM 1943 and King Store Road, have reduced hazardous fuels around scattered rural residences. Twenty-four prescribed burns totaling 6,980 (including natural barriers) were completed from 1980 to 2003.

Eight wildfires have occurred from 1976 to 2004. Most were human caused (4 accidental, 2 known arson cases) or due to equipment failure. The sandhill had several wildfires in 1978 and 1985, which were attributed to accidental ignitions by persons stealing sawdust from the old sawmill site. The equipment fires included an oil-heater-treater that blew up, and a powerline ignition due to high winds. While most of the fires are small (one wildfire was over 500 acres), and all were successfully controlled by initial attack forces from the preserve, Texas Forest Service, and Warren VFD. The preserve assisted the Texas Forest Service in suppression of 4 wildfires in close proximately to the unit.

**e) Specifics of the FMU**

1. Historical Weather Analysis

Frontal events during the winter produce uniform rainfall across the East Texas Region, while summer thunderstorms develop along the Gulf Coast and are carried inland on the sea breeze. The Turkey Creek FMU is the same distance inland as the Big Sandy Creek and Hickory Creek FMUs, so the weather pattern is similar. The 1983 tornado mentioned in the Hickory Creek description also 'touched down' near Hester Bridge Road shredding 28 acres of canopy trees. The preserve's automatic remote weather station (RAWS Unit plus GOES data collection) is located at the 'Ranch House' facility.

2. Fire Season

The fire season is similar to the Big Sandy and Hickory Creek FMUs; however, the vegetation is generally less flammable (see below).

3. Fuel Characteristics

This unit is a complex mosaic of vegetation types that exhibit variability in composition and structure. The Turkey Creek floodplain, and associated slope forests, account for half the area and creates a continuous strip through the length of the unit. The remaining area has pockets of more flammable vegetation types, but are not continuous limiting fire spread. Fire behavior is a function of fuel type, fuel load, fuel moisture content, relative humidity, and wind speed. Variation in these factors influences the rate of fire spread and fireline intensity. The type of fire (backing fire, head fire, or flank fire) also significantly affects fire behavior characteristics (see table 5).

<u>Upland Pine & Upper-Slope Pine-Oak Forest – Fuel Model 4</u>

The Upland Pine area west of the Ranch House and several small portions of USPO along the western boundary has dense understories of highly flammable brush (Yaupon and Wax Myrtle) due to many decades of fire suppression. Fuel Model 4 represents fire behavior. Pine needles often drape shrubs increasing fire intensity and spotting potential. Predicted intensity and rate of spread is highest in this fuel type. The effect of wind speed is critically important, particularly if westward winds are pushing in off adjacent clearcuts or young plantations. The computer model predicts that mid-flame wind speeds of 1, 4, 6, and 10 mph will produce head fire rate of spread at 3, 60, 90, and 130 chains/hour respectively. Predicted fireline intensity is 3,682-7,123 BTU's/foot/second with flame heights in excess of 20 feet. Head fire flame heights of 40-70 feet have been observed. Fortunately the fire would quickly burn into less flammable fuels. Behavior of flank fires in this fuel type is equally dependent upon wind speed. A slow, low-intensity fire with flame heights of two to four feet normally occurs during calm to very low wind conditions. However, flame height will increase when a flank fire moves through extremely dense understory and shrubs. Wind speed near five mph or greater will increase flank fire rate of spread and intensity, consuming the majority of shrubs. Flame height may reach 20-30 feet. Backing fires exhibit slow rate of spread, and flame height is generally two to four feet except in pockets of extremely dense flammable shrubs.

Upland Pine & Upper-Slope Pine-Oak Forest – Fuel Model 7

The Upland Pine area east of the Pitcher Plant Bog has been intensively managed by prescribed burning for 20 years, reducing brush heights to less than 6 feet. The USPO areas along the east boundary and north of King Store Road have been prescribed burned several times reducing flammable shrub fuel loading. Moderately dense stands of flammable shrubs between two and six feet high, below a mature pine or mixed pine-hardwood canopy correspond to Fuel Model 7. Predicted headfire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 11-16 chains/hour and 98-152 BTU's/foot/second, respectively. The computer model predicts that head fire rate of spread can exceed 60 chains/hour, but would quickly run into a less flammable fuel type. Typical head fire rate of spread during a five mph wind speed is near 7 chains/hour with fireline intensity at approximately 100 BTU's/foot/second. Headfire flame height is generally four feet, and occasionally reaches 15-20 feet in denser shrub pockets. Occasional "flare-ups" are short in duration, but increase crown scorch and spot fire potential.

Flank fires and backing fires exhibit significantly lower intensity and slower rate of spread. Fire spread is largely dependent on soil moisture availability, due to water wicking up into the surface fuel bed.

Slope Forests - Fuel Model 9

Southern Pine Beetle infestations in the USPO forests south of King Store Road have reduced pine dominance, increasing canopy hardwoods. The fuel structure is similar to Mid-Slope Oak-Pine Forests. These mixed pine-hardwood forests (including Lower-Slope Hardwood-Pine Forest) are dominated by hardwoods in the canopy, with a moderately well developed hardwood mid-story and understory with scattered shrubs. The fuel bed is a hardwood leaf-pine needle mat. Fuel Model 9 represents fire behavior. Predicted head fire rate of spread during typical weather and fuel moisture conditions is one to two chains/hour with fireline intensity at 8 to 14 BTU's/foot/second. The computer model predicts that head fire rate of spread can approach 40 chains/hour during 10 mph mid-flame wind speed. Observed rate of spread has been two chains/hour or less with an average flame height of two feet. When a head fire encounters scattered flammable shrub thickets (Fuel Model 4 or 7), brief flare-ups occur as previously described.

Flank fires and backing fires exhibit very low intensity and slow rate of spread. Fire spread is largely dependent upon fuel continuity. Rate of spread is normally less than one chain/hour, and flame height generally does not exceed one foot. Flame height increases briefly when shrubs are encountered.

Floodplain Hardwood Forests - Fuel Model 8

Southern Pine Beetle infestations around the Ranch House (NPS bunkhouse) removed most of the pine overstory, creating a hardwood-dominated canopy similar to floodplain forests. Fire Behavior in this area, and the creeks floodplains are best represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat. Intermittent drainages and permanent stream channels often dissect this fuel type. Fuel moistures are relatively high throughout the year, allowing creeping ground fires that consume only the top layer of forest duff. Flame height seldom exceeds six inches. Fires often naturally stop near slight depressions and drainages. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content. The low flammability of this vegetation significantly reduces the potential of wildland fires. This fuel type is typically used as natural firebreak unless drought conditions are present.

4. Fire Regime Alteration

   The vegetation of the area has undergone considerable change as a result of logging, fire suppression, and commercial development. After the initial logging, management for Loblolly Pine created a dense mature pine stand that hosted Southern Pine Beetle infestations over several decades (1970's and 1980's). Existing canopy and mid-story hardwoods quickly responded to the increased light and reduced competition for nutrients, creating a hardwood-dominated canopy. Areas that lacked the ready hardwood component responded with a thick hardwood understory that has reduced flammability.

   In the 'natural' condition, the phyric vegetation types [49% of the area] would be classified as Fire Regime I (low intensity – frequent fire); however, they have been significantly altered (Condition Class 3) and should be split between Fire Regime II category (5% frequent - stand replacing fire) and Fire Regime I (44% frequent-low intensity fire). The remaining vegetation types (51% - floodplains, Lower-Slope hardwood-pine, etc.) have not been as significantly altered by logging and fire suppression and are classified as Fire Regime III, Condition Class 2.

5. Control Problems

   Scattered groups of rural residences form urban interface around the northern half, and southern boundary of the unit. Several oil wells, production facilities, and pipelines must be protected from wildland fires, and provide an ignition source.

6. Other Elements Affecting Management

Some Southern Pine Beetle infestations have large tree trunks on the ground and dense brush reducing accessibility. A vegetation study area, west of the Pitcher Plant Trail, is used by Rice University to monitor long-term change and global warming trends. It must be protected from all fires. A set of vegetation monitoring 'control plots' is located in the Upland Pine Forest west of the 'Ranch House'. It is protected by a handline that must be maintained and defended. Additional long-term vegetation sampling plots, installed by G. Watson, should be monitored during fire events.

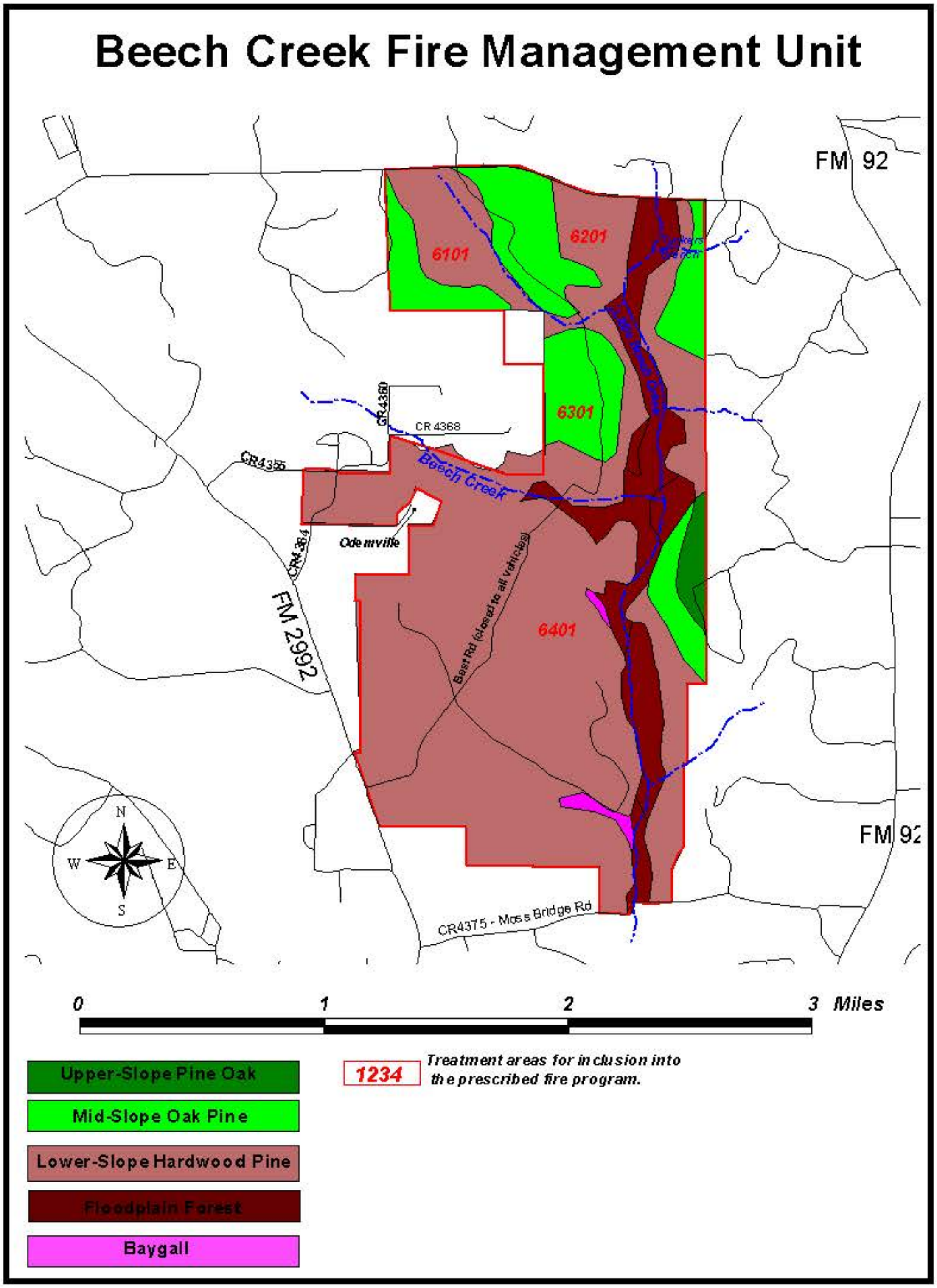
7. Values at Risk

Scattered rural residences, usually with associated pasturelands and outbuildings, create an urban interface zone around the northern half of this unit, and the McNealy Settlement is adjacent to the southeast boundary. Commercial timberlands occupy the remaining boundary interface area. Oil wells and production facilities are inholdings, or adjacent to the boundary. Three pipelines cross the unit.

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I Community | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 17.2 miles | 3.3 miles | 5.7 miles | 8.5 miles | | 21.7 miles | .4 miles | 1.7 miles | 2 inside 3 adjacent | 3.2 miles |

**Table 6c**

## 5. BEECH CREEK FIRE MANAGEMENT UNIT



**a) Physical and Biotic Characteristics**

**General:**

The Beech Creek FMU [4,925 acres] is 1.5 miles southwest of the Steinhagen Lake Dam, near the town of Town Bluff. The Beech Woods Trail and old timber roads provide hiking opportunities and administrative use of ATVs. It has short sections of paved county roads, FM2992 and Moss Bridge Road, as a portion of the boundary, but most of the boundary has difficult access. The Odemville Community forms a small inholding along the western boundary.

**Vegetation:**

The Beech Creek Fire Management Unit is predominately Lower-Slope Hardwood-Pine (70%), sixteen percent Mid-Slope Oak-Pine and Upper-Slope Pine-Oak Forests, and the remainder Floodplain Forest and Baygalls.

The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions:

Upper-Slope Pine-Oak Forest

A small section (63 acres) of USPO Forest occurs mid-point on the eastern boundary, with the associate higher landforms further east on timber company lands. It has a closed canopy of pines (Shortleaf, Loblolly, and Longleaf Pine), and hardwoods (Southern Red Oak, Blackjack Oak, Post Oak, Sweet Gum, White Oak, and Black Gum). The understory is dominated by Yaupon, with Flowering Dogwood, American Beautyberry and Sassafras (Sassafras albidum) prevalent. The surface fuel is typically a needle/leaf mat with scattered pockets of grass.

Mid-Slope Oak-Pine Forest

Small sections of Mid-Slope Oak-Pine [767 acres] are in the northern half of the unit. Southern Pine Beetle infestations reduced the pine overstory in some areas, resulting in a canopy dominated by oaks (southern red oak and white oak), with Loblolly and Shortleaf Pine recovering as saplings. Sweet gum, black gum, and red maple (Acer rubrum) are also present. A dense understory of hardwood saplings will be shaded out as the canopy closes. The surface fuel is typically a uniform layer of hardwood leaves with moist soils.

Lower-Slope Hardwood-Pine Forest, Stream Floodplain, and River Floodplain Forest

These vegetation types [4044 acres] occur on the gentle slopes and flat terraces adjacent to creeks. Oaks [white oak, water oak (Quercus nigra), laurel oak (Q. laurifolia), willow oak (Q. phellos)] with other hardwoods [American beech (Fagus grandifolia) Southern magnolia (Magnolia grandiflora), sweet gum, black gum, ironwood (Carpinus caroliniana) and American holly] provide a dense canopy. Extensive Southern Pine Beetle infestations in the late 1970s killed most of the canopy Loblolly Pine over the southern two-thirds of the unit. The increased light allowed a dense understory of hardwood saplings to develop. Surface fuel is a uniform mat of hardwood leaves with moist soils.

Wetland Baygall Shrub Thicket

This vegetation type [52 acres] occurs in depressional areas where seepage of water from slopes maintains saturated soil conditions. Overstory is open with laurel oak, black gum, sweet bay and red maple present. A thick understory of Titi and gallberry holly (Ilex coriacea) is not typically flammable. Surface fuels are a thin layer of hardwood leaves that are typically covered by standing water.

**Soil and topography:**

The topography is generally flat with shallow depressions, and elevations ranging from 140 to 210 feet.

**Water/Aquatic:**

The headwaters for Beech Creek and Little Beech Creek are just outside the unit, so streams are slow moving and may be virtually stagnant during droughts.

**Air:**

Sensitive smoke receptor sites include the town of Spurger (which includes schools), Town Bluff, and scattered rural residences.

**Wildlife:**

The Beech Creek FMU is open to hunting during the fall.

**Arch/Cultural/Historic:**

Two historic sites are adjacent to the boundaries of the Beech Creek FMU:

> 41TL63: The historic CHADDICK house was constructed in the 1870s and is the traditional 'dog trot' style with two 'mud' chimneys. It is located in the Oldham community adjacent to the preserve.
>
> 41TL64: This is a historic Mormon church that served the Odem (Oldham) Community, built about 1940, abandoned as a church about 1970, becoming storage for hay.

### b) Additional Fire Management Objectives

1. Smoke impacts to the Communities of Spurger & Town Bluff, and scattered rural residences are considered when developing and implementing treatment plans.

### c) Management Considerations

1. Administrative ATV use is permitted on trails, old logging roads, and the boundary if it has been cleared of brush.

2. Southern Pine Beetle infestations have created a dense understory in the southern two-thirds of the unit, reducing accessibility.

3. A Resource Management Goal developed in the late 1980s stopped maintenance on timber company roads in the unit. This has significantly restricted accessibility from the southwestern boundary (FM2992) through the unit to the north boundary. The roads will be considered for a public use trail when the General Management Plan is revised.

**d) Historic Role of Fire**

The preserve's records indicate 2 wildfires occurred since 1977, totaling 9 acres. Both were escapes from Temple Eastex burns of adjacent timberlands.

**e) Specifics of the FMU**

1. Historical Weather Analysis

   Weather is similar to the Big Sandy Creek FMU as it is about the same distance from the Gulf of Mexico.

2. Fire Season

   Ninety-eight percent of the area has hardwoods as the dominant canopy tree. The fire season is typically July through mid-September when soil moisture is low, reducing the wicking of moisture into the mat of hardwood leaves.

3. Fuel Characteristics

   Two percent of the area has fire dependent Upper-Slope Pine-Oak Forest, with the remainder lower flammability, hardwood dominated, forest types.

   Upper-Slope Pine-Oak Forest – Fuel Model 4

   The USPO area has an understory of flammable brush (Yaupon and Wax Myrtle) due to the absence of fire. Fuel Model 4 represents fire Behavior. East winds crossing commercial timberlands will penetrate into the natural fuels producing headfire rates-of-spread at 3, 60, 90, and 130 chains/hour at mid-flame wind speeds of 1, 4, 6, and 10 mph, respectively. Predicted fireline intensity is 3,682-7,123 BTU's/foot/second with flame heights in excess of 20 feet. Fortunately, a fire will quickly move onto less flammable vegetation (see below).

   Slope Forests - Floodplain Hardwood Forests - Fuel Model 8

   The MSOP and floodplain vegetation types are dominated by hardwoods, and represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat. Intermittent drainages feed the two main creeks. Drought periods allow the soil and fuel moisture to drop, allowing creeping ground fires that consume only the top layer of forest duff. Flame height seldom exceeds six inches. Fires often naturally stop near slight depressions and drainages. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content. The low flammability of this vegetation significantly reduces the potential of wildland fires. This fuel type is typically used as natural firebreak unless drought conditions are present.

4. Fire Regime Alteration

   Logging and Southern Pine Beetles have significantly altered the area. It is classified as Fire Regime III (mixed severity of 0-35+ infrequent fire return interval), and Condition Class 3 (High departure from natural variability).

5. Control Problems

   Extensive efforts will be required to locate a fire and move resources as surrounding commercial timberlands restricts access and interior roads have been closed to administrative use by vehicles.

6. Other Elements of the fire Environment

   Large Southern Pine Beetle infestations during the late 1970's killed most of the pine canopy over the southern 2/3s of the unit. While most of the downed logs have rotted, line construction through the dense understory will be difficult.

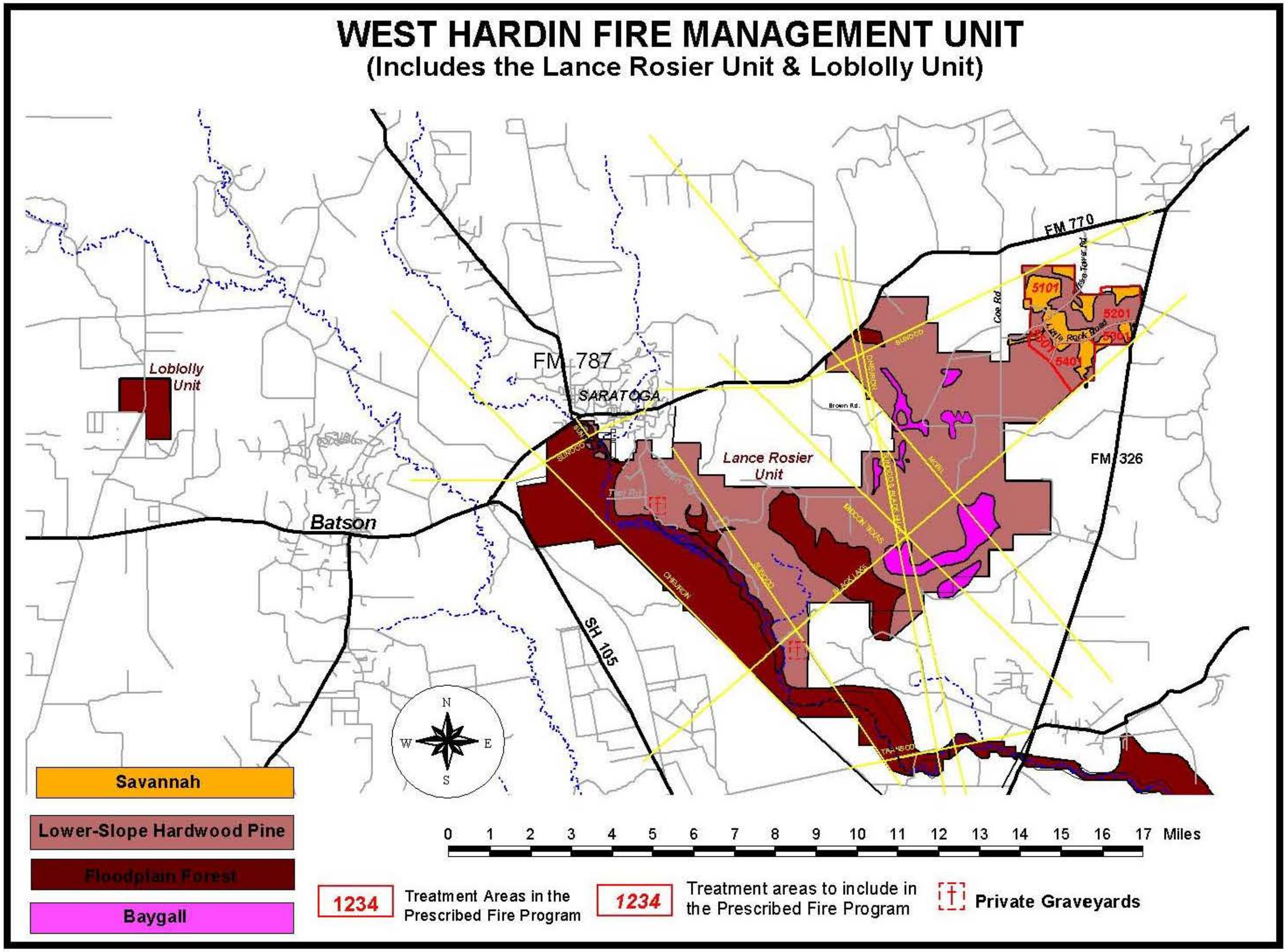
7. Values at risk

   Scattered rural residences, usually with associated pasturelands and outbuildings, create an urban-interface zone along FM2992 and Moss Bridge road. The Oldham community forms an U/I inholding along the western boundary. Commercial timberlands (young pine plantations) are adjacent to 12.7 miles of boundary.

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 12.7 timber + floodplain | *2.8* miles | miles | 2.7 miles | | miles | miles | miles | inside adjacent | miles |

**Table 6d**

## 6. WEST HARDIN FIRE MANAGEMENT UNIT (Lance Rosier and Loblolly Units)



**a) Physical and Biotic Characteristics**

**General:**

This fire management unit includes the Lance Rosier Unit and Loblolly Unit (7 miles West off State Highway 105). The Lance Rosier Unit is a predominately flatlands hardwood area (38 square miles), between the towns of Saratoga, Kountze, and Sour Lake. While the unit has only three miles of paved road along the boundary, the Teel, Cotton, and Church House Roads provide vehicle access to the interior (8 miles). The Loblolly Unit was a mature stand of Loblolly Pine, but Southern Pine Beetle infestations during the late 1970s killed most of the pines, leaving a hardwood forest.

**Vegetation:**

Ninety-six percent of the FMU has hardwood dominated vegetation types. The northeast corner of the Lance Rosier Unit contains wetland pine savannahs within five Treatment Areas.

The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions:

Wetland Pine Savannah [925 acres] occurs in large patches in the northeast corner of the Lance Rosier Unit. Treatment Areas south of Little Rock Road have been burned three times since 1983, maintaining their savannah appearance. Proliferation of flammable brush as an invader species, and stunted Loblolly Pine is shading out the herbaceous ground cover. Longleaf Pines are scattered on 'pimple mounds' (30 to 40 foot diameter mounds that are 3 to 5 feet high). Savannahs between Little Rock and Fire Tower Roads were prescribed burned in 1986. Hardwood brush/trees are significantly over represented and savannahs are shrinking. Savannahs north of Fire Tower Road have not been treated.

Flatland Hardwoods, Lower-Slope Hardwood-Pine Forest, and River Floodplain Forest vegetation types cover most of the Lance Rosier Unit [22,545 acres], and all of the Loblolly Unit [573 acres]. Brush is present in the understory, or as extensive fields, but is not of highly flammable species. Saw Palmetto may occur in the understory (2 - 6 feet high) but lacks the fine fuels, horizontal continuity or density, to add significant flame intensity. Infestations of Southern Pine Beetle occurred in the 1970s and 1980s, killing most of the canopy Loblolly Pines over vast areas. Sites with a high hardwood basal area index quickly shaded out the forest floor preventing pine regeneration. Sites with fewer hardwoods have Lobolly Pine regeneration with a dense hardwood understory and leaf mat ground cover. Mature mixed Hardwood/Loblolly Pine stands are still present on isolated ridges.

Wetland Baygall Shrub Thickets [2,356 acres] occur within large depressions in the Black Creek drainage, and as smaller pockets throughout the areas.

**Soil and Topography:**

The topography is very flat with elevations ranging from 50 to 100 feet.

**Water/Aquatic**:

Little Pine Island Bayou enters the Lance Rosier Unit as an intermittent stream west of Saratoga and flows 32 miles southeast toward the Neches River, becoming a corridor unit. During summer it becomes a series of stagnant puddles. Old meander channels snake across the floodplain. Black Creek begins in the middle of the unit and flows 4 miles east crossing the boundary near State Highway 326. A large baygall feeds its floodplain. Most of this unit has standing ground water, except during droughts.

The Loblolly Unit is drained by roadside ditches associated with CR2071, but does not have a natural stream. Most of the area holds standing water.

**Air:**

Sensitive smoke receptor sites include the towns of Saratoga, Sour Lake and Kountze. Scattered rural residences occur along FM770 and State Highways 326 &105.

**Wildlife:**

The Lance Rosier Unit is open for public hunting in the fall. The Loblolly Unit is closed. Surrounding hunting clubs on timber-company lands support hog populations that move into these units and cause soil disturbance by feeding & wallowing.

**Arch/Cultural/Historic:**

Eight historic sites are documented within the boundaries of the Lance Rosier Unit:

41HN01 – Alabama Indian campsite at the end of Cotton road near the Bayou
41HN11 – Prehistoric points collected between the 'salt lake' and the Bayou
41HN12 – Prehistoric Indian campsite on the west side of the Teel Cemetery
41HN20 – Historic birthplace of Lance Rosier on Cotton Road
41HN22 – Hooks Bear camp south of Coe Road
41HN26 – Historic hunting camp (Barbara Mitchell) with older log corn-crib
41HN27 – Edith Teel home, built in the 1890's. Burned by arsonist after acquision.

### b) Additional Fire Management Objectives

1. Utilization of prescribed fire and mechanical treatments is essential to continue restoration of natural community structure and control hazardous fuels in the wetland savannahs in the northeast corner of the Lance Rosier Unit.

   - A 3-year prescribed burn rotation (minimum) will be maintained in Treatment Areas 5201,5301 and 5401]; the burn program should be expanded to TU5101 when possible.
   - Mechanical thinning of Loblolly Pine (invasive) should be implemented in savannahs to reduce shading of grass/forbs and improve Longleaf Pine regeneration.

**c) Management Considerations**

1. Wetland Pine Savannah is a fire dependant vegetation type that has been managed with prescribed burns to reduce hazardous fuels and restore/maintain fire dependent ecosystems. Suppression actions will favor burnout operations to limit line construction.

2. Consider air quality impacts to the Communities of Saratoga and Kountze when developing implementation plans.

3. Administrative ATV use is permitted on trails, old logging roads, and the boundary if it has been cleared of brush. The area has an extensive network of pipelines (39 miles) suitable for ATV travel.

4. A group of no-burn vegetation sampling plots (control set) is located in Treatment Area 5401 and must be protected from burning.

**d) Historic Role of Fire**

The Texas Forest Service (TFS) and local Volunteer Fire Departments (VFDs) are active in suppressing wildland fires in the West Hardin FMU. The preserve's records indicate only 2 wildfires occurred in, or adjacent to, the Loblolly Unit; and 37 wildfires in the Lance Rosier Unit since 1976, totaling 784 acres. Twenty-eight were arson, with twenty-four ignitions occurring on 9 days. Many ignitions are grouped on the Teel & Cotton Road [twelve] and Little Rock Road (nine). A group of arson starts occurred on Little Rock Road while the preserve was engaged in a 290 acre prescribed burn in the Hickory Creek Unit. Three were 'natural outs'. The MUD fire occurred (lightning) during the summer drought of 1998 that burned 663 acres and cost $135,000 in suppression. This fire is significant as it may cause a vegetation type conversion from Flatland Hardwood Forest to Wetland Pine Savannah. The prescribed fire program focuses on the wetland pine savannahs in the northeast corner of the Lance Rosier Unit, and has conducted 7 prescribed burns totaling 2,507 acres since 1983.

**e) Specifics of the FMU**

1. Historical weather analysis

   These preserve units are closer to the Gulf of Mexico and pick up additional summer rainfall from thunderstorms moving inland on the sea breeze. Lightning has started wildland fires during drought periods. Average annual precipitation is over 50 inches, with March and July the driest. Occasional hurricanes and tropical storms can bring high winds and copious rains (peaking at 6"/hr) during late summer and early fall.

2. Fire season

   The winter fire season (January to April) provides increased fuel availability due to the curing of surface fuels and highly flammable brush. The spring flush of new growth reduces grass and brush volatility. High summer temperatures, long drying days, and reduced rainfall, readily cure surface fuels during July, August, and September. Summer droughts significantly alter the flammability of Flatland Hardwood Forests and other hardwood dominated vegetation types. Fall fires can occur between frontal rainfall events. Wildfires can occur during any month as drying conditions happen quickly (2 weeks without rain).

3. Fuel characteristics

Wetland Pine Savannah

Savannahs, that are several hundreds of acres in size, occur in low areas that hold water for extended periods of time. The grass varies in height and density depending upon the fire return interval, but is typically less than 3' high, and will generally carry a uniform fire front. Predicted headfire rate-of-spread and fireline intensity during probable weather and fuel moisture conditions is 18 to 24 chains per hour, 400 to 500 BTU's/sq. foot, and fireline intensities of 150 to 300 BTU/ft/sec. Flame lengths are typically less than 6 feet. Dense brush on 'pimple mounds' is significantly more intense (Fuel Model 4) and can be a spotting problem near boundaries. Flanking and backing fires exhibit significantly lower intensity and a slower rate of spread.

Floodplain Hardwood Forests - Fuel Model 8

The floodplain vegetation type is conspicuously dominated by hardwoods, and is best represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat, and is generally moist. Intermittent drainages and permanent stream channels often dissect this fuel type. Fuel moistures are relatively high throughout the year, allowing creeping ground fires that consume only the top layer of forest duff. Fires often naturally stop near slight depressions and drainages. This fuel type is typically used as a natural firebreak unless drought conditions are present. Flame height seldom exceeds six inches. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content. The low flammability of this vegetation significantly reduces the potential of wildland fires.

4. Fire Regime Alteration

Wetland Pine Savannah comprises only 3.5% of the area, but is a significant phyric vegetation type. The goal is to return the area to it's natural condition [Fire Regime I (low intensity – frequent fire]; however, the area has been significantly altered (grazing, logging, and fire suppression - Condition Class 3) and is classified as Fire Regime II (high intensity - stand replacing fire). The remaining vegetation types (floodplains, Flatland Hardwoods, Lower-Slope Hardwood-Pine, etc.) have been managed for timber production and are classified as Fire Regime III, Condition Class 2.

5. Control Problems

The Lance Rosier Unit has large contiguous areas that will carry a fire during drought conditions. Savannahs will carry a fast moving headfire with even moderate winds. Spot fire potential downwind from shrub thickets must be considered during handline construction.

6. Other Elements of the Fire Environment

An active graveyard (private inholding) is at the end of Teel Road, while an inactive burial plot (two headstones) occurs southwest of the junction of the Sun and Black Light pipelines. While the unit has only three miles of paved road along the boundary, the Teel, Cotton, and Church House Roads provide vehicle access to the interior (8 miles). The area has an extensive network of pipelines (39 miles) suitable for ATV travel.

7. Values at risk

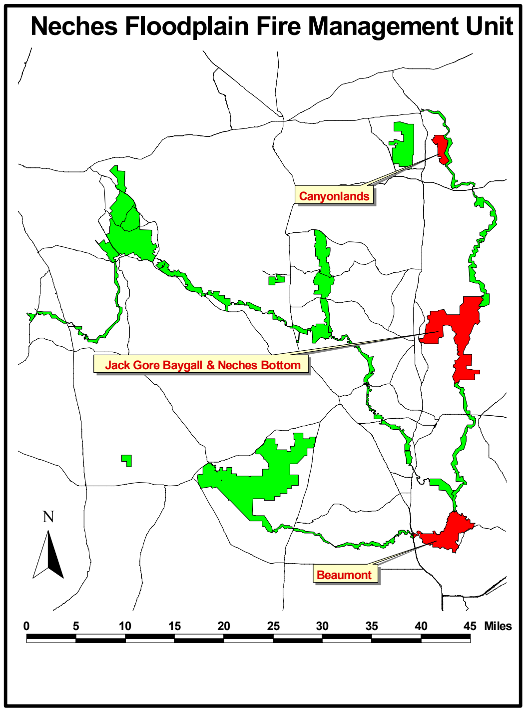
Urban interface occurs around the community of Saratoga, the Brown Settlement, and numerous scattered homesteads. Numerous pipelines cross the Lance Rosier Unit, and a seismic survey was conducted in 2003-2004, which may result in additional production wells. Commercial timberlands are adjacent to 53% miles of boundary.

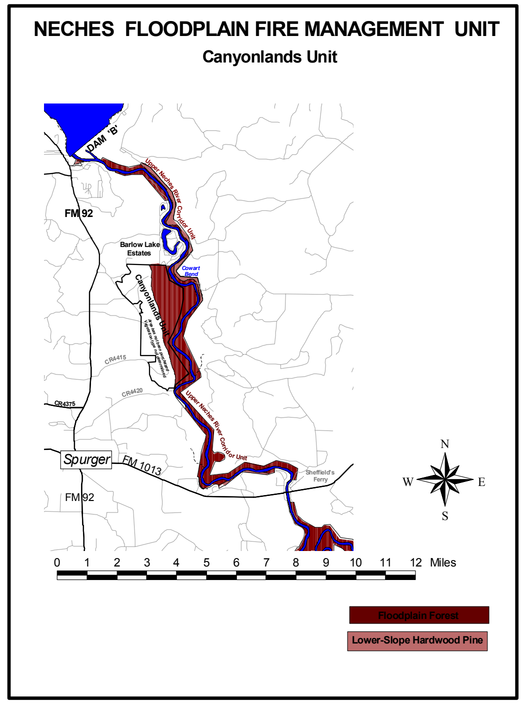
| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 50.6 timber + 2.3 floodplain | 3.4 miles | miles | 2.7 miles | | miles | miles | 8.6 miles | inside adjacent | 36.4 miles |

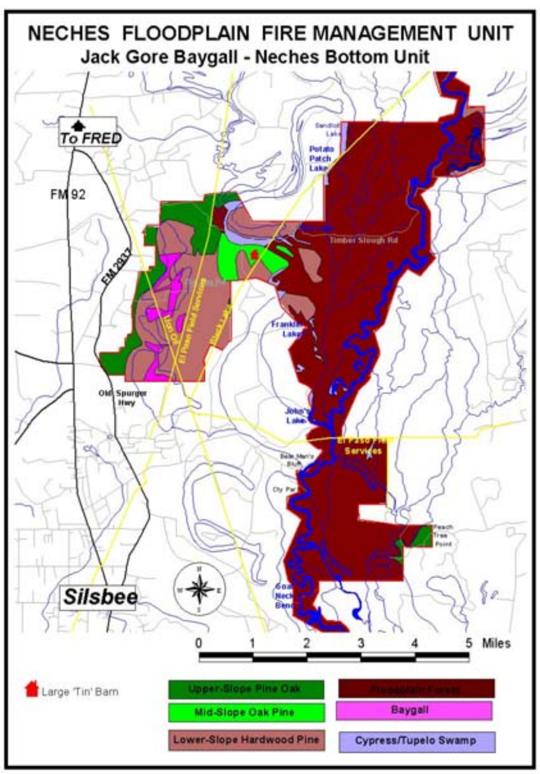
**Table 6e**

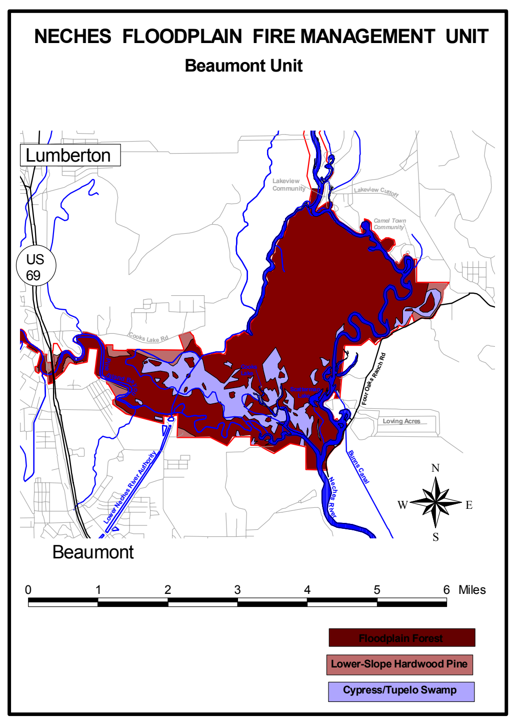
## 7. NECHES RIVER FLOODPLAIN FMU

**(Canyonlands Unit, Jack Gore Baygall & Neches Bottom Unit, Beaumont Unit)**



**a) Physical and Biotic Characteristics**

**General:**

These three preserve units are located along the Neches River, and conserve significant portion of the river floodplain. The Canyonlands Unit was established in the 1994 preserve expansion bill, with acquision anticipated in 2004/2005. It is about 3 miles south of Steinhagen Lake, and is adjacent to the Barlow Lakes residential area on the west side of the river. The Jack Gore Baygall & Neches Bottom Unit [13,183 acres] is about 20 miles south of Steinhagen Lake and north of the towns of Silsbee and Evadale. The Jack Gore Baygall area conserves a large baygall and numerous sloughs and braided channels that snake across the floodplain. Public access is seasonally possible on Timber Slough Road, reaching the river. The Neches Bottom conserves floodplains with braided sloughs on the east side of the river. Administrative access to the eastern boundary is possible across timber company lands. The Beaumont Unit [6329] is predominately an island [4000 acres] formed by the Neches River, Pine Island Bayou, and the Lower Neches River Authority (LNVA) canal. Its southern boundary is the northern city limit of the City of Beaumont, and numerous residential communities are adjacent to NPS lands off the 'island'.

**Vegetation:**

Acreage estimates of vegetation classifications are presented for the Canyonlands Unit, as a vegetational survey will not be conducted until purchase. The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions:

Upper-Slope Pine-Oak Forest

The upper terraces along the western boundary of the Canyonlands Unit [480 acres] are currently commercial Loblolly Pine plantations, and will require extensive mechanical & prescribed fire treatments to restore to USPO. The western edge of the Jack Gore Baygall area and the eastern edge of the Neches Bottom area rise above the floodplain, and have 1,083 acres of USPO.

Mid-Slope Oak-Pine Forest

The Canyonlands Unit has slopes along the western edge of the Neches River floodplain that support MSOP forests [340 acres] and small 'seeps' where ground water creates moist fern bogs. The Jack Gore Baygall area has several 'ridges', along Timber Slough road, that rise above the floodplains and support MSOP forest [363 acres] and commercial pine plantations. Several of these are exotic Slash Pine, and could be restored to native species.

Lower-Slope Hardwood-Pine Forest, Stream Floodplain, and River Floodplain Forest

The gentle slopes and flat terraces adjacent to the Neches River support hardwood dominated forests [Canyonlands Unit – 800 acres, Jack Gore Baygall & Neches Bottom – 11,054 acres, Beaumont Unit – 5,459 acres]. Chinese Tallow is an invasive exotic that is becoming a dominant understory species. Chemical treatments are underway, but a steady supply of seeds will be imported on every flood.

<u>Swamp Cypress Tupelo Forest</u>

Deep sloughs and abandoned stream channels of the Neches River provide boating access during periods of high water flows [Canyonlands – unknown, Jack Gore Baygall & Neches Bottom Unit – 352, Beaumont Unit – 870].

<u>Wetland Baygall Shrub Thicket</u>

The Jack Gore Baygall [968 acres] is a dominant feature along the western slope of the floodplain south of Timber Slough road, and is a small feature (unmapped) in the other units.

**Soil and Topography:**

The Canyonlands Unit has complex topography, including dramatic 30% slopes with 125-foot elevation gains as prominent features. Older geologic formations are exposed by the cutting action of the river, and small pieces of fossilized wood are in the soil.

**Water/Aquatic:**

Over-bank flooding is frequent during periods of high rainfall, with peak flows somewhat moderated by releases from Lake Steinhagen. These events are necessary to scour the water channels, keeping sloughs from filling in.

**Air:**

As the fuel types in this Fire Management Unit will only support significant wildfires during drought periods, smoke transport is typically not an issue. Prevailing southeast winds also reduce the potential of smoke reaching sensitive smoke receptor sites in the towns of Silsbee and Evadale.

**Wildlife:**

The existing preserve units are open for the fall hunting season.

**Arch/Cultural/Historic:**

Five archeological sites have been identified in the Fire Management Unit:

41HN003 – is an Indian ford across the Neches River below the dam for Lake Steinhagen. Shards were collected and the presence of clamshells noted.

41HN05 – is a prehistoric Indian campsite near Ard Lake in the Jack Gore Baygall area.

41HN06 – is a prehistoric Indian campsite on the south edge of Maple Slough in the Jack Gore Baygall area.

41HN18 – is a ceramic scatter on the southern edge of Maple slough in the Jack Gore Baygall area.

41HN30 – is a prehistoric campsite west of Possum Lake and South of Ard Lake in the Jack Gore Baygall area.

### b) Additional Fire Management Objectives

The Canyonlands Unit is part of the Big Thicket Expansion Bill and has not been acquired. When that occurs, a development plan for the commercial pine plantations along the western bluff, including mechanical and prescribed fire treatments, must be considered.

### c) Management Considerations

Road access is limited on the Neches River floodplain; coordination with the ranger staff for boat support may be the most practical method of locating and suppressing a fire.

### d) Historic Role of Fire

The Texas Forest Service, Silsbee Volunteer Fire Department, and the Beaumont Fire Department have participated in suppression actions in this FMU. The Jack Gore Baygall Unit has been the most active with 8 fires totaling 65 acres from 1976 to 2003. Three were arson ignition along Timber Slough Road, with one case involving 5 separate fires. Two arson ignitions occurred at Potato Patch Lake. Accidental ignitions (2) occurred due to oil equipment and a tool shed. One prescribed burn was conducted around the tin barn south of Timber Slough Road. A toilet was ignited at the Edge Water Drive Day-Use area in the Beaumont Unit by a high school student skipping class. The largest fire occurred in the Canyonlands Unit during the summer drought of 2000. It burned 125 acres of (potential) NPS pine plantation (75 timber Company), jumped a county road, and spotted over a canyon.

### e) Specifics of the FMU

1. Historical weather analysis

   The Gulf of Mexico moderates the general weather pattern by increasing winter temperatures near the coast, and provides cooling during the summer (2-3 degrees). It also creates a moisture gradient during the summer, as coastal areas receive more rainfall due to showers and thunderstorms moving inland on the sea breeze. The Beaumont Unit receives relatively uniform rainfall of 1 inch per week, or 50 to 55 inches annually. The Jack Gore Baygall & Neches Bottom Unit, and Canyonlands Unit receive 45 to 50 inches annually, as they are slightly drier during the summer.

2. Fire season

   Soil moisture wicks up into the dense leaf litter, so it is the primary factor controlling fire seasons. Wildland fires can occur during summer drought cycles.

3. Fuel characteristics

   This FMU is principally an intricate mosaic of floodplains, sloughs, and lakes, with highly flammable vegetation types on the upper terraces.

Upper-slope Pine-Oak Forest – Fuel Model 7

Moderately dense pine plantations on the western side of the Canyonlands Unit have the greatest potential for extreme fire behavior and large-scale fire growth. Shrub density and height is largely dependent upon the age of the stand and timber management activities. Predicted headfire rate-of-spread and fireline intensity during probable weather and fuel moisture conditions is 11-16 chains/hour, but may exceed 60 chains/hour. Headfire flame height is generally four feet, and occasionally reaches 15 - 20 feet depending upon shrub density and height. The curing of brush during mid-summer increases fire intensity, crown scorch (i.e. high tree mortality), and spot fire potential. In young pine stands Fuel Model 4 may be more appropriate.

The USPO forests on the edges of the Jack Gore Baygall & Neches Bottom Unit are 600' to 2500' deep, and will not allow sustained fire growth within the preserve.

Slope Forests - Fuel Model 9

Dense Slash Pine plantations on sand ridges south of Timber Slough Road (JGB Unit) have a thick pine needle mat. While sandy soils drain moisture quickly; ridges are surrounded by standing ground water. Wind penetration to the fuel bed will be poor. Observed rate of spread has been two chains/hour or less with an average flame height of two feet. When a head fire encounters scattered flammable shrub thickets (Fuel Model 4 or 7), brief flare-ups occur as previously described.

Slope forests in the Canyonlands Unit have an open mixed pine / hardwood canopy, and greater wind penetration, particularly from the northeast to southeast quadrant. Increased mid-flame wind speeds and slope steepness increases Rate-of-Spread to 30 chains/hour, and flame length to 9 feet.

Floodplain Hardwood Forests - Fuel Model 8

The floodplain vegetation type is conspicuously dominated by hardwoods, and is best represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat dissected by intermittent drainages and permanent stream channels. Fuel moistures are relatively high throughout the year, allowing creeping ground fires that consume only the top layer of forest duff. Flame heights seldom exceed six inches and often stop near slight depressions and drainages. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content. The low flammability of this vegetation significantly reduces the potential of wildland fires. This fuel type is typically used as natural firebreak unless drought conditions are present.

4. Fire Regime Alteration

Upper terraces and slopes of the Canyonlands Unit have been significantly altered by logging and timber management (Condition Class 3) and are classified as Fire Regime II category (high intensity - stand replacing fire). The floodplain vegetation types have been less altered by logging, but are effected by water flow control from Lake Steinhagen and the salt-water barrier (raising typical water levels in the Beaumont Unit) and are classified as Fire Regime III, Condition Class 2. If Chinese Tallow continues to proliferate condition class will deteriorate to class 3.

5. Control Problems

Aerial fire detection is the only viable alternative for most of the remote floodplain areas, and accessibility is limited to cross-country hiking over 10 square miles in the Jack Gore Baygall & Neches Bottom Unit. The Beaumont Unit's 4000-acre 'island' must be reached by boat, then cross-country hiking. It will be difficult to locate small wildfires over these large areas.

6. Other Elements of the fire Environment

Accidental ignitions from recreational use along the Neches River [cooking fires during the summer, and warming fires (hunters) during the winter] are potential sources of wildland fires.

7. Values at Risk

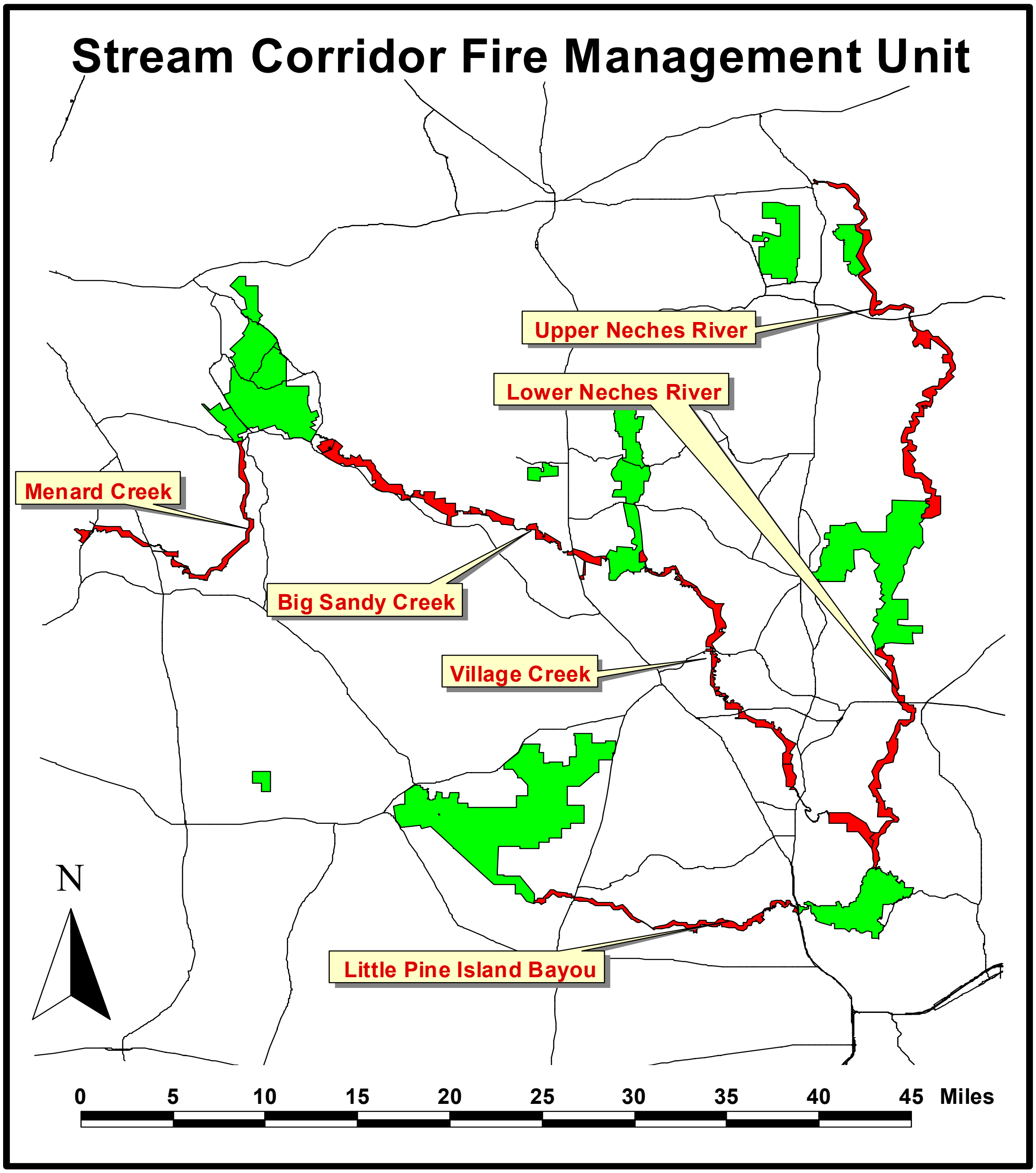
Scattered rural housing is located at the southern boundary of the Canyonlands Unit, the western boundary of the Jack Gore Baygall area, and around the Beaumont Unit. Small clusters of urban homes are grouped around the Beaumont Unit at Lakeview, Camel Town, Bunn's Bluff, Edge Water Drive, and Cooks Lake Road. Several NPS day-use areas (Edge Water, Cooks Lake, Lakeview Sandbar, and the Confluence Boat Ramp), and a private boat launch near Lakeview have facilities (picnic tables, trash barrels, toilets, etc.).

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 28.8 timber +103.8 floodplain | 1.3 miles | 1.9 miles | 19 miles | | miles | miles | 6.2 miles | 2 inside 2 adjacent | 15.2 miles |

**Table 6f**

## 8. STREAM CORRIDOR FIRE MANAGEMENT UNIT

**(Menard Creek, Big Sandy Creek, Village Creek, Little Pine Island Bayou, and the Upper & Lower Neches River)**



**a) Physical and Biotic Characteristics**

**General:**

The preserves corridor units are narrow ribbons that protect waterways, and were established for recreational opportunities, and to provide wildlife migration routes to prevent population isolation.

The Menard Creek Corridor begins at FM943 near the community of Segno and generally parallels FM2798 (south) and FM787 (west) 17 miles to the Trinity River. Scattered rural housing is along the east and south sides with three small sub-divisions (Hoop-n-Holler, Outlaw Bend, and Big Ticket lake Estates), and the Six Lakes Campground and Recreation area adjacent. Commercial timberlands are adjacent to the west and north boundaries. Several pipelines, State Highway 126, and FM 2610 cross the corridor. The Holly Grove Day-Use area provides recreational opportunities (swimming).

The Upper Neches River Corridor Unit begins at Lake Steinhagen dam and follows the river 28 miles south, passing the Canyonlands Unit, to the Jack Gore Baygall & Neches Bottom Unit. Access is limited by the numerous sloughs and timber company ownership of adjacent lands. Vehicles can cross the river on FM1013, which also has a private boat ramp (Sheffield's Ferry - historic site). The Lower Neches River Corridor Unit picks up the river at the southern boundary of the Jack Gore Baygall Unit and follows it 14 miles past Village Creek, and 2 more miles to the Beaumont Unit. Access is limited by the numerous sloughs and timber company ownership of adjacent lands. Vehicle can cross the river on US69, which also has a state maintained boat ramp, and a NPS Day-Use area.

The Big Sandy Creek Corridor is part of the Big Thicket Expansion bill, with some areas scheduled for purchase in 2004 & 2005. It begins at the southeastern corner of the Big Sandy Creek Unit, follows the creek 14 miles to the Wildwood Community where Big Sandy Creek joins with Kimball Creek becoming Village Creek, then following Village Creek 5 more miles to the Turkey Creek Unit. Access is generally poor as adjacent lands are in private and timber management ownership. Some road frontage occurs along FM943, and US69 crosses the creek 2 miles north of the NPS Visitor Center.

Village Creek Corridor picks up Village Creek as it exits the southeastern corner of Turkey Creek Unit, and follows it 24 miles, passing through the Sandyland Sanctuary [Nature Conservancy of Texas] and Village Creek State Park [Texas Parks and Wildlife], to the Neches River. Access is limited as adjacent lands are in private and timber management ownership. Vehicles can cross the creek on FM326 and FM418 (between the towns of Silsbee and Kountze), and on US69 (between the towns of Lumberton and Silsbee). Active railroad lines cross the creek one-mile south of FM 327, and 3/4 mile south of Hwy 96. High voltage transmission lines cross 1.25 miles north of FM 418, and 1.3 miles north of Hwy 96. Numerous oil wells occur on adjacent lands (generally north of Lumberton), and seven pipelines cross the corridor. Recreational canoeists utilize the creek from FM 418 south to Hwy 96 (Lumberton).

Little Pine Island Bayou is the major drainage for the West Hardin County area, with its headwaters northwest of Saratoga. The corridor unit follows the bayou as it exits the Lance Rosier Unit near SH326 (no facilities) and follows it 19 miles to the Beaumont Unit. It passes through the Pinewood Community golf course and is adjacent to the communities of Bevil Oaks, Artesian Acres, and Northwest Forest. It becomes the southern city limit of Lumberton, and the northern city limit for the city of Beaumont.

**Vegetation:**

The vegetation is similar to the Neches River Floodplain FMU, but is confined to narrow ribbons of land surrounding stream channels. No acreage estimates of vegetation classifications are presented for the Big Sandy Creek or Village Creek areas, as a vegetational survey will not be conducted until purchase. The vegetative descriptions utilize the classification system presented by Harcombe and Marks (1979) and are adapted to the current conditions:

Lower-Slope Hardwood-Pine, Flatland Hardwoods, and River Floodplain Forest [grouped together as they have similar vegetation and fire characteristics] is the dominant vegetation type of the stream channels [11390 acres].

Upper-Slope Pine-Oak [748 acres] occurs in small areas along the east/west section of Menard Creek (near State Highway 146) where the creek has steeper banks. The associated upland areas are outside the preserve, and managed for timber production.

**Soil:**

Soil types are similar to the Neches River Floodplain FMU.

**Water/Aquatic:**

The Menard Creek Corridor [3860 acres] is a perennial stream in the Trinity River watershed with its headwaters near the town of Livingston. It is spring fed during the summer.

The Neches River in a major stream in East Texas, with the headwaters in the Dallas/Fort Worth area and, with the Angelina River, drains 8500 square miles. It shapes the floodplain with periodic floods that scoured the channels, cut off bends (creating oxbow lakes), and transports sand between sandbars. Lake Sam Rayburn on the Angelina River supplies hydroelectric power, with Lake Steinhagen principally a surge dam (minor hydro-electric generation). Big Sandy Creek, Village Creek, and Little Pine Island Bayou Corridors are major tributaries of the Neches River.

**Air:**

This FMU is a collection of all the corridor units that are scattered around the preserve and connect to the other FMUs. Smoke production issues are minimal, as wildland fires will be aggressively suppressed, and no prescribed burns will be ignited.

**Wildlife:**

The preserves corridor units were established for recreation use, and to provide wildlife migration routes between the larger units to avoid isolation of populations. All corridors are closed to hunting.

**Arch/Cultural/Historic:**

41HN14 – points were collected where US69 crosses Village Creek
41HN29 – Several shell mounds on the West Bank of the Neches River near Evadale

**b) Additional Fire Management Objectives**

NONE

**c) Management Considerations**

Road access is limited on the Neches River floodplain; coordination with the ranger staff for boat support may be the most practical method of locating and suppressing a fire.

**d) Historic role of Fire**

Preserve records list 4 wildfires in the Menard Creek Corridor Unit between 1977 and 2004. They include 1 arson fire; two escapes from adjacent prescribed burns, and a 420-acre wildfire (20 on NPS) that burned onto the creek floodplain before TFS dozers could control it. Little Pine Island Bayou Corridor Unit lists three wildfires. Two were large fires that spread onto the floodplain before being controlled, and the third was accidental. The Upper Neches River Corridor Unit also had 3 wildfires. They include arson fires at Bush Lake and Sheffield's Ferry (destroyed two abandoned cabins), and the burning of an abandoned fiberglass boat at the 'Eason Camp'.

**e) Specifics of the FMU**

1. Historical Weather Analysis.

   The Gulf of Mexico moderates the general weather pattern by increasing winter temperatures near the coast, and provides cooling during the summer (2-3 degrees). It also creates a moisture gradient during the summer, as coastal areas receive more rainfall due to showers and thunderstorms moving inland on the sea breeze. Little Pine island bayou receives relatively uniform rainfall of 1 inch per week, or 50 to 55 inches annually. Rainfall is gradually reduced (5 to 10 inches annually) and temperature increases (2 to 3 degrees) moving northward to Woodville.

2. Fire Season

   Soil moisture wicks up into the dense leaf litter, so it is the primary factor controlling fire seasons. Wildland fires can occur during summer drought cycles.

3. Fuel Characteristics

This FMU is composed of six narrow land ribbons connecting other Fire Management Units. Fuel Characteristics are similar to those described in the Neches River Floodplain FMU without the slope effects described for the Canyonlands Unit.

4. Fire Regime Alteration

Timber Companies historically owned most of these areas prior to acquision, and in the recent past used 'Best Management Practices' that included 'stream side management zones' that limited timber harvesting next to the stream. However, the relatively high boundary length when compared to acreage indicates that external influences will have significant impacts. This FMU is classified as Fire Regime III [35-100+ year frequency, of mixed severity] and Condition Class 2 [moderate departure form historic norms].

Chinese Tallow is an aggressive exotic on disturbed lands. Periodic flooding and the cutting action of the stream causes natural disturbance. Proliferation of Chinese Tallow could deteriorate condition class to level 3.

5. Control Problems

Aerial fire detection is the only viable alternative for most of the remote floodplain areas. Access to the Upper and Lower Neches River areas, and portions of Little Pine Island Bayou, is limited to boats (restricted Passenger & cargo capability), or off-road tracks on timber management areas. The remaining areas will require cross-country hiking from the closest timber management road. It will be difficult to locate small wildfires over these large areas.

6. Other Elements of the fire environment

Accidental ignitions from recreational use along the streams (cooking fires during the summer, and warming fires (hunters) during the winter are potential sources of wildland fires. Industrial sources of wildland fire ignitions include several railroad lines and numerous pipelines that cross these areas.

7. Values at Risk

Scattered rural housing is located along the banks of streams near populated areas [Barlow Lake Estates, Sheffield's Ferry, Bush Lake, Lakeview, Camel Town, Bunn's Bluff, Artesian Acres, Northwest Forest, Pinewood, McNeally Settlement, Outlaw Bend, Hoop–n-Holler, Big Thicket Lake Estates, and the 6-Lakes Campground.

| Timber Lands | Boundary Road (paved) | Boundary Road (dirt) | U/I Scattered Rural Housing | U/I | Interior Trails | Interior Paved Road | Interior Dirt Road | Oil-Gas Facility | Pipeline |
|---|---|---|---|---|---|---|---|---|---|
| 126.6 timber + 5 floodplain | 4 miles | .8 miles | 17.3 miles | 2.4 | miles | 2.3 miles | 6.2 miles | inside adjacent | 7.3 miles |

**Table 6g**

## *IV. WILDLAND FIRE MANAGEMENT PROGRAM COMPONENTS*

### A. General Implementation Procedures

Safety is the prime consideration is all fire management activities. A Job-Hazard-Analysis must be prepared and communicated before the start of any activity. It will be a topic of the annual safety refresher. Tailgate safety sessions will be conducted prior to commence of fieldwork, and an After-Action-Review held to share 'lessons learned' (see appendix VIII and XI). Unsafe and/or Hazardous Condition Reports (anonymous) are available on a bulletin board in the crew area. All fire employees will have computer access and be trained in SafeNets procedures during the annual safety refresher.

Implementation of wildland fire management components must be consistent with fire management capabilities and should consider the current and predicted conditions affecting fire behavior. Preplanned decisions based on historical fire behavior indices should be considered to aid the decision progress. As the preserve does use 'Fire Use' the Stage I to III decision process identified in the Wildland and Prescribed Fire management Policy – Implementation Procedures and Reference Guide is not required (i.e. it is a suppression only program). However, much of the same information is required to develop a Wildland Fire Implementation Plan (WFIP), which is mandatory on all extended attack fires. Specific WFIP procedures, including a Wildland Fire Situation Analysis (WFSA) are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide.

A Wildland Fire Situation Analysis (WFSA) will be used to select an alternative for fires that have not been contained during the initial attack phase. An Incident Action Plan (IAP) will be completed for all extended attack wildland fires. Command of wildland fires after they move off the preserve may transfer to the fire department having jurisdiction, to the Texas Forest Service, or a Joint Command structure utilized. The WFSA and Incident Action Plan will be developed utilizing the procedures developed by that organization. The park may provide a resource advisor as a liaison between park management staff and the fire department/TFS.

### B. Wildland Fire Suppression

#### 1. Fire Behavior

Big Thicket National Preserve is a complex mosaic of vegetation types that exhibit tremendous variability in composition and structure. Fire behavior in each of the vegetation types is equally as varied. Fire behavior is basically a function of fuel type, fuel load, fuel moisture content, relative humidity, and wind speed. Variation in any of these factors influences the rate of fire spread and fireline intensity. In addition, the type of firing pattern (backing fire, head fire, or flank fire) significantly affects fire behavior.

Fire behavior is predicted by the use of Fuel Model computer programs developed by Rothermel (1972) and Albini (1976). Correlation of standard fire behavior Fuel Models and vegetation types in Big Thicket National Preserve are presented in Table 4.

**Correlation of Fire Behavior Fuel Models and Vegetation Types***

| Vegetation Type | Fire Behavior Fuel Model 2 | 4 | 7 | 8 | 9 |
|---|---|---|---|---|---|
| Upland Pine | X | X | X | | |
| Wetland Pine Savannah | X | X | X | | |
| Sandhill Pine | X | | X | | |
| Upper Slope Pine Oak | | X | X | | X |
| Mid Slope Pine Oak | | | X | | X |
| Lower Slope Hardwood Pine | | | | | X |
| Floodplain Hardwood Pine | | | | X | |
| Floodplain Harwood | | | | X | |
| Flatland Hardwood | | | | X | |
| Wetland Baygall | | | | X | |

Vegetation Types as defined by
P. Harcomb and P. Marks 1978

Table 4

Utilization of the BEHAVE program with existing or forecasted conditions provides estimates of fire behavior. However, the user must realize that computerized Fuel Models generalize the many interacting variables, which affect fire behavior. Fire behavior predictions are interpreted as relative values, based upon previously documented fire behavior, and not as definitive answers. Comparative fire behavior predictions calculated for each fuel type (model) are presented in Table 5. It is important to note that the predictions represent fire behavior associated with head fires (fires driven by wind). Rate of spread and intensity may be considerably reduced when flank fires (right angle to wind) or backing fires (opposite direction to wind) are encountered, although severity or depth of burn and heating may be greater for backing fires.

**Comparative Fire Behavior Calculations**

| Fuel Model | Temp/RH | Rate of Spread (Chains/hr) | Heat per Unit Area (BTU/ft sq.) | Fireline Intensity (BTU/ft/sec) |
|---|---|---|---|---|
| - 2 - Savannah | 55/35 | 24 | 488 | 216 |
| | 90/60 | 18 | 453 | 152 |
| - 4 - Dense Brush | 55/35 | 136 | 2863 | 7123 |
| | 90/60 | 80 | 2499 | 3683 |
| - 7- Southern Rough | 55/35 | 16 | 533 | 152 |
| | 90/60 | 11 | 491 | 98 |
| - 8 - Hardwoods | 55/35 | 1 | 185 | 2 |
| | 90/60 | 1 | 171 | 2 |
| - 9 - Dense Pine | 55/35 | 2 | 366 | 14 |
| | 90/60 | 1 | 339 | 8 |

Calculations based upon a mid-flame windspeed of 10 mph, and 8% fuel moisture (10hr. TLF).

This table is provided for comparison of the outputs for different fuel models, and is not intended for use predicting a wildland fire. Specific inputs are required for use on fires.

Table 5

Generalizations on fire behavior in each fuel type can be made. Fires in hardwood-dominated forests (Fuel Models 8 and 9) often exhibit low-intensity and slow rate of spread. Fires occurring in mixed pine-hardwood forests with a moderately well developed shrub layer (Fuel Model 7) exhibit comparatively higher intensity and a faster rate of spread. Fires in open canopy forests with a dense herbaceous layer (Fuel Model 2) generally exhibit moderate intensity and a high rate of spread. The most extreme fire behavior will probably occur in forests that have a dense accumulation of tall shrubs, and a well-developed understory stratum below a pine dominated canopy (Fuel Model 4). As fuel treatments reduce the scrub understory and increase the grass/forb ground cover, the corresponding Fuel Model will change to Fuel Model 7 (recovering), and Fuel Model 2 (natural).

<u>Upland Forests-Fuel Model 2</u>

Upland vegetation types (Sandhill Pine Forest, Upland Pine Forest, Wetland Pine Savannah) composed of a relatively open tree layer, sparse shrub stratum, and a well developed herbaceous layer are best represented by Fuel Model 2. Predicted head fire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 18-24 chains/hour (one chain=66 feet), and 152-216 BTU's/foot/second, respectively (Table 13). The computer model predicts that head fire rate of spread may approach 70 chains/hour. However, observed rate of spread is often near seven chains/hour, and fireline intensity is about 100 BTU's/foot/second. Head fire flame height is generally four feet, and flame width ranges between two and five feet, depending upon wind speed. Spot fires routinely occur 5 to 10 feet in advance of a head fire. Spot fire potential increases when a head fire moves through areas of dense shrubs (Yaupon and wax myrtle), which are scattered throughout Upland Pine Forest and Wetland Pine Savannah. The scattered shrub "thickets" often correspond to Fuel Model 4. Spot fires may occur over 200 feet in advance of a head fire when dense shrubs are encountered, threatening fireline security.

Flank fires in upland vegetation types corresponding to Fuel Model 2 normally spread at two chains/hour. Flank fire flame height is generally three feet, and flame width is near two feet. Backing fires are dependent on continuous fuels, and exhibit flame heights of two feet or less with rate of spread at one chain/hour.

Direct suppression of a rapid spreading head fire with hand equipment is not practical in this fuel type. Indirect suppression action using burnout tactics from natural and constructed barriers is the most feasible method. Spot fire potential downwind from dense shrub thickets must be considered during handline construction. Flank fires and backing fires are much easier to control due to slower rate of spread and lower fireline intensity.

<u>Upland Forests - Fuel Model 4</u>

As previously mentioned, scattered areas of dense shrub and understory thickets (Fuel Model 4) occur throughout Upland Pine Forest and Wetland Pine Savannah. Dense shrub thickets are also found in Upper-Slope Pine-Oak Forest. The development of a very dense shrub and understory stratum in these vegetation types is largely due to fire suppression over a number of years.

The factors most responsible for potentially dangerous fire behavior in this fuel type are the dense accumulation of highly flammable shrubs (Yaupon and Wax myrtle) and height (20-35 feet) of the well-developed understory stratum below the pine dominated canopy. Pine needles often drape the understory and shrubs.
Predicted intensity and rate of spread is highest in this fuel type (Table 5). The effect of wind speed on rate of spread is critically important. The computer model predicts that wind speeds of 1, 4, 6, and 10 mph will produce head fire rate of spread at 3, 60, 90, and 130 chains/hour, respectively. Fortunately, high rates of spread are not maintained because this fuel type is interspersed with less flammable vegetation types. Predicted fireline intensity is 3682-7123 BTU's/foot/second with flame heights in excess of 20 feet. Head fire flame heights of 40-70 feet have been observed, but are short in duration. Spot fire potential dramatically increases when this situation occurs, particularly during gusty winds.

Behavior of flank fires in this fuel type is equally dependent upon wind speed. A slow low-intensity fire with flame heights of two to four feet normally occurs during calm to very low wind conditions. However, flame height will increase when a flank fire moves through extremely dense understory and shrubs. Wind speed near five mph or greater will increase flank fire rate of spread and intensity, consuming the majority of shrubs. Flame height may reach 20-30 feet. Backing fires exhibit slow rate of spread, and flame height is generally two to four feet except when extremely dense flammable shrubs are encountered. Direct suppression of a head fire with hand equipment is not practical, nor safe, in this fuel type. Indirect suppression action utilizing natural and constructed barriers is the best approach. Ignition of "burn-outs" from constructed firelines and ignition of spot fires within the burn perimeter reduces head fire intensity and escape potential. Spot fire potential beyond firelines must be critically evaluated and monitored.

Prior to igniting a prescribed fire in this fuel type, it is essential that adequate control lines (natural or constructed) be established. Coordination of ignition pattern with wind direction and speed is extremely important to reduce crown scorch and escape potential.

Upland and Slope Forests - Fuel Model 7

Moderately dense stands of flammable shrubs between two and six feet high, below a pine or mixed pine-hardwood canopy, occur throughout the following vegetation types: Sandhill Pine Forest, Upland Pine Forest, Wetland Pine Savannah, Upper-Slope Pine-Oak Forest, and Mid-Slope Oak-Pine Forest. Vegetation stands of this type most closely correspond to Fuel Model 7 (Table 12). Shrub density and height is largely dependent upon fire history.
Fire behavior in this fuel type is much less severe compared to Fuel Model 4. Predicted head fire rate of spread and fireline intensity during probable weather and fuel moisture conditions is 11-16 chains/hour and 98-152 BTU's/foot/second, respectively. The computer model predicts that head fire rate of spread can exceed 60 chains/hour.

Typical head fire rate of spread during a five mph wind speed is near seven chains/hour with fireline intensity at approximately 100 BTU's/foot/second. Head fire flame height is generally four feet, and occasionally reaches 15 - 20 feet depending upon shrub density and height. Occasional "flare-ups" are short in duration, but increase crown scorch and spot fire potential. Fire behavior associated with flank fires and backing fires in this fuel type is similar to the description presented for such fires in Fuel Model 2.

Direct suppression of a head fire with handtools in this fuel type may be possible, dependent upon rate of spread, fireline intensity, and flame height. Indirect suppression action utilizing natural and constructed barriers is often the preferred method. Spot fire potential downwind from well-developed shrub thickets must be considered during handline construction. Flank fires and backing fires in this fuel type are much easier to control due to slower rate of spread and lower fireline intensity

Slope Forests - Fuel Model 9

Mixed pine-hardwood forests, dominated by hardwoods in the canopy, with a moderately well developed hardwood understory and scattered shrubs (Mid-Slope Oak-Pine Forest and Lower-Slope Hardwood-Pine Forest) are best represented by Fuel Model 9. Some areas within Upper-Slope Pine-Oak Forest dominated by hardwoods are also included in this fuel type. The fuel bed is a hardwood leaf-pine needle mat.

Predicted head fire rate of spread during typical weather and fuel moisture conditions is one to two chains/hour with fireline intensity at 8 to 14 BTU's/foot/second. The computer model predicts that head fire rate of spread can approach 40 chains/hour during 10 mph mid-flame wind speed. Observed rate of spread has been two chains/hour or less with an average flame height of two feet. When a head fire encounters scattered flammable shrub thickets (Fuel Model 4 or 7), brief flare-ups occur as previously described.

Flank fires and backing fires exhibit very low intensity and slow rate of spread. Fire spread is largely dependent upon fuel continuity. Rate of spread is normally less than one chain/hour, and flame height generally does not exceed one foot. Flame height increases briefly when shrubs are encountered.

Direct suppression of a head fire with handtools in this fuel type can be accomplished. Spot fire potential is low, but must be considered. Constructed barriers (handline or plowed line) must avoid concentrations of flammable shrubs to insure fireline security.

Floodplain and Flatland Hardwood Forests - Fuel Model 8

Vegetation types conspicuously dominated by hardwoods (Floodplain Hardwood-Pine Forests, Floodplain Hardwood Forest, Wetland Baygall Shrub Thicket, and Flatland Hardwood Forest) are best represented by Fuel Model 8. The fuel bed is normally a thin hardwood leaf mat. Intermittent drainages and permanent stream channels often dissect this fuel type. Fuel moistures are relatively high throughout the year. Creeping ground fires are the norm, consuming only the top layer of forest duff. Flame height seldom exceeds six inches. Fires often naturally stop near slight depressions and drainages. Fire behavior predictions for Fuel Model 8 often exceed observed behavior due to low fuel loads and high fuel moisture content.

## 2. Preparedness Activities

a) Fire Prevention

Fire prevention includes all activities designed to reduce the number of unwanted fires that occur in the area. The fire prevention program is oriented towards increasing public awareness of the detrimental and beneficial effects of fire and reducing human actions responsible for ignitions. The Texas Forest Service, US Forest Service, Big Thicket National Preserve, and other land management groups collaborate to improve public awareness of increasing fire danger and prevent ignition of wildland fires. Under extreme fire danger situations the county judges impose a moratorium preventing outdoor burning. The news media is notified and interviews conducted to raise public awareness.

A Wildland Fire Prevention Plan is located in Appendix I.

b) Annual Training Activities

The preserve participates in the spring and fall training academies hosted by the Texas Forest Service at Angelina College (Lufkin, Texas) and Fort Swift (Bastrop, Texas) by providing assistance, instructors, and sending students. Prior to these academies, the FMO reviews staff qualifications, performs a needs assessment, and coordinates training opportunities with staff. Long-range goals are discussed during each employee's annual employee evaluation, and other training opportunities explored. Interagency fire availability and trainee assignments are provided to TICC weekly during fire season. A task book is issued by the FMO after pre-requisite training is completed. Typically only one task book is active at a time; however, a second task book may be issued for a separate job at the same complexity / responsibility level. A second task book will not be issued at a higher level (i.e. Crewboss and Strike Team Leader).

Mandatory annual safety refresher training (8 hours annually) is held in early January and must include fire shelter drills and gear inspection. It typically includes: Local weather patterns and US Drought Outlook, Work/Rest Guidelines, Lessons learned - Entrapments & Fatalities, and Recent Safety Incidents. Seasonal firefighters will receive the safety refresher training before their first fire assignment.

c) Fire Readiness of Equipment and Supplies

The preserves FMO, Equipment Technician, and local interagency partners perform Preseason Readiness Inspections and Drills prior to the summer fire season.

Minimum Checklists: Agency Administrator Overview, Fire Management Administration, Wildland Fire Situation Analysis, Training, Prevention/Education/Information; Fire Weather Preparedness; Individual Firefighter Evaluation; Dispatch; General Facilities

Minimum Drills: Initial Report; Briefing Checklist/Risk Management; Belt Weather Kit; Response Get-Away Standards; Spot Fire; Handtool Safety; Handtool Safety Check; Fireline Construction; Dirt Throwing; Firing Devices; Dispatching; Engine Inspection; Mobile Attack; Stationary Attack; Hydraulic Calculations; Fitting Identification

While they are typically performed in June, it may occur earlier during a dry spring. During fire season the Equipment Technician supervises daily equipment checks, and schedules repairs. The Equipment Technician issues equipment from the cache, maintains an inventory, and recommends major purchases in January and September. Completion of a pre-season risk assessment will be done annually prior to the beginning of fire season.

d) Fire Weather and Fire Danger

*Weather Station*

The preserve has a Remote Automated Weather Station (Forest Technology System) in the Turkey Creek FMU (central location). It includes: Temperature and Relative Humidity sensor, 10 hour fuel stick, wind direction and speed sensors, solar sensor, and rain gauge. It communicates by phone modem and GOES link to the Weather Information Management System (WIMS). The preserve also monitors the Texas Forest Service weather station in Woodville to check the variability of weather events and verify station readings.

*National Fire Danger Rating System*

The potential for a wildland fire occurrence, and the expected severity (i.e. intensity, rate of spread, etc.) of a wildland fire, is determined through use of the National Fire Danger Rating System (NFDRS). The NFDRS is a computer model that integrates weather conditions, fuel type, fuel conditions, and risk factors (human and lightning) to determine the relative fire danger and potential severity on a given day. Correlation of the NFDRS Fuel Models (Deeming et al. 1977) and vegetation types is presented in Table 4. As fire danger is rated from a worst-case approach, Fuel Model "D" (dense brush understory >6 foot) is used. A comparison of the outputs from the Texas Forest Service (Woodville) and the Preserve's (Village Mills) weather stations' is used to adjust response due to variations in rainfall patterns. Keech-Byron Drought Index values determine appropriate "preparedness levels" which define a particular state of readiness and the specific actions needed to insure appropriate response (see Table 7). The Drought Index relates to the dryness of fuels, and is divided into classes that indicate difficulty of suppression. The Burning Index is also used as it includes a wind component in the calculations that indicate fire behavior potential. During fire season the Fire Management Officer insures that KBDI and BI values are calculated, cataloged, evaluated to determine the fire danger and preparedness level, and implements actions described in the 'Staffing Plan'.

e) Step-Up Plan

**Preparedness Class Levels**

| CLASS | FUEL MODEL D BURNING INDEX | KEECH-BYRAM DROUGHT INDEX | FIRE DANGER |
|---|---|---|---|
| I | 0 - 14 | 0 - 99 | LOW |
| II | 15 - 27 | 100 - 349 | MODERATE |
| III | 28 - 54 | 350 - 499 | HIGH |
| IV | 55 - 59 | 500 - 599 | VERY HIGH |
| V | 60 plus | 600 - 800 | EXTREME |

Table 7

Preparedness level I: All supplies and equipment are inspected and serviced; fire-fighting personnel receive training and pass physical fitness test; telephones are staffed during regular duty hours. One engine is immediately available. The Teas Forest Service - Woodville Dispatch provides dispatch services during normal working hours, while the Tyler County Sheriffs Office provides off-shift dispatch services through a cooperative agreement with the preserves law enforcement program. The FMO develops a Pre-season Risk Analysis and Redcards are being issued. Funding by routine operational accounts.

Preparedness level II: See above; also, all firefighting personnel maintain radio contact during duty hours. Five days per week coverage. Funding by routine operational accounts.

Preparedness level III: See above; also, all firefighting personnel have personal protective gear and fire tools available during duty hours; be within one hour travel time to a vehicle during duty hours. The NPS-TFS shared dozer is immediately available. Funding by routine operational accounts.

Preparedness level IV: See above; also, prevention patrols are conducted during peak burning hours (11 AM - 6 PM); engines and equipment for extensive hoselays may be prepositioned in high hazard areas; emergency firefighters may be hired and equipment rental agreements/contracts activated; local news media are contacted and informed of very high fire danger; preserve staff assists the Texas Forest Service with logistics, dispatch, and aerial detection. Coordination with other land management agencies (Texas Forest Service, US Forest Service, US Fish and Wildlife, and Texas Nature Conservancy) is established through a MAC group. The Superintendent, Division Chiefs, and IMR Fire Management Office are notified. An emergency preparedness account [less than $100,000 approved by superintendent] may be opened to provide additionally initial attack capabilities through use of additional engine, module, handcrew, aircraft or prevention type patrols.

Preparedness level V: See above; trails and backcountry areas may be closed to public use if conditions warrant. NPS resources will be grouped with interagency resources into strike teams/task forces and prepositioned at area volunteer fire departments. The NPS Mobile Command Post may be utilized if the fire is expected to move into extended attack. Funded by a Preparedness Level account, or a Severity Account can be requested if a long-term commitment is expected.

Staffing Plan

Staffing levels I-III

Availability of resources will be dependant upon seasonal staffing levels, liew days, and time of day, but will include: 1 Incident Commander Type 4 or 5, 1 engine boss, a dozer-plow operator, and 3 firefighters. If the fire involves urban interface, additional firefighters will be requested from the ranger staff and local Volunteer Fire Departments.

Staffing level IV

An Acting FMO will be assigned when the FMO is on mandatory days off. Seven days per week – extended shift coverage is initiated. Staffing will increase to: 1 Incident Commander – Type 3, 2 Engine Bosses, 1 Firefighter – Type 1, and 3 firefighters – Type 2; and one ground support / logistics person will be available (call-when-needed).

Staffing level V

Staffing is increased by a Task Force / Strike Team Leader and 2 additional firefighters (type 2).

**3. Pre-Attack Plan**

The FMO will track escalating fire danger indices and wildfire responses by local volunteer fire departments and land management agencies within the Mutual Aid Zone, and coordinate staffing levels with Texas Forest Service management personnel.

Local fire management agencies have created a Multi-Agency Coordination group (MAC) that has periodic meetings, and will serve as the coordination team during period of extreme fire seasons or periods of extreme fire danger within normal seasons. Interagency resources will be requested through the Texas Interagency Coordination Center and pre-positioned in areas of elevated risk.

**4. Initial Attack**

The preserve will provide for safe and efficient objectives and operations as described in RM-18, Ch 9 and the Interagency Standards for Fire and Fire Aviation Operations Guide (Redbook).

Immediately upon detection and/or notification of an unplanned ignition, fire information (from the public, aerial detection plane, of fire fighters on scene) is relayed to the FMO. An Incident Commander is assigned and resources dispatched based upon preset 'run cards' (see appendix G); upon arrival potential threat to resources and property is evaluated, fire size-up is completed, the Appropriate Management Strategy determined, and additional personnel and equipment needs relayed to the dispatcher. The superintendent and/or chief ranger will be apprised of the fire situation commensurate with its activity level and potential.

The first firefighters arriving at the scene have the full authority and duty to protect persons and property. They are relieved of decision responsibility upon arrival of overhead personnel qualified at the appropriate level. An aggressive suppression strategy will be implemented in areas where urban interface values (i.e. structures, homes, oil/gas facilities, etc.) are threatened. If initial attack resources are not able to suppress the fire, or a qualified Incident Commander is not available, the Texas Forest Service is authorized to suppress the fire according to their management directives. The Texas Forest Service is authorized to construct a plowline around the wildfire, or along the boundary, to prevent the fire from crossing onto adjacent lands in the absence of sufficient NPS resources. Wildland fires that move across ownerships will be managed under a 'Unified Command', or under a single IC with a Delegation of Authority from the adjacent agency.

Initial Attack Priorities

Initial attack priorities in descending importance:

a. NPS fires within an Urban Interface Zone.
b. Urban interface fires within the Mutual Aid Zone to reduce the loss of structures and economic impact to local communities.
c. NPS fires with the potential to threaten a U/I Zone, or moving toward a boundary.
d. Mutual Aid Zone fires with the potential to threaten a U/I Zone, or cross onto park lands.
e. NPS fires within Upland Pine, Wetland Pine Savannah, Sandhill Pine, and Upper-Slope Pine-Oak vegetation types
f. NPS fires with Mid-slope Oak-Pine, Lower-Slope Hardwood-Pine, and floodplain vegetation types
g. Mutual Aid Zone assistance requests.

Multi-start days during Very High or Extreme fire danger periods create competition for resources. The Texas Interagency Coordination Center, Woodville Zone Dispatch (TFS/BITH) and Incident Commanders must balance conflicting needs and risks, and maximize resource capabilities. NPS resources will not generally leave an uncontained mutual aid - urban interface fire to respond to a NPS wildland fire that does not have structures at risk. A NPS resource advisor will assist interagency incident commanders in developing the appropriate management response on NPS lands.

Appropriate Initial Attack Response (see Figure 12)

While it is not possible to cover all the possible combinations of variables (vegetation types, position of the fire within each of the FMUs, current and expected fire behavior, values at risk, etc.) some generalizations can be made. Minimum Impact Suppression Tactics (MIST) and burnout operations to strengthen lines must be considered where feasible. Dozer operations may be initiated under the authority of the incident commander when adjacent values are in eminent peril; however, preserve resource staff must be consulted when time and circumstances permit. Single-Engine Air Tankers (SEAT) does not have the volume to be effective in penetrating the dense canopy to a surface fire over most of the preserve. Heavy air tankers would be more effective, and both should be considered along the boundary if open vegetation and values-at-risk warrant. Helicopters with buckets have been effective when available.

1 In the Neches River Floodplain FMU, and floodplain vegetation areas within the interior of the other FMUs [excluding the Steam Corridor FMU (see #3)], the Appropriate Management Strategy must include utilization of the natural barriers, and minimize handline construction. Direct Attack with handtools and ATV pump units may be cost effective on small fires and meet the goals of cooperators.

2 Areas intensively managed by prescribed burns may have high values-at-risk adjacent to the boundary, but will have reduced fuel loads, and less fire intensity. The appropriate management strategy is to maximize the use of natural and existing man-made barriers, minimize the use of interior handline, and show a preference for handline over plowed line along the boundary. Interior plowed lines are the least preferable action, and will require rehabilitation. Indirect Attack with burnout operations must be considered as a preferred suppression option.

3 The Stream Corridor FMU or high-risk boundary area will require an aggressive suppression response to protect adjacent values-at-risk. The Appropriate Management Strategy will stress the use of natural barriers and handline construction, particularly on stream floodplains, but also include dozer-plow use along the boundary or around the fire when essential.

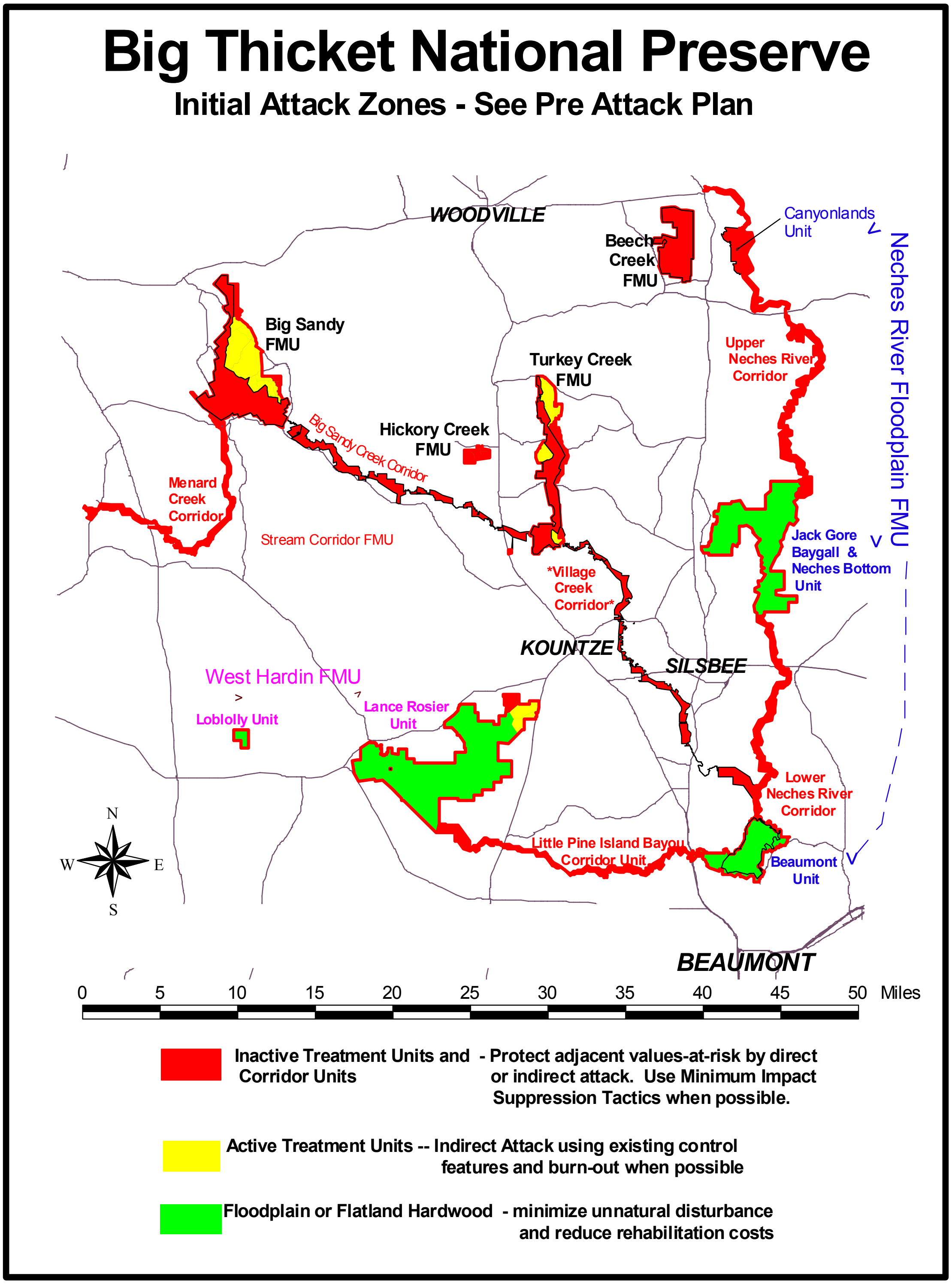

Big Thicket National Preserve
Initial Attack Zones - See Pre Attack Plan
WOODVILLE
Beech Creek FMU
Canyonlands Unit
Neches River Floodplain FMU
Big Sandy FMU
Turkey Creek FMU
Upper Neches River Corridor
Hickory Creek FMU
Big Sandy Creek Corridor
Menard Creek Corridor
Stream Corridor FMU
Jack Gore Baygall & Neches Bottom Unit
*Village Creek Corridor*
KOUNTZE
SILSBEE
West Hardin FMU
Loblolly Unit
Lance Rosier Unit
Lower Neches River Corridor
Little Pine Island Bayou Corridor Unit
Beaumont Unit
BEAUMONT
N
W
E
S
0 5 10 15 20 25 30 35 40 45 50 Miles
Inactive Treatment Units and Corridor Units - Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.
Active Treatment Units -- Indirect Attack using existing control features and burn-out when possible
Floodplain or Flatland Hardwood - minimize unnatural disturbance and reduce rehabilitation costs

Figure 12

Confinement as an initial attack suppression strategy

A confinement strategy may be implemented as the initial attack action as long as it is not used to meet resource objectives. Confinement is selected in lieu of wildland fire use to maximize firefighter safety, minimize suppression costs, and to maximize availability of critical suppression and management resources during periods of high fire danger in highly valued resource areas. Confinement can also be a strategic selection through the WFSA process when the fire is expected to exceed initial attack capability or planned management capability. When confinement is selected as the initial action, the same management process applies as for wildland fire use decisions. A long-term implementation plan is needed to guide the implementation of the confinement strategy. The WFIP prepared in stages, meets this requirement.

Fire Response Times

Staffing Level I-III (typically occurs during the fall and spring)

The fire management staff operates out of the Woodville area, and typically has 1 Type VI engine, the dozer-plow unit, and an ATV Pump unit immediately available. At this staffing level an additional Type V engine is stationed at the Lilly House (fire seasonal quarters) in the Big Sandy FMU, and a Type VI engine at the Maintenance Facility near the Turkey Creek FMU. During regular workdays fire staff will be involved with projects that are typically in Big Sandy FMU, Hickory Creek FMU, Turkey Creek FMU, or the northeast corner of the Lance Rosier Unit which will vary response capability.

Staffing Level IV & V (typically occurs during the winter and summer)

The fire management staff may be positioned at the Texas Forest Service office to enhance mutual aid capabilities. Seasonal firefighters (1 to 5) are on duty, emergency firefighters hired, and other fire qualified park staff (resource management and rangers) utilized. All fire equipment will be co-located and loaded. Resources may be grouped into Task Forces or Strike teams with Texas Forest Service and interagency resources, and then dispatched to fires as a unit.

## Fire Response Times

| Staffing Class Level | | I - III | IV & V |
|---|---|---|---|
| Big Sandy FMU<br>Turkey Crk FMU<br>Hickory Crk FMU<br>Beech Crk FMU | On Shift | 45 - 60 | 30 - 45 |
| | Off Shift | 80 - 120 | 60 - 90 |
| | Weekends | 90 - 150 | 30 - 45 |
| West Hardin FMU<br>*Lance Rosier Unit*<br>*Loblolly Unit* | On Shift | 60 - 90 | 50 - 80 |
| | Off Shift | 90 - 120 | 80 - 100 |
| | Weekends | 90 - 150 | 50 - 80 |
| Neches River Floodplain FMU<br>*JG Baygall & Neches Bottom Unit*<br>*Beaumont Unit*<br>*Canyonlands Unit* | On Shift | 75 - 100 | 60 - 90 |
| | Off Shift | 100 - 140 | 90 - 120 |
| | Weekends | 100 - 150 | 60 - 90 |
| | *more time will be require for boat access* | | |
| Stream Corridors FMU<br>*Upper Neches River Corridor*<br>*Lower Neches River Corridor*<br>*Little Pine Island Bayou Corridor*<br>*Menard Creek Corridor*<br>*Big Sandy Crk Corridor*<br>*Village Crk Corridor* | On Shift | 70 - 110 | 60 - 90 |
| | Off Shift | 90 - 150 | 100 - 150 |
| | Weekends | 90 - 150 | 70 - 110 |
| | *more time will be require for boat access* | | |

Table 8

<u>Restrictions and Special Concerns</u>

The Appropriate Management Strategy will match the complexity of the vegetation, visitation and use facilities, and adjacent private values. It must emphasize the use of natural barriers on the floodplain, and line construction along the boundary coupled with burnout operations. Handline construction is preferred within the preserve. Dozer-plow units can be used for direct attack if urban interface values are threatened, but will require rehabilitation. Dozer-plow/blade units and other heavy equipment can be used along the boundary if fire behavior and adjacent values-at-risk warrant, but will require extensive rehabilitation. ATVs and other light-ground-pressure equipment may be used along the boundary, and on interior roads and trails. Cross-country travel is also permitted if limited to direct attack along the flanks of a wildfire (from within the black), or mop-up adjacent to roads/trails/control lines. Aircraft may be used, but avoid low-level flights over the Alabama - Coushatta Indian Reservation and other communities. Water drops are acceptable throughout the preserve, but chemical retardant will not be used on floodplains or the Neches River Floodplain and Stream Corridor FMUs. The use of fireline explosives is prohibited. Exemptions will require the concurrence of the preserves management team [the Chief of Resource Management, the Chief Ranger, and the Superintendent] and the FMO.

Local Issues

- The Forestry Department of the Alabama - Coushatta Indian Reservation has a fire management program and may supply/request fire assistance when needed. The BIA district office in Anadarko, Oklahoma is their representative.

- During drought periods the county judges establish Outdoor Burning Bans in consultation with the Texas Forest Service. Red warning flags are flown at local Post Offices.

- The hiring of local Volunteer Fire Department members as emergency firefighters is a priority if qualified under the NWCG-310-1 system.

- Out of area resources will generally be quartered in local hotels to provide adequate rest. Transportation with a driver will be provided to either Lufkin or Beaumont when those resources are in R&R status.

**5. Extended Attack and Large Fire Suppression**

Extended Attack Needs

The fire response will shift from initial attack to extended attack when the suppression effort moves into the next burning period (generally considered 24 hours). A Wildland Fire Situation Analysis will determine the Appropriate Management Action. An Incident Complexity Analysis (see page 13-13 of the Interagency Standards for Fire and Fire Aviation Operations [i.e. Redbook]) will be completed for all Type 3,4 or 5 incidents to determine if transition to the next level of incident management support is needed. An arriving fire management overhead team is thoroughly briefed on the fire situation [control actions performed, critical resources, weather forecast, natural barriers, etc.] and also receives a formal "Limited Delegation of Authority" from the Superintendent granting authorization to take management actions on the fire.

If a wildland fire originating within the preserve spreads across the boundary, the Texas Forest Service has full responsibility for suppression actions on private or commercial lands. The National Park Service retains management authority on all wildland fires within preserve boundaries.

Wildland Fire Situation Analysis development

A Wildland Fire Situation Analysis will be approved by the superintendent after being completed with the preserves fire staff. The preserve will follow the interagency operations guide for WFSA threshold approvals. The Daily Review will be delegated to the chief of Resources Management, with regular briefings to the superintendent. If fire conditions or complexity levels escalate, signature authority will automatically and immediately revert to the superintendent. The FMO will updated and maintain document currency. The WFSA will provide resources estimates, a fire complexity guide to indicate overhead staffing level (i.e. should individual overhead positions be filled, or should a Management Team be ordered), and strategies with cost estimates. The Incident Commander, fire management staff, and preserve resource management staff prepare the WFSA, utilizing standardized format, to accurately describe the current fire activity, management objectives, and other pertinent data.

Transition to Extended Attack or Type I / Type II Incident Management

Wildland fires burning during Staffing Level I to III are usually suppressed by initial attack due to reduced fire behavior during the night (relative humidity typically reaches One-hundred percent). Mop-up or burnout operations may extend into the next burning period without it being considered extended attack.

The usual summer fire season has brief periods of Staffing Level IV, possibly V, with single fires moving into the next burning period. Firefighting resource may work extended shifts, and recognition of the extended attack status is necessary to provide replacement forces and provide adequate rest. Multiple start days, and fires remaining in extended attack over several days indicate that local resources are being over-committed and additional resources are needed to provide large fire suppression and restore initial attack capability.

Drought conditions can occur during the winter, spring, or summer, and extend for weeks or months at Staffing Level V. It creates exceptional fire behavior that is a significant threat to firefighter safety and urban interface values. The WFSA development will determine the type of IMT to order, in conjunction with the Redbook complexity assessment. This transition should reference an Appendix with an Agency Administrator Package that includes a draft Delegation of Authority, and a transition plan.

Minimum Impact Suppression Tactics

Minimum impact suppression tactics is the policy for all fire management activities. Line construction methods to be considered are: [first] mowing, or use of ATVs to push over the grass, and burn out using handtools and water or foam to hold the line, [second] use rubber tire or track equipment to mow/grind rake brush creating a 5' wide control line and use handtools or ATV rake/plow to scrape surface fuels <18" wide to mineral soil), [third] use a dozer plow/blade to create a wide fire brake. The dozer is typically used along the boundary when adjacent values are high, or competition for firefighting resources prevent adequate staffing of the fire. Dozer operations may be initiated under the authority of the incident commander when adjacent values are in eminent peril; however, preserve resource staff must be consulted when time and circumstances permit, particularly if used for interior line construction.

Rehabilitation Guidelines

Utilization of MIST principals will minimize rehabilitation following a fire. All dozer-plow or dozer-blade areas within the preserve will require considerable rehabilitation efforts. Typically the berms can be 'rolled' back into place, if they are not 'set' into place by rainfall, foot traffic, or a return trip by heavy equipment. Handlines generally do not require significant rehabilitation efforts. Severely damaged canopy trees in developed areas (i.e. trails) may be classified as "hazardous" and will be felled to protect the public. All flagging, signs, and trash will be removed during the mop-up phase. Restoration actions begin promptly following suppression of the fire. The Incident Commander is responsible for insuring that rehabilitation actions are conducted.

## 6. Records and Reports

The status of all wildland fires will be reported daily to the Texas Interagency Coordination Center [TICC] by a faxed ICS-209 form. It details the statistics [size, equipment, staffing, progress, etc.] and details current activities & potential in a short narrative.

The park establishes an account code using the park Identifier (7147), followed by a unique national accounting code received from TICC (AA##), followed by an activity class (E11 for wildfires, W12 for Wildland/Urban Interface prescribed burns, H12 for hazardous fuel reduction prescribed burns, E13 for emergency stabilization). All resources or charges assigned to this incident will use this account number. The IMR Fire Budget Analyst will be notified of the account number for cost tracking. Prescribed burn projects will be generated in NIFPORS, and accounts numbers received as part of the annual budget process

A fire report (DI1202) will be initiated in the SACS system, then updated daily. The final fire report [including a narrative & map (GPS data is preferred)] must be completed, and entered into the computer system, within 10 days of calling the fire out. Fire reports for prescribed burns, and any escape, must be reported in the DI-1201 format on SACS. The park will maintain a file that includes the burn plan, fire report, fire narrative, cost, spread maps, observed weather and fire behavior data, fire monitoring data, any operational or injury review, and any other information that is pertinent. Any significant injury / accident, or escaped fire that has significant impact to adjacent lands, is large in size, or controversial must be reported by phone to the IMR FMO. The park will also maintain a fire atlas (GIS maps) as a historical record.

All entrapments or burn-overs will be reported to the superintendent immediately, and a review process initiated. A preliminary report (NFES 0869) will be prepared and faxed to the IMR fire office.

Weather data is automatically recorded by the RAWS unit directly into WIMS, and archived into the National Fire Weather Data Library. The Equipment Technician will verify data and input sky condition. The FIREFAMILY program should be run on annually to adjust preparedness level break points

| Record/Report | Frequency | Responsibility | Distribution |
|---|---|---|---|
| FMP Revision | Annually | FMO | Superintendent |
| NFPORS Submissions | Annual budget<br>Monthly updates | FMO | Resource<br>Management Staff |
| Pre-season | Annually/ | FMO | IMR FMO |
| Risk Analysis | Periodically | Fire Ecologist | Superintendent |
| Red Cards | Annually | FPA & FMO | Firefighters |
| Fitness Training<br>Experience Records | Annually | FPA & FMO | SACS |
| Training Needs Assessment | Annually | FPA & FMO | Firefighters |
| Fire Prevention Analysis | Every 3 Years | FMO | Superintendent |
| Cache Inventory | Bi-annually | Equipment Tech | FMO |
| Prescribed Burn Plan &<br>Reports | As needed | Rx Fire Specialist | FMO<br>IMR-Fire Staff<br>NFPORS |
| Preparedness level IV-V | As needed | FMO | |
| Fire Weather | As needed | Equipment Tech | WIMS<br>Fire Staff |
| Fiscal Records | As needed | FPA | FSS / AFS3 |
| DI-1202 Fire Report | Each Fire | FMO | SACS<br>Fire Atlas |
| Situation Report | Each Fire | Incident Commander | TICC |
| S-290 | | FMO | Superintendent |
| OAS-23 | Each Flight | FMO | AMD |

Table 9

## C. Wildland Fire Use

Wildland Fire use is a management strategy to achieve resource benefit from natural ignitions when weather prescriptions are defined. While the Big Sandy, Hickory Creek, Turkey Creek, and West Hardin fire management units that have large areas of fire dependant vegetation types [Upland Pine, Upper-Slope Pine-Oak, Wetland Pine Savannah, and Sandhill Pine], the flammability and potential fire behavior, size of the units, and urban-interface values require a suppression-oriented strategy. The Neches

River Floodplain FMU and West Hardin FMU have large areas of less flammable fuels [i.e. hardwoods], where a fire could burn without undue risk to urban-interface values. However, these vegetation types are not fire dependant, so resource benefits cannot be assumed. Therefore, the preserve will not have a Wildland Fire Use program.

## D. Prescribed Fire

1. Planning and Documentation

Annual activities

A winter meeting will be scheduled with the Fire Management Officer, Fire Ecologist, Prescribed Fire Specialist, the preserve management team, resource staff, and collaborators to review current treatments and establish priorities for proposed mechanical and prescribed fire treatments. Projects will be established and tracked in the National Fire Plan and Reporting System (NFPORS), with monthly updates (by the 23rd). The IMR Director will issue verification forms to superintendents for signature. While funding notification typically occurs in January, departmental guidelines state: "Under NO circumstances will not having justified funds available be a barrier to accomplishment". The Job Hazard Analysis's for fire management activities will be reviewed and amended to reflect new procedures and equipment use. This information will be provided during the 8-hour safety refresher.

Long-Term Prescribed Fire Strategy

The goal of the prescribed fire program is to use planned ignitions to restore vegetation structure and composition of phyric communities through the reduction of invading species and shrub stratum density. Restoration of these communities will control unnatural hazardous fuels and reduce urban-interface risks.

The vegetation types that are periodically burned include Sandhill Pine Forest, Upland Pine Forest, Wetland Pine Savannah, and Upper-Slope Pine-Oak Forest. The fire interval necessary to restore and maintain each vegetation type is based upon the scientific information, current forest structure, and vegetation composition. Restoration fire intervals are more frequent than maintenance phase in order to attain management goals. Restoration phase fire intervals are based on the immediate need to reduce shrub density while providing for regeneration and growth of historically dominant canopy, understory, and herbaceous species.

In an attempt to determine the seasonal occurrence of primeval fire in the Big Thicket region, monthly thunderstorm activity was correlated with probability of ignition, potential fire spread, and intensity. Mean monthly values for probability of fuel ignition (Ignition Component), spread potential (Spread Component), and expected intensity (Energy Release Component) are high during winter months. However, thunderstorm activity is at a minimum. Indicating that fire potential is high during the winter, but the probability of an ignition event (lightning) is low. Intense, wide ranging winter fires probably occurred occasionally. Conversely, fire indices are much lower during spring and fall, but thunderstorm occurrence peaks during July and August. Historical, low intensity summer wildland fires were probably most frequent. The data support the prevailing description of natural southeastern ecosystem fire regimes as "frequent fires of low-intensity."

Initial burns are typically conducted during the winter due to stable weather conditions, reduced impact on wildlife populations (little breeding or nesting activity), and good consumption of fuels with less mortality of canopy hardwoods (dormant period). Winter burns may be conducted to achieve hazardous fuel reductions and specific ecosystem responses. After the initial restoration burns, planned ignitions will generally be conducted during the summer and early fall. Prescription "windows" for planned ignitions within specific vegetation types and Fire Management Units are presented in Appendix E. A projected schedule for all burn blocks is shown in Appendix H. The Global Change Research Study Areas in the Turkey Creek FMU, and 'control - vegetation sampling plots' in active treatment areas will be protected from burning.

After several winter burns to reduce fuels and fire intensity, a shift to summer burns (growing season) will mimic the natural process and produce a natural appearance.

It is important to note that Lower-Slope Hardwood-Pine or Floodplain Forest type vegetation types are not directly ignited. However, fires may migrate down-slope into these vegetation types during drought conditions.

Prescribed Fire Strategy

Safety is the primary objective when planning and conducting prescribed burns. Burn plans will be reviewed by the fire management officer, prescribed fire specialist, fire ecologist, and an external technical review to assure it is a well-reasoned and safe plan of operations. All employees are expected to participate in creating safe working conditions by participating in briefings, utilizing safety gear and following operational guidelines, being proactive in equipment maintenance, and correcting/reporting unsafe conditions/situations to their supervisor.

Big Sandy FMU: Continue prescribed burn treatments in Upland Pine and Upper-Slope-Pine-Oak vegetation types to control brush and promote an herbaceous ground cover. Frequent fires kill Loblolly Pine reproduction, so Longleaf Pine will quickly dominate the seedling class. Occasional intense fires will kill scattered mature Loblolly Pine and the canopy will be restored to Longleaf Pine over 80 to 100 years.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| 1201 | I | 2 |
| 1300s | II | 2 |
| 1401 | II | 2 |
| 1501 | II | 3 |
| 1600s | II | 3 |
| 1701 | III | 3 |
| 1801 | III | 3 |
| 1901 | III | 3 |
| Remainder | III | 1 |

Hickory Creek FMU: Continue prescribed burn treatments in Upper-Slope-Pine-Oak and Wetland Pine Savannah vegetation types to control brush and increase herbaceous ground cover. Longleaf Pine dominates seedling and mid-story classes due to prior prescribed burn treatments. The canopy will be restored to Longleaf Pine over 40 to 80 years.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| 2101 | II | 3 |

| | | |
|---|---|---|
| 2201 | II | 3 |
| 2300s | I | 2 |
| 2401 | I | 2 |
| 2501 | I | 2 |
| 2601-02 | I | 2 |
| 2701-02 | I | 2 |
| Control Plot | III | 3 |
| Baygalls | III | 2 |

Turkey Creek FMU: Continue prescribed burn treatments in Sandhill Pine Forest, Upland Pine, and Wetland Pine Savannahs (Pitcher Plant Bogs). Frequent treatments have altered stand structure and species composition toward natural conditions. Expand frequent burn program to Upland Pine site on west boundary. Target Southern Pine Beetle infestation sites in USPO vegetation types to promote pine regeneration when possible.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| 3101 | III | 3 |
| 3201-02 | I | 2 |
| 3301 | III | 3 |
| 3401 | III | 3 |
| 3501 | III | 3 |
| 3601 | I | 2 |
| 3701 | II | 3 |
| 3702 | III | 3 |
| Remainder | III | 2 |

Beech Creek FMU: NO prescribed fire treatments have occurred. Consider expansion into Southern Pine Beetle Sites to reduce understory density.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| ALL | III | 3 |

West Hardin FMU: Increase frequency of prescribed fire treatments in Wetland Pine Savannah to control invading brush and increase grass density and promote Longleaf Pine seedlings/saplings. Include additional savannah areas (5101) in treatment schedule. Conduct burns in the MUD fire area and research conversion to Wetland Pine Savannah.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| 5101 | III | 3 |
| 5201 | II | 3 |
| 5301 | II | 2 |
| 5401 | II | 2 |
| Remainder | III | 2 |

Neches River Floodplain FMU: The floodplains are not a target of prescribed fire treatments. The pine plantation on the western bluff of the Canyonlands Unit will require treatment when acquired.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| Canyonlands | II | 3 |

| | | |
|---|---|---|
| Remainder | III | 2 |

Stream Corridors FMU: This FMU is not a target of prescribed fire treatments.

| ***Treatment Area*** | ***Fire Regime*** | ***Condition Class*** |
|---|---|---|
| ALL | III | 2 |

Required Personnel

***Fire Management Staff - current [target]***

| | |
|---|---|
| Fire Management Officer | 1 |
| Fire Ecologist | 1 |
| Prescribed Fire Specialist | 1 |
| Equipment Technician | 1 |
| Engine Boss (STF) | 1 [increase to PFT] |
| Lead Fire Effects Monitor | 1 |
| Monitors (seasonal) | 5 |
| Lead Firefighter (seasonal) | 1 |
| Firefighters (seasonal) | 3 [increase to 13 pay periods] |
| Fire Program Assistant | 1 |

**Preserve Staff – Collateral Duty**

| | |
|---|---|
| Firefighters | 4 |
| Ground Support | 1 |
| Information Officer | 1 |

Adequate staffing for planned ignitions may require temporary assignments from neighboring land management agencies, utilization of an interagency fire module, use of firefighters from the Alabama Coushatta Reservation, and/or use of U.S. Forest Service personnel.

Weather, Fire Behavior, and Fire Effects Monitoring

All wildland fires will have staff assigned to monitor weather and fire behavior, utilizing standardized Fire Behavior/Weather Data recording forms. Digital photographs will document the range of fire behavior, and be maintained as a database. Weather updates will be broadcast over the radio net every hour, or if threshold levels are reached. The preserves RAWS unit will record general weather patterns, and site-specific weather collected by portable weather equipment. Monitoring staff will prepare maps of burn progression, intensity, and perimeter utilizing GIS/GPS equipment. Mapping of burned areas will include ‘islands’ <1% of project size as burned. A fire effects report, prepared by the fire monitors and fire ecologist, will be in the fire file.

Monitoring in the Big Thicket will characterize the effects of prescribed burning/fire use on forest structure, development, succession, species replacement, etc. In addition, BITH will implement an intensive herbaceous layer aspect.

The fire effects monitoring program is designed to track vegetational change in Treatment Areas, and will be analyzed to determine fire's role in ecosystem function. The monitoring program will initially consist of 17 burn plots and 16 control plots established by Rice University. Additional plots will be established as new treatment areas are included, or as needed to promote statistical validity. Short-term effects focus on specific fire events (burn coverage, consumption, severity, mortality –v- recovery, etc.) by sampling preburn, post-burn, and a plus one-year re-read. Long-term effects search for shifting vegetation patterns (species composition & abundance) in the canopy, understory, and ground cover. Control plots are an important aspect of monitoring long-term change by providing a comparison of fire-treated to fire protected sites. Field measurements will include: Brown's transects to monitor downed woody fuels, live stem counts of all brush species, tree data at the seedling-sapling-overstory stages, and documentary photographs taken. Grass / forb / sedge specie presence and abundance will be included in selected treatment areas. A digital photo gallery will be maintained of sampling plots.

Prescribed Fire Critiques

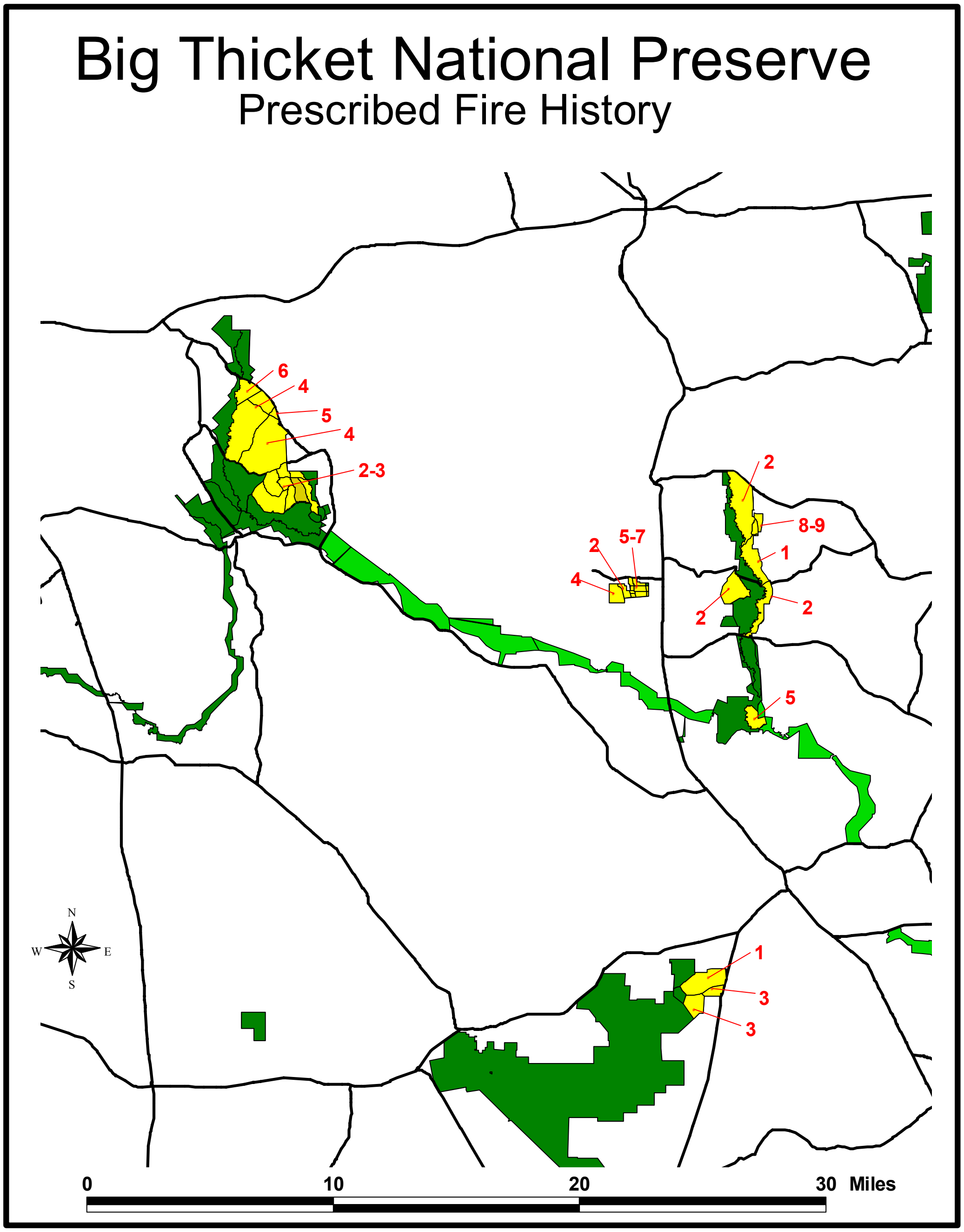
The burn boss will conduct an After-Action-Review on-site, at the end of each active fire period. While a group meeting is preferred, specific resources that are leaving the fire early may be debriefed individually. All participants will be given the opportunity to discuss equipment status, holding and ignition operations, observed fire behavior, safety issues, any remaining control needs, tomorrows operations, personnel issues, and other pertinent items.

Reporting of Accomplishments or Escaped Fires

The initiation, accomplishments, and cost of prescribed burn treatments are tracked on the NFPORS web page. A short description of significant treatments, as a ‘success story’, is submitted to the Fire Communications Program Lead at the National Interagency Fire Center. Wildfires that are affected by fuel treatments are reported to the National FMO and Department Chief of Staff. Fire reports for prescribed burns follow the same procedures as wildfires, and any escape is entered on the fire report for the prescribed burn, and a separate fire report generated to document the escaped fire. Escaped fires will be reviewed at the local, regional, or national level based upon containments costs, damage to adjacent values, injuries or fatalities, or other controversial issues. The park file will include additional monitoring data, and accomplishments. Fire reports, burn narrative, maps, etc., will be submitted within 10 days of declaring the fire out, and will include pre & post burn fuel consumption and regime class / condition.

Historic Fuel Treatments

One hundred and six prescribed burns were conducted from 1981 to 2003. Eighty-seven were broadcast burns for hazardous fuel reduction in established treatments units, and nineteen were slash burns to treat Southern Pine Beetle infestations. Forty-seven burns were less than 100 acres in size, thirty-two ranged between 100 and 999 acres, and eight exceeded 1,000 acres in size. The largest burns are in the Upper-Slope Pine-Oak Forest within the Big Sandy Creek Unit. After the initial burns reduce hazardous fuels, treatments areas are combined into larger, more cost-effective burns. Vegetation types within these burns include: upland pine (16); Upper-Slope Pine-Oak (18); sand hill pine (5); and wetland pine savannah (48). The majority of planned ignitions (46) have been conducted during the winter months, with 28 summer burns, 9 fall, and 4 during the spring. To date, there have been no prescribed burns in June.


Big Thicket National Preserve
Prescribed Fire History
6
4
5
4
2-3
2
8-9
1
2
2
2
5-7
4
5
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10
20
30 Miles

Prescribed Burn Plan Requirements

Prescribed burn plans must meet the requirements of RM-18 - chapter 10 (see example in appendix M). The burn plan is developed for a specific area and defines objectives, weather, expected behavior, type of firing (i.e. backfire, flank fire, head fire), equipment, personnel requirements and responsibilities, geographical limits, and smoke management. The Prescribed Fire Specialist prepares burn plans with direction from the Fire Ecologist and Fire Management Officer. It goes through an external technical review, and is then approved by the Superintendent.

**2. Exceeding Prescribed Burn Plan**

The Burn Boss has full command authority and responsibility for proper execution of the burn. A prescribed burn will not be ignited, or allowed to continue burning as a prescribed burn, if prescription limits are exceeded. A prescribed fire must be converted to a wildfire if weather conditions or fire behavior exceed prescription parameters, goals are not being met, or an escape occurs. A Wildland Fire Situation Analysis will be prepared (see RM-18, chapter 9) to guide suppression efforts after initial attack. If the escaped fire has the potential to cross the boundary, or is on adjacent lands, the Texas Forest Service will be notified and command transferred after a situation briefing. Trigger points are identified in the transition section of the prescribed burn plan (see appendix M).

**3. Air Quality and Smoke Management**

The US Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for ozone, lead, carbon monoxide, sulfur dioxide, and respirable particulate matter to protect human health and welfare. The Beaumont/Port Arthur area (Hardin, Jasper, Jefferson, and Orange counties) was considered a "nonattainment area" for ozone based upon the one hour standard [125 ppb] in July of 1997, and will continue to be judged on the one-hour standard. It will be switched to the eight-hour standard [85 ppb] when the three-year average of the forth-highest daily maximum hour concentration measured at each monitoring site is less than 85 parts per billion.

Ambient monitoring was briefly conducted at the preserve during the early 1980s, and determined that most pollution was carried in from the Houston metroplex and petrochemical refining operations along the Texas / Louisiana coast.

In 2003, TCEQ monitoring site at Sabine Pass (on the Gulf Coast) recorded ozone exceedences of the one-hour standard on: March 30$^{th}$ 2004 - 128 ppb [with a 8 hour average of 96 ppb], May 29$^{th}$ 2003 – 129 ppb [with a 8-hour average of 114 ppb], August 5$^{th}$ 2002 – 130 ppb [with a 8-hour average of 92 ppb], and July 12, 2002 – 156 ppb [with the highest 8-hour peak of 116 ppb]. The TCEQ web page noted that the August 5$^{th}$ 2002 exceedance was the fifth exceedance-day at Sabine Pass for the three-year period (2000 – 2002). Wind patterns suggest that emissions in the Houston area are being added to moderate regional background levels of ozone in combination with conducive weather conditions, particularly limited vertical mixing of air along the coast minimizing dispersal. Estimates of local ozone contribution during the March 30$^{th}$ 2004 event was 48% of the measured peak, and 53% of the May 29$^{th}$ 2003 event. Four of the seven Continuous Air Monitoring Stations (CAMS) within the B-PT zone exceeded the 8- hour standard on May 29, 2003.

The Mauriceville CAMS exceeded the 1-hour ozone standard on October 28, 2003 – 131 ppb [with a 8-hour average of 65 ppb], with none of the other CAMS sites recorded a 1-hour exceedance, and only the Beaumont CAFS site recorded a 8- hour exceedance. The TCEQ web page notes that with a southwest to northeast wind it is possibly a single parcel of high ozone, and that with low temperatures (69 degrees) suggestive of highly reactive chemical involvement.

On Tuesday, May 12th, 2002, a large marsh grass fire in southwest Louisiana was blown by southeast winds across the Beaumont-Port Arthur area. The Mauriceville CAMS measures a 1-hour PM2.5 average of 11.8 micrograms per cubic meter and a daily average of 29.3. Satellite animation shows the smoke plume blowing across Sabine Lake and B-PT. Another large smoke plume from a forest fire in west-central Louisiana is also visible.

Plume animations show the estimated tracks from large clusters of industrial sources of oxides of nitrogen (NOx) and volatile organic compounds (VOC) and the broad urban plumes from Beaumont, Port Arthur, Lake Charles urban areas are blow by north winds out over the Gulf of Mexico, then are carried back inland on the afternoon sea-breeze.

TCEQ has recommended revisions to the State Implementation Plan for the Beaumont/Port Arthur and Houston/Galveston/Brazoria nonattainment areas.
It includes: revision of nitrogen oxides control strategies and reduction of highly-reactive volatile organic compound emission reductions, Statewide standards on gas cans, repeal of the commercial lawn equipment exemption, repeal rules that prohibit vehicles over 14,000 pounds from idling more than 5 minutes in specific counties. The EPA has approved an extension of the B-PA and Houston/Galveston attainment dates to November 15, 2007. Regional ozone strategy includes the National Low Emission Vehicle Program (NLEV), stage 1 vapor recover (capture of vapor fro gasoline storage tanks – adopted June 30, 1999), and national low-sulfur gasoline starting January 1, 2004. Regional Nox emission reductions from all cement kilns and electric utility power boilers and gas turbines in east and central Texas to reduce regional transport.

The preserve has approximately 43,380 acres (predominately hardwood forest) within Hardin County, including: the southern portion of the Turkey Creek Unit, the west side of the Jack Gore Baygall & Neches Bottom Unit and Lower Neches River Corridor, most of the Beaumont Unit, the northern bank of the Little Pine Island Bayou Corridor Unit, the Village Creek Corridor Unit, and the Lance Rosier Unit. Of those acres, only 1035 acres support fire dependant ecosystems that are part of the prescribed fire program. As it is only .18% of the counties land mass, is only burned in a 2 to 3 year cycle, and is downwind of the B-PA urban areas, prescribed burns cannot be considered a significant factor in local pollution events.

Smoke conditions are monitored by fire and security personnel during prescribed burns, and documented with photography. If a smoke plume has the potential for impacting local residents, downwind conditions are observed and the ignition patterned adjusted.

Prevention of Significant Deterioration

Big Thicket National Preserve is designated as a Class II area under the Prevention of Significant Deterioration (PSD) provisions of the Clean Air Act. As such, the area's air quality is protected by allowing only limited increases (i.e., allowable increments) over baseline concentrations of pollution for sulfur dioxide ($SO_2$), nitrogen oxides ($NO_X$), and particulate matter (PM). The PSD permitting program is administered by the Texas Commission on Environmental Quality (TCEQ), and applies to defined categories of new or modified sources of air pollution with emissions greater than 100 tons per year and all other sources greater than 250 tons per year. The preserve has participated in air quality by supporting the collection of epiphytic plants, as ozone levels well below the NAAQS standards can be phytotoxic and have damaging effects on sensitive vegetation.

Class I Airsheds

Big Bend National Park, located 600 miles west, is the closest Class I airshed. As prevailing winds are from the southeast, fire management activities will not affect that airshed.

Smoke Sensitive Areas

Preserve units are scattered across a 1750 square mile area that includes thousands of rural homes scattered along roads, numerous small communities, towns, and cities. The prescribed burn program has not received a formal smoke complaint due to pre-burn neighbor notifications and successful smoke management. TCEQ does not issue permits for forestry burning, but will investigate complaints. While dense population areas adjacent to active prescribed fire Treatment Areas are considered smoke sensitive (listed), homes adjacent to prescribed burns are also considered when developing burn plans. The City of Beaumont is not typically affect by the prescribed burn program as Treatment Areas are northwest of the city, and northwest winds are infrequent and of short duration.

| | |
|---|---|
| Big Sandy FMU: | Alabama and Coushatta Indian Reservation (school)<br>Indian Springs (residential community)<br>Dallardsville (community - school)<br>US Highway 190<br>FM1276 (county road) |
| Hickory Crk FMU: | Wildwood Resort Community (retirement population)<br>US Highway 69<br>FM2827 (county road) |
| Turkey Crk FMU: | Warren (community - schools)<br>Kountze (community - schools)<br>US Highway 69<br>FM1943 (county road) |
| West Hardin FMU: | Kountze (community – schools)<br>Saratoga (community)<br>State Highway 105<br>FM770 (county road) |

## E. Non-Fire Fuel Treatments

The Wildwood Community is the preserve's most critical urban interface with over 650 homes, plus an airstrip, 18-hole golf course, and lake on 4000 acres. Four prescribed burns were conducted from 1983 to 1995 to control hazardous brush. The scheduled 1998 burn was cancelled because the risk, and consequences, of an escaped fire became too great due to increasing home construction along the boundary without fuel management on adjacent lots. During the summer fire season of 2000 two wildfires on timber company lands put the community at risk, and during the fall a NPS / community meeting was held. The preserve prepared an Environmental Assessment in 2002 to chemically treat 37 acres of hazardous fuel along the boundary with an herbicide, followed by mechanical grinding. It was completed in

2003, and the slash was burned during the winter of 2004. This treatment was expanded to chemically treat 344 acres of brush and grind 314 acres during the spring and summer of 2004. A mix of fire and resource management accounts funded the treatment. A funding request for chemically treating the remaining areas (295 acres) is in the 2005 budget.

The preserve has identified seven exotic slash pine plantations in three preserve units totaling over 300 acres. Removal of exotic species and restoring the site to native vegetation is a resource management objective, and removing flammable brush from the understory is a fire management goal. Initial treatments began in the 1980s and included cut & leave (Lance Rosier Unit -25 acres), thinning and contract sale (Turkey Creek – est. 40 acres), and hand girdling (Jack Gore Baygall – est. 50 acres). In 2002 an Environmental Assessment was prepared to restore the slash pine plantation in the Turkey Creek Unit to Longleaf Pine. Treatment began in 2003 and included contracting for tree removal with a local timber company through the Nature Conservancy, and a prescribed burn to remove logging slash. Tree utilization funded the conservancy's restoration efforts of replanting the site with Longleaf Pine seedlings, and will fund chemical treatment of brush (summer 2004), interpretive displays, and expansion of the project into adjacent Southern Pine Beetle infestations areas.

Mechanical projects in the Big Sandy FMU could remove understory brush in Upland Pine and Upper-Slope Pine-Oak vegetation types (6,100 acres) and reduce invading Loblolly Pine in the canopy. Mechanical treatments should also be used in the Turkey Creek FMU to remove flammable brush in the understory of a 75 acre Upland Pine site that has a mature Longleaf Pine canopy, and reduce hardwoods (planting pines) in 3030 acres of Upper-Slope Pine-Oak that were heavily infested with Southern Pine Beetles in the 1980s. Individual treatments of several hundred acres would create a mosaic across the landscape, and take several decades to complete the areas.

**Annual Activities**

Annual activities include identification of treatment sites and funding sources (fire, resource management, self-funding through by-product utilization, other) by the FMO, Fire Ecologist, and Resource Management staff. Identification of additional collaborators would extend treatments across boundaries to effect landscape scale management. Increasing the role of partners (Temple Inland and Texas Nature Conservancy) would provide expertise in forest management and restoration. An annual review of the treatments is essential to improve future treatment benefits.

**Effects Monitoring**

A new series of plots would be established to monitor pre and post treatment effects. Periodic sampling during work progress will indicate crew effectiveness and be communicated to the contract representative. A formal survey will determine treatment effectiveness will be completed and must match contract obligations before payment. Control plots would be established to determine long-term change, and require sampling and analysis every ten years. Specific protocols would be established to measure brush species presence and volume reduction, herbaceous vegetation recovery, and canopy tree species ratio & density to determine optimum levels.

**Restrictions**

Heavy equipment is limited to vehicles with light ground pressure (floatation tires or tracks), and work performed only during periods of dry soil conditions to prevent rutting and soil displacement. Grinding, cutting, or mowing implements will be used in a manner to prevent

Longleaf Pine seedling / sapling mortality. Equipment maintenance must be performed off preserve lands, and refueling operations done on plastic sheeting to avoid soil contamination.

**Critiques**

Preserve fire management staff will conduct a post-treatment meeting including other personnel associated with the project (monitoring staff, resource management, contractors, cooperators, partners, etc.). Topics will include: treatment effectiveness, possible treatment and/or contract modifications for future activities, and other pertinent issues.

**Cost Accounting**

Specific accounts will be prepared by the Fire Program Assistant and preserve budget analysis based upon funding information received through the IMR-Fire Office and NFPORS computer software. The preserve Procurement Officer will prepare contracts based upon a Scope-of-Work prepared by the fire management staff. The Procurement Officer will appoint fire management staff as contractor representatives for day-to-day inspections. The FPA will track NPS obligations against the account, and the Procurement Officer will pay contracts. A formal survey to determine treatment effectiveness will be completed and must match contract obligations before payment.

**Reporting and Documentation**

Treatments are implemented in the NFPORS software system by the FMO, with costs estimates generated by fire management staff. A treatment file will be assembled by the Fire Ecologist which includes: a map of the treatment area, scope of work, public notices, any compliance documents, a copy of the bid proposal, contract, progress reports, monitoring data and photographs, any reports of injuries - equipment damage – or other significant event, and critique comments. A copy will be maintained in the project files, with copies sent to the Chief of Resource Management. The Fire Ecologist will prepare a 'success story' for IMR and NIFC fire information officers. The NFPORS web page will be updated on the 23$^{rd}$ of each month until the project is completed, and will be a discussion item in the FMO's cluster conference call.

**Annual Planned Project List**

**2005**

| | | | |
|---|---|---|---|
| Big Sandy FMU | Longleaf Restoration | NEPA Document | 1 each |
| Hickory Crk FMU | | | |
| | Sundew Trail Area | Chemical brush control | 110 acres |
| | Treatment Area 2601 | Chemical brush control | 70 acres |
| | Treatment Area 2501 | Chemical brush control | 65 acres |
| | Treatment Area 2301 | Chemical brush control | 50 acres |
| | Treatment Area 2201 | Rx burn | 96 acres |
| | Treatment Area 2300s | Rx burn | 90 acres |
| Turkey Crk FMU | | | |
| | LL Pine Area | Slash Burn | 15 acres |
| | Sandhill Expansion | Rx burn | 112 acres |

2006 to 2013 prescribed burn schedule, see appendix N

## F. Emergency Rehabilitation and Restoration

Mitigation and restoration activities will be incorporated into the suppression actions. Maximizing the use of the least resource damaging suppression actions (utilization of natural barriers, and existing roads or trails) and utilization of light ground pressure equipment minimizes rehabilitation following a fire. Locating control lines to avoid falling and bucking trees also reduces required rehabilitation. Severely damaged large trees in developed areas (i.e. trails) may be classified as "hazardous" and will be felled to protect the public. Restoration actions begin promptly following suppression of the fire, with flag lines, signs, and trash removed during the mop-up phase. The Fire Management Officer is responsible for insuring that rehabilitation actions are conducted. Plowed firelines within the preserve require considerable rehabilitation efforts. Typically the berms can be ‘rolled’ back into place, if they are not ‘set’ into place by rainfall, foot traffic, or a return trip by heavy equipment. Handlines generally do not require significant rehabilitation efforts. Contouring of slopes, erosion control, or seeding is not required in the preserve.

## V. *ORGANIZATIONAL AND BUDGETARY PARAMETERS*

A professionally trained cadre of firefighting personnel is necessary to effectively respond to a wildland fire event. The optimum organizational structure will include an Incident Commander – Type III – Multi-resource (1); Incident Commander Type IV or V – Initial Attack (2); Task Force / Strike Team Leader (1); Single Resource Boss Engine/Crew (2); Fire Monitors (4); Firefighters Type 1 (2) & Type 2 (4). Additional firefighters from other preserve divisions, emergency hires (AD's), and contracted/rented equipment will be necessary during planning levels 4 and 5 to provide extended coverage. All personnel engaged in fire management duties will meet Interagency Fire Qualifications Standards (i.e. training, experience, and physical fitness).

Fire Management staff are organized within the Resource Management Division, under the Chief of Resources Management.

```
                         Superintendent
                               |
      Safety Officer----------------+----Fire Information Officer
                               |
                  Chief of Resources Management
                               |
                               |
                               |
                     Fire Management Officer
                               |
                               |
   Fire Program Assistant---------+
                              / \
                             /   \
                            /     \
          Rx Fire Specialist     Fire Ecologist
                  |                          |
     Equipment Technician                    |
                 |                           |
                 |                           |
      Engine Boss (STF)            Fire Effects Monitor (STF)
                 |                           |
Seasonal:  Crew leader GS5 x1        Lead Monitor GS6 x1
Seasonal:  Crewmember GS4 x2         Field Monitor  GS5 x4
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RESPONSIBILITIES

| | |
|---|---|
| Superintendent: | - Overview of Program (employee training & availability)<br>- Sets Goals (signs Project Verification Forms)<br>- Sets Restrictions or Closures<br>- Approval of: Fire Management Plans<br>Fire Reports<br>Prescribed Burn Plans<br>Training Assignments<br>Temporary Duty Assignments |
| Chief of Resources Management: | - Overview of Program<br>- Review Prescribed Burn Plans |
| Fire Management Officer: | - Manages program in accordance with Fire Management Plan; and within federal, state and local regulations.<br>- Sets specific goals and priorities.<br>- Manages budget and FirePro funding.<br>- Determines training needs; submits requests.<br>- Develops Cooperative Agreements and coordinates activities with local agencies.<br>- Calculates Preparedness level and appropriate response;<br>- Submits situation reports to USFS Lufkin Zone Dispatch.<br>- Submits fire reports and Prescribed Burn Plans for approval. |
| Fire Ecologist: | - Develops Monitoring Plans, analyzes data, supervises fire rehabilitation projects<br>- Checks fire management documents, burn plans, NEPA documents & reports for scientific accuracy. |
| Fuels Specialist: | - Develops Prescribed Burn Plans, including NEPA documents, and submits for approval.<br>- Implements prescribed burn plans (Rx boss) and participated in all wildland fire management activities (ICT3) |
| Equipment Technician: | - Maintains all fire equipment is response ready condition, and maintains Fire Cache (order material and issue gear).<br>- Coordinates, tracks, and teaches wildland fire training courses and Physical Fitness Tests.<br>- Participates in all levels of fire management activities. |
| Engine Boss (STF): | - Supervises daily activity of fire crew in the full range of fire management activities, and functions as Engine Boss on prescribed burns and wildland fires. |
| Lead Fire Effects Monitor: | - Monitors weather, fire behavior, and smoke dispersal on wildfires and prescribed burns.<br>- Supervises vegetation monitoring activities, and fire effects monitoring for wildfires and prescribed burns, including post burn evaluation. |

| | |
|---|---|
| Fire Program Assistant: | - Maintains Preserve files: wildfire reports, prescribed burn plans, physical test scores, weather records, and evaluations.<br>- Maintains employee qualification records via the SACS computer system. |
| Incident Commander: | - Selects strategy and directs suppression efforts in a cost efficient manner while striving for minimum resource damage.<br>- Techniques utilized must provide for fire fighter safety.<br><br>- Prepares Situation Analysis daily (to FMO).<br>- Protects human life, urban interface values, private property<br>- Actively mitigates traffic control problems.<br>- Inspects all critical control lines prior to leaving fire unstaffed.<br>- Prepares narrative (to FMO)<br>- Supervises rehabilitation of control lines. |
| Burn Boss: | - Protects human life, urban interface values, private property,<br>- Conducts burn in accordance with the ignition burn plan, while adjusting ignition patterns to coincide with varying weather, fire behavior, and resource needs.<br>- Actively mitigates traffic control problems.<br>- Assures notification of local residents.<br>- Issues statements through the Fire Information Officer.<br>- Inspects all critical control lines prior to leaving fire unstaffed.<br>- Assures monitoring of weather, fire behavior, and smoke dispersal.<br>- Supervises rehabilitation of control lines.<br>- Prepares narrative and Fire Report (to FMO) |
| Fire Fighter: | - Fights fire aggressively, but maintains safety awareness.<br>- Maintains physical fitness requirements.<br>- Maintains gear and equipment in response ready condition. |
| Rx Holding crewmember: | - Follows ignition plan.<br>- Maintains safety awareness.<br>- Maintains physical fitness requirements.<br>- Maintains gear and equipment in response ready condition. |
| Fire Monitor: | - Monitors/records weather every 1/2 hour.<br>- Alerts Incident Commander / Burn Boss of substantial changes.<br>- Utilizes standardized work sheet to document fire behavior.<br>- Documents burn activities with photography.<br>- Prepares narrative and burn pattern map (to IC / Burn Boss). |
| Fire Information Officer: | - Develops statements on fire activity that complies with agency policy, regulations, and procedures.<br>- Provides for the flow of information to/and from news personnel and the general public. |
| Safety Officer: | - Reviews operations, plans, and monitors fire control activities for safety considerations. |

Fire Program Analysis Funding

Funding for FPA activities is provided through D.O.I firefighting accounts (P.L. 101-121, Department of the Interior and Related Agencies Appropriation Act, 1990). It established the funding mechanism for normal year expenditures of funds for fire management purposes. Fire funds are non-NPS, no-year funds that are distributed to parks by the NPS Fire Management Program Center (NIFC) through System Support Offices. In the Inter-Mountain Region, funds are channeled through FMO's to NPS units without direct access. All unobligated treatment funds are to be returned at the end of the treatment for redistribution.

Section 102 of the General Provisions of the Department of Interior's annual Appropriations Bill provides the authority under which appropriated moneys can be expended or transferred to fund expenditures arising from the emergency prevention and suppression of wildland fire.

31 U.S. Code 665 (E)(1)(B) provides the authority to exceed appropriations due to wildland fire management activities involving the safety of human life and protection of property.

Interagency Assistance

Fire management planning, preparedness, prevention, suppression, restoration and rehabilitation, monitoring, research, and training will be conducted on an interagency basis with the involvement of cooperators and partners. The preserve will provide qualified employees through the Texas Interagency Coordination Center for regional and national assignments per national staffing level determinations. The preserve is an 'umbrella park' and provides fire management assistance and oversight to Padre Island National Seashore, Lyndon B. Johnson National Historical Park, and San Antonio Missions National Historical Park. The preserve will pursue agreements with local agencies, volunteer fire departments, and civic groups for wildland fire actions and urban interface treatments.

The authority for interagency agreements is found in "Interagency Agreement Between the Bureau of Land Management, Bureau of Indian Affairs, National Park Service, U.S. Fish and Wildlife Service of the United States Department of the Interior and the Forest Service of the United States Department of Agriculture" (1982).

The authority for rendering emergency fire or rescue assistance outside of the National Park system is the Act of August 8, 1953 (16 USC 1b(1)), and the Departmental Manual (910 DM).

Agreements

Padre Island National Seashore – This Interpark Agreement allows Big Thicket National Preserve fire management staff to assist Padre Island National Seashore in their fire management activities.

Lyndon B. Johnson National Historical Park - This Interpark Agreement allows Big Thicket National Preserve fire management staff to assist Lyndon B. Johnson National Historical Park in their fire management activities.

San Antonio Missions National Historical Park - This Interpark Agreement allows Big Thicket National Preserve fire management staff to assist San Antonio Missions National Historical Park in their fire management activities.

Alabama - Coushatta Indian Reservation - This Cooperative Agreement provides for the training, utilization, and payment for tribal personnel used in fire management activities on the preserve.

Texas Forest Service - This Memorandum of Understanding provides for cooperative fire management activities, establishes a Mutual Aid Zone, and provides for the staffing of a TFS dozer for preserve fire management activities and mutual aid response.

Texas Land Management Agencies – This Memorandum of Understanding is between the US Fish & Wildlife service (Region 2), the National Park Service (Intermountain Region), Texas Forest Service, National Forest Service (National Grasslands and Forest in Texas), and the Nature Conservancy (Texas Chapter). It provides for the mutual support, cooperation and assistance between agencies for fire management activities and wildfire incidents, emergency management of 'all-risk' incidents at no costs.

## *VI. MONITORING AND EVALUATION*

General

Fire management plans, activities, and treatments will be based on a foundation of sound science. Research will support ongoing efforts to increase our scientific knowledge of biological, physical, and sociological factors. Information needed to support fire management will be developed through an integrated interagency fire science program. Scientific results must be made available to managers in a timely manner and must be used in the development of land management plans, fire management plans, and implementation plans. Research and monitoring programs are essential to document changes in, and between, fire dependent plant communities. As the wildland fire management program matures, site-specific research will provide guidance toward achieving natural community structure and processes.

Big Thicket National Preserve

The preserves Resource Management Plan discusses fire effects research in projects BITH-N-025.002 and BITH-N-025.003:

The influence of fire in the ecosystem of the Southeastern United States Gulf Coastal Plain is widely recognized. The periodic occurrence of fire in the Big Thicket region of East Texas has contributed to the diverse array of plant communities now situated within the Preserve. Although the role of fire in maintaining certain plant communities is widely assumed, the actual effects of natural fires are poorly documented. Indirect lines of evidence which imply dependence by certain plant communities on periodic fire episodes include: apparent fire-tolerance and adaptations of certain plant species, favorable responses of these communities to fire, historic records, original property survey descriptions, and the observations of regional naturalists… Management practices on private lands in Southeast Texas have favored economically valuable, high-density commercial stands of pine for forest products such as pulpwood, plywood and lumber. This has resulted in the extirpation of most fire-dependent communities in the region. The Preserve may eventually harbor the few remaining viable stands of these vegetation types, and become a biological "island" for those members of the regional flora and fauna that depend on them. During early observations of the Preserve, it became apparent that the phyric communities were quickly being lost to encroachment by hardwood tree and shrub species. A biologist working for the Preserve has commented that as much as 25% of the flora, mostly representing herbaceous species could be lost if fire was not restored to its original role.

The fire management program affects vegetative patterns within 20,000 acres of five fire dependent ecosystems. The program's goal is to reverse 50 to 75 years of fire suppression and restore natural community structure and balance. To accurately access progress and refine burn prescriptions, the vegetational changes must be tracked and evaluated in conjunction with burn season, rotation cycle, and actual burn conditions.

Initial research efforts (G. Watson 1983/84) focused on baseline vegetation statistics by establishing 24 permanent vegetational sampling sites within the Hickory Creek, Turkey Creek, Lance Rosier, and Big Sandy Creek Units (see Appendix 1). Each site consists of a ten-meter square 'tree plot' where each individual was identified and measured; a five-meter square 'shrub plot' where each species was identified and total stems tallied; and a transect/point frame process which identified ground cover by species/type and relative abundance. All sites have extensive photographic (slide) documentation. The photo log will be maintained on a five-year cycle (minimum), with a full resampling of vegetation every ten years.

RICE UNIVERSITY

The department of Ecology and Evolutionary Biology at Rice University, under the direction of Professor P.A. Harcombe, completed a five-year study on Fire Effects on Vegetation in the Big Thicket. Plant communities included sandhill pine-oak, upland pine, upper-slope pine-oak, mid-slope oak-pine, lower-slope hardwood-pine, baygall thicket, and wetland pine savannah sites in the Big Thicket National Preserve (245 plots) and Roy E. Larson Preserve of the Nature Conservancy of Texas (77 plots). Existing tornado study plots (20), located in the Hickory Creek Savannah unit, were also included. Plots were sampled during the initial installation; burn plots were resampled annually, with control plots resampled biannually. Soils in selected areas were also checked for the presence of grass phytoliths to determine historic ground cover. Data analysis included extensive computer ordination graphs, statistical comparisons, and fire intensity modeling.

Short-term results indicate significant fuel reduction in upland pine, upper-slope pine-oak, and sandhill vegetation types. Needle drop after hot fires replaced some of the consumed fuels. Minimal fuel reduction occurred on mid-slope forest due to patchy fires of low intensity. The grass/herb recovery in savannahs was rapid and replaced fuel consumed by the fire. Only in the savannahs was the brush cover reduced significantly. Other types showed a decline in brush cover, but no significant difference between pre and post shrub covers. Density of large saplings decreased in all types after fire, but only significantly in upland pine and Upper-Slope pine-oak. Reduction in small tree density was apparent in all types except savannah. Dramatic changes occurred in the small tree category of upland pine stands and some of the sandhill and upper-slope pine-oak stands. The upper-slope sites had a dramatic change in understory composition. However, the loss of mature Longleaf Pine (due to logging), and an altered fuel bed, may be a constraint to reestablishing a natural community. If viable seed remains in the soil, planned ignitions may provide release for a new generation.

A dense grass cover emerged immediately after a hot fire removed the brushy understory in upland pine (BS06 & TC36). Nearby upper-slope pine-oak type didn't burn as hot, and didn't have the grass cover response. Several sandhill sites (xeric) had negligible grass cover increase due to poor site quality. Abundance of dumbbell phytolith from 11 of 15 samples reflects the present grass abundance. Four other sites had no, or only sparse grasses at present, but abundant phytolith's to indicate its historic presence.

Fire in the savannahs have a limited impact on the sparse overstory, but plays a role in maintaining a diverse herbaceous ground cover, and prevents the savannah from succeeding to other types.

Reintroduction of fire changed the vegetative structure and relative abundance of species in sandhill and upland pine communities, particularly in the small tree category. This was principally caused by the reduction of understory hardwoods and shrubs. Upper-slope pine-oak stands were affected to a lesser degree. Each type became more independent, with the sandhill becoming most dissimilar. The stands didn't show systematic change to another type. One upland pine type did show movement from mid-slope to upper-slope on the ordination graph. However, no clear pattern was apparent in the large sapling category, and suggests that while species composition and abundance was altered, recovery was also rapid. The seedling and small sapling category results were similar.

Planned ignitions did open the sandhill and upland sites where Longleaf pines were still present and hot fires were possible. Grass cover was reappearing in upland pine areas that historically had an herbaceous layer. However, soil samples from the sandhill site didn't have sufficient dumbbell phytolith's to substantiate a historic grass cover. Significant brush reduction occurred after two burns. The open canopy and current community structure may represent its historic condition.

When a tornado ripped a 77-acre swath trough a mixed savannah, it reduced the overstory basal area by 61%. This added significant material to the ground fuels. However the subsequent rapid growth of hardwoods did not contribute to fire intensity, rather it shifted the site ordination toward mid-slope which is less flammable than savannah. A large increase in Longleaf pine between 1990 &1991 is partially due to fire. The strength of fire effects may determine the ability to recover the savannah. However, a shorter fire return cycle may be needed. This site was prescribed burned in '86, '91, '95.

Preliminary findings support their general hypothesis that fire affects dry uplands more strongly than mesic slopes and bottomlands types. Prescribed burning caused rapid resprouting of shrubs, seedlings, and saplings. Some plots even had a higher number of post-fire individuals. The greatest reduction occurred in the 2-5 cm dbh class of woody plants, with the least effect on large trees. The duration of fire effects depends upon the reduction in the small tree class and rate of regrowth of small sized classes and species composition of the newly regenerated populations. Compositional changes in the understory were largely chaotic (without pattern); however, savannah and sandhill communities tended to return to their preburn composition after several years. As a five-year study tracked change after only one prescribed burn (two burns on the sandhill) longer-term research into shrub root stock reduction resulting from repetitive burning over several decades is necessary. Current fire effect practices emphases growing season burns to control understory brush and promote grass/forb ground cover.

This study documents that Prescribed fire will bring structural change to some of the plant communities, particularly upland pine, upperslope pine-oak, and sandhill pine. While it had limited effect on the overstory, it can open up the understory, reduce shrub cover, and even introduce an herbaceous component.

## *VII. FIRE RESEARCH*

Specific research is need to determine if Wetland Pine Savannahs move around the landscape over a 100+ year cycle. Anecdotal remarks by local 'old-timers' indicated that Wetland Pine Savannah grows up into 'Pin Oak Flats' if fires are excluded. While Flatland Hardwood Forests are not considered a fire dependent vegetation type, an unusual wildfire (lightning strike) occurred in a Flatland Hardwood area of the Lance Rosier Unit during the summer drought of 1998. Approximately half of the 663 acres it covered had virtually One hundred percent canopy tree mortality [Loblolly Pine and hardwoods (oaks)]. Five years later the area has dense patches of pine regeneration and a significant herbaceous layer. Repetitive burning will determine if the site can transition to savannah.

## *VIII. PUBLIC SAFETY*

Urban Interface

The preserve has approximately 530 miles of boundary due to the disjunct arrangement of the land units, and the long configuration of the corridor units. Adjacent land-use activities generally consist of commercial timber production, agriculture (rice and soybean farming), cattle grazing, petroleum exploration and production, residential subdivision development, and rural homesite development. Commercial timber management is by far the most prevalent adjacent land-use activity, occurring along approximately 318 miles of boundary. Rural homesite developments occur on about 26 miles of boundary; residential subdivisions occur along 12 miles; and 80 miles of pipeline and petroleum production fields occur in or adjoin the Preserve.

Rural homesites occur near virtually every management unit. Residential subdivisions are located adjacent to the Hickory Creek Savannah Unit, Menard Creek Corridor Unit, Beaumont Unit, Little Pine Island Bayou Corridor Unit, Upper Neches River Corridor Unit, and Lower Neches River Corridor Unit. Oil and gas production fields occur within or near the Lance Rosier Unit, Jack Gore Baygall, Neches Bottom Unit, Turkey Creek Unit, and Big Sandy Creek Unit. Protection of adjacent values-at-risk must be considered while selecting the Appropriate Management Strategy and tactics. Resource damaging tactics (i.e. plowed line) will be limited to the boundary, when feasible, and burning –out of fuels completed.

Evacuation Plans

The Big Sandy FMU has a private inholding (Mr. Lilly – life estate), and a preserve residence (seasonal bunk house) near the junction of Lilly road and Sunflower Roads. They are located on the creek's floodplain, reducing the risk from wildland fire. Residents can evacuate by vehicle west or east on Sunflower road or north on Lilly road.

The Turkey Creek FMU has a preserve residence (seasonal bunk house) near Triple D Ranch. Evacuation by vehicle on an administrative road (2-track gravel, 1.5 miles to Hester Bridge Road); or hike .5 miles southwest on the powerline ROW to the boundary, then west to a county road. The firearms Range and radio tower area provides an adequate safety zone, as surrounding fuels are hardwoods.

The Beech Creek FMU surrounds the small community of Odemville. However, hardwood fuels have less flammability than upland pine ecosystems, and two paved county roads provide adequate escape routes.

The Hickory Creek FMU shares its western boundary with the Wildwood Community, a critical urban-interface area. Fuel treatments are reducing the risk to adjacent structures. A paved county road [FM3063] is the only public access route for residences. Evacuation on timber company roads (dirt) north or west would require guided convoys, and may not be possible for small vehicles. The gold course, ball fields, and lake areas provide adequate safety zones.

Trailheads and other visitor use areas have public road access that provides ready evacuation routes. Firefighters or law enforcement staff (ranger) will patrol trails before conducting prescribed burns or if threatened by wildfires, and evacuate hikers by the best means possible.

The preserve issues 2500 permits for hunting during the fall season (October thru January). While prescribed burns are generally not conducted in hunting areas during that period, clearance and notification issues will be addressed in the prescribed burn plan. Rangers will alert hunters of wildfires by utilizing their PA and siren systems, and clear access paths with ATVs.

Mitigating Safety Issues

An internal review of prescribed burn plans is done by preserve staff (Fire Management Officer, Fire Ecologist, Burn Boss, and Equipment Technician), then an external technical review is performed by a Burn Boss qualified at the same level of complexity. All safety issues are resolved before the plan is brought to the superintendent for signature Staff meetings of all fire personnel are conducted weekly and assignments discussed. During Very High or Extreme fire danger, weather conditions, equipment readiness, assignments, and other safety issues are discussed prior to each shift. . Fire staff are briefed on operational plans prior to initial attack on wildfires, and safety issues resolved before committing resources to a specific action.

## *IX. PUBLIC INFORMATION AND EDUCATION*

Informing the public about the fire management program is an ongoing process involving numerous methods. Formal interpretive programs, both on-site and off-site, often address the ecological relationship of fire to the preservation of natural biological communities. These programs stress the importance of fire in maintaining biological diversity, and also include information on the detrimental effects of catastrophic wildland fires to resources and property. Interpretive brochures addressing the preserve's fire management program are often placed at trailheads following a planned ignition in the area. In addition, public meetings are scheduled with civic organizations prior to igniting wildland fires near residential developments.

Public news media are contacted during periods of high fire danger. Television networks occasionally conduct interviews with management personnel during wildland fires for public broadcasts.

Local environmental organizations (Big Thicket Conservation Association, Sierra Club, Audubon Society, and Texas Committee on Natural Resources) are kept informed on the Big Thicket National Preserve fire management program. Copies of this document may be requested by interested organizations for review and comment.

Fire management and visitor education staff conducts 'on-site' and 'off-site' lectures on the ecological relationship of fire to the preservation and sustainability of natural biological communities. These programs also stress the detrimental effects of catastrophic wildland fires to natural resources and property loss, and emphasize landowner mitigations. The preserves Environmental Education Specialist has developed an active multi-grade school program that includes fire management messages.

## *X. PROTECTION OF SENSITIVE RESOURCES*

Archeological/Cultural/Historic Resources

Pre-historic sites are buried and protected from most fires, but are at risk from dozer blade or plowed control lines. Utilization of MIST principals will void soil disturbance within the interior of the units, and known sites will be avoided. All structures were inspected for historical significance prior to NPS acquision, with only the Teal and Brammer sites recommended for protection / utilization. An arson fire destroyed the Teal home, and the Brammer Home was used as the preserve's contact station for the Kirby Nature trail until the Visitor Center was constructed in 2003. It is currently used for environmental education. Historic tramlines from the early logging period are present, but will not be adversely affected by fires.

<u>Natural Resources</u>

Special management consideration must be given to the Phlox Nivalis (Texas Trailing Phlox) discovered along the FM 1276 road shoulder after the July 1993 burn of Treatment Unit 1401, and was discovered along the Kennedy road [Treatment Unit 1501 in 1998. Several populations were planted under a Recover Plan in Treatment Units 3601 and 1201 (see Appendix 6). While these plants are adapted to exist in a fire ecosystem, ignition and control lines will avoid impacting these sites.

<u>Infrastructure that require special consideration</u>

Big Sandy: A small private graveyard is located along Cotton Road, near the Horse Trail, which must be protected from fire. Fireline is generally constructed around the perimeter, and all ATV equipment is banned from the interior. Most of the adjacent lands along the southeast boundary are private, with scattered residences along FM 1276. Several houses form an in holding which includes a ranger residence/office. Scattered rural residences occur along FM 1276 north of Dallardsville
Mr. Lilly has granted administrative access through the pasture south of Cotton Road.

## *XI. FIRE CRITIQUES AND ANNUAL PLAN REVIEW*

IMR fire staff may conduct a fire program review on a 3 to 5 year cycle, or audit specific projects as needed. The park superintendent may also request or conduct a review. All entrapments, deployments, other serious incidents, or potentially serious incidents will be immediately investigated. Reviews will be conducted so as to provide constructive critiques not as a faultfinding process.

The Fire Management Officer will review the Fire Management Plan annually, and submit changes for the superintendent's approval.

Fire management staff will conduct an annual Fire Readiness Review utilizing the Interagency Fire Readiness Review Guide adapted for the preserves specific needs. Participation by interagency partners will be requested.

Each wildland fire will have an ‘After Action Review’ conducted by the Incident Commander or Burn Boss, with recommendations added to the fire record. A formal critique of fires greater than 10 acres will be ‘chaired’ by the FMO, and documented in fire file.

Fire Reviews will be conducted in accordance with RM18:

Purpose of reviews:

- Examine progress of ongoing fires
- Identify new or improved techniques or tactics.
- Compile consistent and complete information to improve or refine park fire management programs and to ensure cost effectiveness of the program.
- Examine unusual fire related incidents

Hotline Reviews: Examine the progress of ongoing fire incident. Conducted by the Fire Management Officer or Superintendents designee with the Incident Commander. Provides for conformation of decisions made daily in the Wildland Fire Situation Analysis or determines faulty decision process and provides corrective action.

Park-level Reviews: The Superintendent or designated representative, the FMO plus other qualified personnel appointed by the Superintendent make up the review board. Provides the Superintendent with information to recognize commendable actions and to take corrective actions. A report generated from this review is forwarded to the Regional FMO.

Entrapment and Fire Shelter Deployment Review: Any entrapment or deployment will be reviewed as soon as possible after the incident and a report will be made to the Regional FMO.

## *XII. CONSULTATION AND COORDINATION*

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## *XIII. APPENDICES*

### ***Appendix A:***

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Appendix B.

## DEFINITIONS

Appropriate Management Action: Specific actions taken to implement a management strategy.

Appropriate Management Strategy: A plan or direction selected by agency administrator which guide wildland fire management actions intended to meet protection and fire use objectives.

Contain/Control: These terms are used to report the condition of the fire, and relate to fire time keeping, but do not have tactical meaning.

Fire Management Plan: A strategic plan that defines a program to manage wildland fires. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, burn plans, and prevention plans.

Fire Use: A wildland fire ignited by natural means that is managed for resource benefits.

Initial Actions: Action taken by first resources to arrive at a wildland fire to meet protection and fire use objectives.

Preparedness: Activities that lead to a safe, efficient, and cost effective program in support of land management objectives through appropriate planning and coordination.

Prescribed burn: A wildland fire ignited by management actions to meet specific objectives.

Prescription: Measurable criteria that guide selection of appropriate management strategies and actions. Prescription criteria may include safety, economic, public health, and environmental, geographic, administrative, social or legal considerations.

Suppression: A management action intended to protect identified values from a fire, extinguish a fire, or alter a fire's direction of spread.

Urban-Interface: The intermingling of wildland fuels with homes, residential communities, or human infrastructures.

Wildfire: A wildland fire that is not a prescribed burn.

Wildland: Any area under fire management jurisdiction of a land management agency.

Wildland fire: Any fire that occurs in the wildland.

Wildland Fire Situation Analysis (WFSA): A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, political, and economic criteria.

## Appendix C SPECIES LIST

| | |
|---|---|
| Abutilon theophrasti | butterprint, buttonweed, Indian mallow, velvetleaf, velvetleaf (or butterprint), velvetleaf Indian mallow |
| Acalypha gracilens | slender copperleaf, slender threeseed mercury |
| Acalypha rhomboidea | Virginia threeseed mercury |
| Acalypha virginica | mercuryweed, threeseeded mercury, Virginia copperleaf, Virginia threeseed mercury, wax balls |
| Acer barbatum | florida maple, hammock maple, southern sugar maple |
| Acer negundo | ashleaf maple, box elder, boxelder, boxelder maple, california boxelder, manitoba maple, western boxelder |
| Acer negundo var. negundo | ash-leaf maple, boxelder |
| Acer nigrum | black maple, black sugar maple, hard maple, rock maple, sugar maple |
| Acer rubrum | red maple |
| Acer rubrum var. drummondii | drummond maple, Drummond's maple |
| Acer rubrum var. rubrum | red maple |
| Acer saccharinum | silver maple |
| Acer saccharum | sugar maple |
| Achillea millefolium | bloodwort, carpenter's weed, common yarrow, hierba de las cortaduras, milfoil, plumajillo, western yarrow, yarrow (common) |
| Acmella oppositifolia var. repens | creeping spotflower, oppositeleaf spotflower |
| Actaea pachypoda | baneberry, white baneberry |
| Adiantum pedatum | maidenfern, maidenhair, maidenhair fern, northern maidenhair |
| Aeschynomene indica | Indian jointvetch, jointvetch, kat sola, Kat sola, Indian jointvetch |
| Aesculus flava | yellow buckeye |
| Aesculus glabra | buckeye, ohio buckeye, Ohio buckeye, Texas buckeye |
| Aesculus glabra var. glabra | ohio buckeye, Ohio buckeye |
| Aesculus pavia | red buckeye |
| Agalinis fasciculata | beach false foxglove |
| Agalinis gattingeri | roundstem false foxglove |
| Agalinis heterophylla | prairie false foxglove, prairie false-foxglove |
| Agalinis oligophylla | ridgestem false foxglove |
| Agalinis pulchella | purple gerardia, St. Mark's false foxglove |
| Agalinis purpurea | purple false foxglove |
| Agalinis tenuifolia | slender-leaf false foxglove, slenderleaf false foxglove |
| Agalinis viridis | green false foxglove |
| Agastache nepetoides | catnip giant hyssop, yellow giant hyssop, yellow gianthyssop |
| Ageratina altissima | white snakeroot |
| Ageratina altissima var. altissima | white snakeroot |
| Ageratina altissima var. angustata | white snakeroot |
| Agrimonia incisa | incised agrimony |
| Agrimonia microcarpa | smallfruit agrimony |
| Agrimonia rostellata | beaked agrimony, woodland groovebur |
| Agrostis elliottiana | Elliot bentgrass, elliott bentgrass, Elliott's bentgrass |
| Agrostis hyemalis | winter bentgrass |
| Albizia julibrissin | mimosa, mimosa tree, powderpuff tree, silk tree, silktree |
| Aletris aurea | golden colicroot |
| Aletris farinosa | white colicroot |
| Allium canadense | Canada garlic, meadow garlic, Wild onion |
| Allium canadense var. canadense | Canada garlic, meadow garlic |
| Allium canadense var. mobilense | meadow garlic |
| Allium cernuum | nodding onion |
| Allium drummondii | drummond onion, Drummond's onion |
| Allium oleraceum | field garlic |
| Allium vineale | wild garlic |
| Alnus serrulata | alder, hazel alder |

| | |
|---|---|
| Alopecurus carolinianus | Carolina foxtail, tufted meadow-foxtail |
| Alophia drummondii | propeller flower |
| Alophia drummondii | propeller flower |
| Alternanthera philoxeroides | alligator weed, alligatorweed, pig weed |
| Amaranthus arenicola | sandhill amaranth, torrey amaranth |
| Amaranthus spinosus | pigweed species, spiny amaranth, spiny amaranthus |
| Amaranthus viridis | slender amaranth |
| Ambrosia artemisiifolia | annual ragweed, common ragweed, low ragweed, ragweed, Roman wormwood, short ragweed, small ragweed |
| Ambrosia psilostachya | Cuman ragweed, perennial ragweed, western ragweed |
| Ambrosia trifida | blood ragweed, giant ragweed, great ragweed, horseweed, perennial ragweed (great), tall ragweed |
| Amelanchier arborea | allegheny serviceberry, apple shadbush, common serviceberry, downy serviceberry, serviceberry, shadblow |
| Ammannia auriculata | eared redstem, earleaf ammannia |
| Ammannia coccinea | purple ammannia, valley redstem |
| Amorpha canescens | leadplant, leadplant amorpha |
| Amorpha fruticosa | desert false indigo, desert indigobush, dullleaf indigo, False indigo, false indigo-bush, indigobush, leadplant |
| Amorpha paniculata | panicled false indigo, panicled indigobush |
| Ampelopsis arborea | peppervine |
| Ampelopsis cordata | heartleaf ampelopsis, heartleaf peppervine |
| Ampelopsis cordata | |
| Amphiachyris dracunculoides | common broomweed, prairie broomweed |
| Amphicarpaea bracteata | American hogpeanut, hog-peanut |
| Amsonia glaberrima | |
| Amsonia illustris | Ozark bluestar |
| Amsonia tabernaemontana | eastern bluestar, willow slimpod |
| Amsonia tabernaemontana var. tabernaemontana | eastern bluestar |
| Anagallis arvensis | pimpernel, scarlet pimpernel |
| Anagallis minima | chaffweed |
| Andropogon gerardii | big bluestem, bluejoint, turkeyfoot |
| Andropogon glomeratus | bushy bluestem |
| Andropogon glomeratus var. pumilus | bushy bluestem |
| Andropogon gyrans | Elliott's bluestem |
| Andropogon gyrans var. gyrans | elliott bluestem, Elliott's bluestem |
| Andropogon hallii | sand bluestem |
| Andropogon ternarius | splitbeard bluestem |
| Andropogon virginicus | broomsedge, broomsedge bluestem, yellow bluestem |
| Andropogon virginicus var. virginicus | broomsedge, broomsedge bluestem |
| Anemone berlandieri | tenpetal thimbleweed |
| Anemone virginiana | tall thimbleweed, Virginia anemone |
| Antennaria parlinii | Parlin's pussytoes |
| Antennaria parlinii ssp. parlinii | Parlin's pussytoes |
| Anthaenantia rufa | purple silkyscale |
| Anthaenantia villosa | green silkyscale |
| Anthemis arvensis | corn chamomile, mayweed, scentless chamomile |
| Apios americana | apios americana, groundnut, potatobean |
| Apocynum cannabinum | common dogbane, dogbane, hemp dogbane, Indian hemp, Indian-hemp, Indianhemp, prairie dogbane |
| Apteria aphylla | nodding nixie |
| Arabidopsis thaliana | mouse-ear cress, mouseear cress |
| Arabis canadensis | sicklepod, sicklepod rockcress |
| Arabis laevigata | smooth rockcress |
| Aralia racemosa | American spikenard |
| Aralia spinosa | angelicatree, devil's walkingstick, devils walkingstick |
| Ardisia crenata | coral ardisia, hen's eyes |

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| Argemone albiflora | bluestem pricklypoppy |
| Arisaema dracontium | green dragon, greendragon |
| Arisaema triphyllum | Indian jack in the pulpit, Jack in the pulpit, Jack-in-the-pulpit |
| Arisaema triphyllum ssp. quinatum | Jack in the pulpit |
| Arisaema triphyllum ssp. triphyllum | Jack in the pulpit |
| Aristida | annual threeawn, perennial threeawn, perennial threeawn species, threeawn |
| Aristida desmantha | curly threeawn |
| Aristida lanosa | woollysheath threeawn, woolysheath threeawn |
| Aristida longispica var. geniculata | red threeawn, slimspike threeawn |
| Aristida longispica var. longispica | red threeawn, slimspike threeawn |
| Aristida oligantha | Oldfield (Prairie) 3-awn, oldfield threeawn, prairie threeawn |
| Aristida palustris | longleaf threeawn |
| Aristida purpurascens | arrowfeather threeawn |
| Aristida purpurascens var. purpurascens | Arrowfeather 3-awn, arrowfeather threeawn, longleaf threeawn |
| Aristida purpurascens var. virgata | arrowfeather threeawn |
| Aristolochia reticulata | Texas dutchman's pipe |
| Aristolochia serpentaria | Virginia dutchmanspipe, Virginia snakeroot |
| Aristolochia tomentosa | common dutchmanspipe, woolly dutchman's pipe |
| Armoracia lacustris | |
| Arnoglossum muehlenbergii | great Indian plaintain |
| Arnoglossum ovatum | ovateleaf cacalia |
| Arnoglossum plantagineum | arnoglossum, groovestem Indian plaintain |
| Aronia arbutifolia | red chokeberry |
| Artemisia ludoviciana | cudweed sagewort, gray sagewort, Louisiana sagewort, Louisiana wormwood, mugwort wormwood, prairie sage, white sagebrush |
| Arundinaria gigantea | giant cane |
| Asarum canadense | Canadian wild ginger, Canadian wildginger |
| Asclepias amplexicaulis | bluntleaf milkweed, clasping milkweed |
| Asclepias lanceolata | fewflower milkweed |
| Asclepias longifolia | longleaf milkweed |
| Asclepias obovata | pineland milkweed |
| Asclepias perennis | aquatic milkweed |
| Asclepias quadrifolia | fourleaf milkweed |
| Asclepias rubra | red milkweed |
| Asclepias tuberosa | butterfly milkweed, butterflyweed |
| Asclepias tuberosa ssp. interior | butterfly milkweed |
| Asclepias variegata | redring milkweed, white milkweed |
| Asclepias verticillata | eastern whorled milkweed, whorled milkweed |
| Asclepias viridiflora | green antelopehorn milkweed, green comet milkweed, green milkweed |
| Asimina parviflora | smallflower pawpaw |
| Asimina triloba | pawpaw |
| Asparagus officinalis | asparagus, garden asparagus, garden-asparagus |
| Asplenium platyneuron | ebony spleenwort |
| Asplenium rhizophyllum | walking fern |
| Aster drummondii var. texanus | Texas aster |
| Aster ericoides | heath aster, white aster, white heath aster |
| Aster lanceolatus var. simplex | |
| Aster ontarionis | Ontario aster |
| Aster pilosus | white heath aster, white oldfield aster |
| Aster subulatus | annual saltmarsh aster |
| Aster subulatus var. ligulatus | annual saltmarsh aster, panicled aster, saltmarsh aster, slender aster, southern annual saltmarsh aster |
| Astragalus distortus | bentpod milkvetch, Ozark milkvetch |
| Astragalus leptocarpus | rare loco milkvetch, slimpod milkvetch |
| Athyrium filix-femina | lady fern |
| Athyrium filix-femina | common ladyfern, ladyfern, subarctic lady fern |

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| Athyrium filix-femina ssp. asplenioides | asplenium ladyfern |
| Aureolaria flava | smooth yellow false foxglove |
| Aureolaria flava var. flava | smooth yellow false foxglove |
| Aureolaria flava var. macrantha | smooth yellow false foxglove |
| Aureolaria grandiflora | largeflower yellow false foxglove |
| Aureolaria pectinata | combleaf yellow false foxglove |
| Aureolaria virginica | downy yellow false foxglove |
| Avena fatua | flaxgrass, oatgrass, wheat oats, wild oat, wild oats |
| Axonopus fissifolius | carpetgrass, common carpetgrass, Louisiana grass, mat grass, narrowleaved carpetgrass |
| Axonopus furcatus | big carpetgrass |
| Azolla caroliniana | Carolina mosquitofern |
| Baccharis halimifolia | eastern baccharis |
| Baccharis halimifolia | eastern baccharis |
| Baccharis salicina | Great Plains false willow, Great Plains falsewillow, willow baccharis |
| Bacopa caroliniana | blue waterhyssop |
| Bacopa monnieri | coastal waterhyssop, herb of grace, herb-of-grace |
| Bacopa rotundifolia | disc waterhyssop, disk water-hyssop, disk waterhyssop, wet waterhyssop |
| Bambusa multiplex | hedge bamboo |
| Baptisia alba var. macrophylla | largeleaf wild indigo |
| Baptisia bracteata var. leucophaea | longbract wild indigo |
| Baptisia nuttalliana | Nuttall's wild indigo |
| Baptisia sphaerocarpa | green wildingo, round wildindigo, yellow wild indigo |
| Bartonia texana | Texas screwstem |
| Bartonia verna | white screwstem |
| Belamcanda chinensis | blackberry lily |
| Berberis thunbergii | Japanese barberry |
| Berchemia scandens | Alabama supplejack |
| Berlandiera betonicifolia | |
| Berlandiera pumila | soft greeneyes |
| Berlandiera pumila pumila | |
| Berlandiera pumila scabrella | |
| Berlandiera pumila var. scabrella | |
| Berlandiera X betonicifolia | berlandiera, Texas greeneyes |
| Betula nigra | river birch |
| Bidens aristosa | bearded beggarticks, bearded beggerticks, long-bracted beggar-ticks, tickseed sunflower |
| Bidens bipinnata | Spanish needles, spanish-needles |
| Bidens discoidea | discord beggarticks, small beggarticks |
| Bidens frondosa | bur marigold, devil's beggartick, devil's beggarticks, devil's bootjack, devil's-pitchfork, devils beggartick, pitchfork weed, sticktight, sticktights, tickseed sunflower |
| Bidens laevis | burmarigold, smooth beggartick, smooth beggarticks |
| Bidens leptocephala | few-flower beggarticks, fewflower beggarticks |
| Bidens mitis | smallfruit beggarticks |
| Bigelowia nudata | pineland rayless goldenrod |
| Bigelowia nudata ssp. nudata | pineland rayless goldenrod |
| Bignonia capreolata | cross vine, crossvine |
| Blephilia ciliata | downy blephilia, downy pagoda-plant |
| Blephilia hirsuta | hairy pagoda-plant |
| Boehmeria cylindrica | small-spike false nettle, smallspike false nettle, smallspike falsenettle |
| Boltonia asteroides | star boltonia, white doll's daisy, white doll's-daisy |
| Boltonia diffusa | smallhead doll's daisy |
| Boltonia diffusa var. diffusa | smallhead doll's daisy |
| Bothriochloa laguroides | silver beardgrass |
| Bothriochloa saccharoides | silver bluestem |

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| Botrychium biternatum | sparselobe grapefern |
| Botrychium dissectum | cut-leaf grape fern, cutleaf grapefern |
| Botrychium virginianum | rattlesnake fern |
| Brachyelytrum erectum | bearded shorthusk |
| Brasenia schreberi | schreber watershield, watershield |
| Brassica napus | rape, turnip |
| Brickellia eupatorioides | false boneset |
| Briza minor | little quakinggrass |
| Bromus catharticus | rescue brome, rescue grass, rescuegras, rescuegrass |
| Bromus japonicus | Japanese brome, Japanese bromegrass, Japanese chess |
| Bromus pubescens | hairy woodland brome |
| Bromus secalinus | bromegrass, cheat, chess, chess brome, rye brome, ryebrome |
| Brunnichia ovata | American buckwheat vine, buckwheat vine, redvine |
| Buchnera americana | American bluehearts, bupleurum |
| Buglossoides arvensis | corn gromwell, corn-gromwell, field gromwell |
| Bulbostylis barbata | watergrass |
| Bulbostylis capillaris | densetuft hairsedge, threadleaf beakseed |
| Bulbostylis ciliatifolia | capillary hairsedge |
| Bulbostylis ciliatifolia var. coarctata | capillary hairsedge |
| Burmannia biflora | northern bluethread |
| Burmannia capitata | southern bluethread |
| Callicarpa americana | American beautyberry |
| Callirhoe papaver | woodland poppymallow, woods poppymallow |
| Callisia cordifolia | Florida roseling |
| Callitriche heterophylla | differentleaf waterstarwort, greater water starwort, larger waterstarwort, twoheaded water-starwort, variedleaf waterstarwort |
| Callitriche terrestris | terrestrial water-starwort, terrestrial waterstarwort |
| Calopogon | grasspink |
| Calopogon barbatus | bearded grasspink |
| Calopogon oklahomensis | Oklahoma grasspink |
| Calopogon tuberosus | tuberous grasspink |
| Calopogon tuberosus var. tuberosus | tuberous grasspink |
| Calycocarpum lyonii | cupseed, sasparilla |
| Calyptocarpus vialis | straggler daisy |
| Calystegia | false bindweed, falsebindweed |
| Campanulastrum americanum | American bellflower |
| Campsis radicans | common trumpetcreeper, cow-itch, trumpet creeper |
| Caperonia palustris | sacatrapo, Texasweed |
| Capsella bursa-pastoris | shepardspurse, shepherd's purse, shepherd's-purse, shepherdspurse |
| Cardamine bulbosa | bulb bittercress, bulbous bittercress |
| Cardamine concatenata | cutleaf toothwort |
| Cardamine dissecta | forkleaf toothwort |
| Cardamine douglassii | limestone bittercress |
| Cardamine hirsuta | hairy bittercress |
| Cardamine parviflora | sand bittercress, smallflowered bittercress |
| Cardamine parviflora var. arenicola | sand bittercress |
| Cardamine pensylvanica | Pennsylvania bittercress, Quaker bittercress |
| Cardiospermum halicacabum | balloonvine, love in a puff |
| Carduus nutans | chardon penche, musk thistle, nodding plumeless thistle, nodding plumeless-thistle, nodding thistle, plumeless thistle |
| Carex | carex, sedge, sedge species, sedges |
| Carex abscondita | thicket sedge |
| Carex alata | broadwing sedge |
| Carex albicans | whitetinge sedge |
| Carex albolutescens | greenwhite sedge |

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| Carex albursina | white bear sedge |
| Carex amphibola | amphibious sedge, eastern narrowleaf sedge |
| Carex atlantica | prickly bog sedge |
| Carex atlantica ssp. capillacea | prickly bog sedge |
| Carex basiantha | Willdenow's sedge |
| Carex blanda | bland sedge, eastern woodland sedge, woodland sedge |
| Carex caroliniana | Carolina sedge |
| Carex cephalophora | oval-leaf sedge, ovalleaf sedge |
| Carex complanata | blue sedge, hirsute sedge |
| Callicarpa americana | American beautyberry |
| Callirhoe papaver | woodland poppymallow, woods poppymallow |
| Callisia cordifolia | Florida roseling |
| Callicarpa americana | American beautyberry |
| Callirhoe papaver | woodland poppymallow, woods poppymallow |
| Callisia cordifolia | Florida roseling |
| Callitriche heterophylla | differentleaf waterstarwort, greater water starwort, larger waterstarwort, twoheaded water-starwort, variedleaf waterstarwort |
| Callitriche terrestris | terrestrial water-starwort, terrestrial waterstarwort |
| Calopogon | grasspink |
| Calopogon barbatus | bearded grasspink |
| Calopogon oklahomensis | Oklahoma grasspink |
| Calopogon tuberosus | tuberous grasspink |
| Calopogon tuberosus var. tuberosus | tuberous grasspink |
| Calycocarpum lyonii | cupseed, sasparilla |
| Calyptocarpus vialis | straggler daisy |
| Calystegia | false bindweed, falsebindweed |
| Campanulastrum americanum | American bellflower |
| Campsis radicans | common trumpetcreeper, cow-itch, trumpet creeper |
| Caperonia palustris | sacatrapo, Texasweed |
| Capsella bursa-pastoris | shepardspurse, shepherd's purse, shepherd's-purse, shepherdspurse |
| Cardamine bulbosa | bulb bittercress, bulbous bittercress |
| Cardamine concatenata | cutleaf toothwort |
| Cardamine dissecta | forkleaf toothwort |
| Cardamine douglassii | limestone bittercress |
| Cardamine hirsuta | hairy bittercress |
| Cardamine parviflora | sand bittercress, smallflowered bittercress |
| Cardamine parviflora var. arenicola | sand bittercress |
| Cardamine pensylvanica | Pennsylvania bittercress, Quaker bittercress |
| Cardiospermum halicacabum | balloonvine, love in a puff |
| Carduus nutans | chardon penche, musk thistle, nodding plumeless thistle, nodding plumeless-thistle, nodding thistle, plumeless thistle |
| Carex | carex, sedge, sedge species, sedges |
| Carex abscondita | thicket sedge |
| Carex alata | broadwing sedge |
| Carex albicans | whitetinge sedge |
| Carex albolutescens | greenwhite sedge |
| Carex albursina | white bear sedge |
| Carex amphibola | amphibious sedge, eastern narrowleaf sedge |
| Carex tenax | wire sedge |
| Carex tetrastachya | Britton's sedge |
| Carex texensis | Texas sedge |
| Carex triangularis | eastern fox sedge |
| Carex tribuloides | blunt broom sedge |
| Carex tribuloides var. sangamonensis | blunt broom sedge |
| Carex verrucosa | warty sedge |
| Carex vulpinoidea | common fox sedge, fox sedge |

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| Carpinus caroliniana | American hornbeam, american hornbean |
| Carpinus caroliniana ssp. caroliniana | American hornbeam |
| Carya alba | mockernut hickory |
| Carya aquatica | water hickory |
| Carya cordiformis | bitternut hickory |
| Carya glabra | pignut hickory |
| Carya illinoinensis | pecan |
| Carya myristiciformis | nutmeg hickory |
| Carya ovata | shagbark hickory |
| Carya ovata | carya ovata australis, shag-bark hickory, shagbark hickory |
| Carya pallida | sand hickory |
| Carya texana | black hickory |
| Carya tomentosa | mockernut hickory |
| Castanea pumila | Allegeny chinkapin, allegheny chinkapin, chinkapin, northern catalpa |
| Castanea pumila var. pumila | chinkapin, trailing chinkapin |
| Castilleja coccinea | Indian paintbrush, scarlet Indian paintbrush |
| Castilleja indivisa | entireleaf Indian paintbrush, Texas paintbrush |
| Castilleja pallida var. septentrionalis | |
| Catalpa speciosa | northern catalpa |
| Caulophyllum giganteum | giant blue cohosh |
| Caulophyllum thalictroides | blue cohosh |
| Cayaponia quinqueloba | fivelobe cucumber |
| Ceanothus americanus | Jersey tea, jerseytea, New Jersey tea |
| Celastrus orbiculata | Asian bittersweet |
| Celastrus scandens | American bittersweet |
| Celtis laevigata | sugar berry, sugar hackberry, sugarberry |
| Celtis occidentalis | common hackberry, hackberry, western hackberry |
| Cenchrus incertus | coast sandspur, field sandbur, sandbur, southern sandbur, spiny burrgrass |
| Cenchrus longispinus | burgrass, field sandbur, innocent-weed, longspine sandbur, mat sandbur, sandbur |
| Cenchrus spinifex | coastal sandbur |
| Centaurea biebersteinii | spotted knapweed |
| Centaurium pulchellum | branched centaury |
| Centella asiatica | spadeleaf |
| Centella erecta | erect centella |
| Centrosema virginianum | butterflypea, spurred butterfly pea |
| Cephalanthus occidentalis | buttonbush, common buttonbush |
| Cerastium fontanum | common chickweed, common mouse-ear chickweed, mouse-ear chickweed |
| Cerastium fontanum ssp. vulgare | big chickweed, common mouse-ear chickweed |
| Cerastium glomeratum | sticky chickweed |
| Ceratophyllum demersum | common hornwort, coon's tail, coon's-tail, coontail, hornwort |
| Cercis canadensis | eastern redbud, Redbud |
| Cercis canadensis var. canadensis | eastern redbud, redbud |
| Chaerophyllum procumbens | spreading chervil |
| Chaerophyllum tainturieri | chervil, hairy-fruit chervil, hairyfruit chervil |
| Chaetopappa asteroides | Arkansas leastdaisy, least daisy |
| Chamaecrista fasciculata | partridge pea, Showy partridgepea, sleepingplant |
| Chamaecrista nictitans | partridge pea, partridge-pea |
| Chamaecrista nictitans ssp. nictitans var. nictitans | partridge pea, sensitive partridge pea, sensitive partridgepea |
| Chamaesyce cordifolia | heartleaf sandmat |
| Chamaesyce humistrata | spreading sandmat |
| Chamaesyce maculata | spotted sandmat |
| Chamaesyce maculata | large spurge, spotted sandmat, spotted spurge |
| Chamaesyce nutans | eyebane, nodding spurge, spotted sandmat, spotted spurge |
| Chamaesyce prostrata | prostrate sandmat, prostrate spurge |

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| Chamaesyce serpens | matted sandmat, serpent spurge |
| Chaptalia tomentosa | woolly sunbonnets |
| Chasmanthium latifolium | broadleaf uniola, Indian wood-oats, Indian woodoats |
| Chasmanthium laxum | slender woodoats, spike uniola |
| Chasmanthium sessiliflorum | longleaf spikegrass, longleaf woodoats |
| Chenopodium ambrosioides | Mexican tea, Mexican-tea |
| Chenopodium ambrosioides var. ambrosioides | Mexican tea |
| Chimaphila maculata | striped prince's pine, striped prince's-pine |
| Chionanthus virginicus | fringetree, white fringetree |
| Chloracantha spinosa | devilweed aster, Mexican devilweed, spiny aster, spiny chloracantha |
| Chrysopsis mariana | Maryland goldenaster |
| Chrysopsis pilosa | soft goldenaster |
| Chrysopsis pilosa | soft goldaster, soft goldenaster |
| Cicuta maculata | common water hemlock, poison parsnip, spotted cowbane, spotted parsley, spotted water hemlock, spotted water-hemlock, spotted waterhemlock, water hemlock |
| Cicuta maculata var. maculata | common water hemlock, poison parsnip, spotted cowbane, spotted parsley, spotted water hemlock, spotted water-hemlock, water hemlock |
| Cimicifuga racemosa | black bugbane |
| Circaea lutetiana | |
| Circaea lutetiana | broad-leaf enchanter's-nightshade, broadleaf enchanter's nightshade |
| Circaea lutetiana ssp. canadensis | broad-leaf enchanter's-nightshade, broadleaf enchanter's nightshade |
| Cirsium altissimum | roadside thistle, tall thistle |
| Cirsium carolinianum | Carolina thistle, soft thistle |
| Cirsium discolor | field thistle |
| Cirsium horridulum | yellow thistle |
| Cladium mariscus ssp. jamaicense | jamaica sawgrass, Jamaica swamp sawgrass |
| Claytonia virginica | Spring beauty, Virginia springbeauty |
| Clematis crispa | curly virginsbower, swamp leather flower |
| Clematis glaucophylla | whiteleaf leather flower |
| Clematis pitcheri | bluebill, pitcher clematis, pitchers virginsbower |
| Clematis reticulata | netleaf leather flower |
| Clematis viorna | vasevine |
| Clematis virginiana | devil's darning needles, devil's-darning-needles, virgin's bower, Virginia bower |
| Cleome hassleriana | pink queen, pinkqueen |
| Clethra alnifolia | coastal sweetpepperbush, summersweet clethra |
| Clethra alnifolia | |
| Clinopodium brownei | Browne's savory |
| Clitoria mariana | Atlantic pigeonwings, pidgeonwings |
| Cnidoscolus texanus | bullnettle, Texas bullnettle |
| Cocculus carolinus | Carolina coralbead, Carolina snailseed, redberry moonseed |
| Coelorachis cylindrica | Carolina jointail, cylinder jointtail grass |
| Coelorachis rugosa | wrinkled jointtail grass |
| Commelina | commelina, dayflower |
| Commelina communis | Asiatic dayflower, common dayflower |
| Commelina communis var. communis | Asiatic dayflower |
| Commelina diffusa | climbing dayflower, spreading dayflower |
| Commelina erecta | erect dayflower, whitemouth dayflower |
| Commelina erecta var. angustifolia | whitemouth dayflower |
| Commelina erecta var. deamiana | whitemouth dayflower |
| Commelina erecta var. erecta | whitemouth dayflower |
| Commelina virginica | Virginia dayflower |
| Conium maculatum | cigue maculee, cigue tachetee, deadly hemlock, poison hemlock, poison parsley, poison-hemlock |
| Conoclinium coelestinum | blue mistflower |
| Convolvulus arvensis | creeping jenny, European bindweed, field bindweed, morningglory, |

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| | perennial morningglory, smallflowered morning glory |
| Conyza bonariensis | asthmaweed, flaxleaved fleabane, hairy fleabane |
| Conyza canadensis | Canada horseweed, Canadian horseweed, horseweed, horseweed fleabane, mares tail, marestail |
| Conyza canadensis var. pusilla | Canadian horseweed |
| Corallorrhiza wisteriana | coralroot, spring coralroot |
| Coreopsis basalis | goldenmane tickseed |
| Coreopsis lanceolata | lance coreopsis, lanceleaf tickseed |
| Coreopsis linifolia | Texas tickseed |
| Coreopsis tinctoria | golden tickseed, Plains coreopsis, plains tickseed |
| Coreopsis tinctoria var. tinctoria | golden tickseed |
| Coreopsis tripteris | atlantic coreopsis, tall tickseed |
| Cornus alternifolia | alternate-leaf dogwood, alternateleaf dogwood |
| Cornus drummondii | roughleaf dogwood |
| Cornus florida | flowering dogwood |
| Cornus foemina | |
| Cornus foemina | stiff dogwood |
| Cornus racemosa | gray dogwood |
| Corydalis micrantha | smallflower corydalis, smallflower fumewort |
| Corylus americana | American hazelnut, hazel, hazelnut |
| Cosmos bipinnatus | garden cosmos |
| Crataegus berberifolia | barberry hawthorn |
| Crataegus brachyacantha | blueberry hawthorn |
| Crataegus crus-galli | bush hawthorne, cockspur hawthorn |
| Crataegus marshallii | parsley hawthorn |
| Crataegus opaca | riverflat hawrthorn, riverflat hawthorn |
| Crataegus spathulata | littlehip hawthorn |
| Crataegus uniflora | dwarf hawthorn, oneflower hawthorn |
| Crataegus viridis | |
| Crataegus viridis | green hawthorn |
| Crepis capillaris | smooth hawk's-beard, smooth hawksbeard |
| Crepis pulchra | hawksbeard, smallflower hawksbeard |
| Crinum americanum | seven sisters |
| Croptilon divaricatum | goldenweed, slender scratchdaisy |
| Croptilon hookerianum | Hooker's scratchdaisy |
| Crotalaria sagittalis | arrow crotalaria, arrowhead rattlebox |
| Crotalaria spectabilis | showy crotalaria, showy rattlebox |
| Croton argyranthemus | healing croton, silverleaf croton |
| Croton capitatus | doveweed, hogweed, hogwort, woolly croton, wooly croton |
| Croton capitatus var. capitatus | hogwort |
| Croton glandulosus | vente conmigo |
| Croton glandulosus var. septentrionalis | vente conmigo |
| Croton humilis | pepperbush |
| Croton michauxii | Michaux's croton, narrowleaf rushfoil |
| Croton monanthogynus | oneseeded croton, prairie tea, prairie-tea |
| Croton willdenowii | two-fruit rushfoil, Willdenow's croton |
| Cryptotaenia canadensis | Canadian honewort, honewort |
| Cucurbita texana | Texas gourd |
| Cuphea carthagenensis | Colombian waxweed |
| Cuphea glutinosa | sticky waxweed |
| Cuphea viscosissima | blue waxweed |
| Cuscuta | dodder |
| Cuscuta compacta | compact dodder |
| Cuscuta cuspidata | cusp dodder |
| Cuscuta gronovii | scaldweed |

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| Cyclospermum leptophyllum | marsh parsley |
| Cynanchum laeve | climbing milkweed, honeyvine, honeyvine milkweed, sandvine |
| Cynodon dactylon | Bermudagrass, chiendent pied-de-poule, common bermudagrass, devilgrass, grama-seda, manienie, motie molulu |
| Cynoglossum virginianum | blue houndstongue, wild comfrey |
| Cynoglossum virginianum var. virginianum | wild comfrey |
| Cynosciadium digitatum | finger dogshade, fringed dogshade |
| Cyperus acuminatus | taper-tip flat sedge, taperleaf flatsedge, tapertip flatsedge |
| Cyperus aggregatus | inflated-scale flatsedge, inflatedscale flatsedge |
| Cyperus articulatus | jointed flatsedge |
| Cyperus compressus | poorland flatsedge |
| Cyperus croceus | Baldwin's flatsedge |
| Cyperus cyperinus | Old World flatsedge |
| Cyperus echinatus | globe flatsedge |
| Cyperus elegans | royal flatsedge, sticky flatsedge |
| Cyperus entrerianus | woodrush flatsedge |
| Cyperus erythrorhizos | red-root flat sedge, redroot flatsedge, redroot nutgrass |
| Cyperus esculentus | |
| Cyperus flavicomus | white-edge flatsedge, whiteedge flatsedge |
| Cyperus grayoides | Illinois flatsedge |
| Cyperus haspan | haspan flatsedge |
| Cyperus hystricinus | bristly flatsedge |
| Cyperus iria | ricefield flatsedge |
| Cyperus lupulinus ssp. lupulinus | Great Plains flatsedge |
| Cyperus ochraceus | pond flatsedge |
| Cyperus odoratus | fragrant flatsedge, rusty flat sedge |
| Cyperus oxylepis | sharpscale flatsedge |
| Cyperus plukenetii | Plukenet's flatsedge |
| Cyperus polystachyos | manyspike flatsedge |
| Cyperus pseudovegetus | marsh flatsedge |
| Cyperus reflexus | bentawn flatsedge |
| Cyperus retroflexus | one-flower flatsedge, oneflower flatsedge |
| Cyperus retrofractus | rough flatsedge |
| Cyperus retrorsus | pine barren flatsedge |
| Cyperus retrorsus var. retrorsus | pine barren flatsedge |
| Cyperus rotundus | chaguan humatag, cocograss, kili'o'opu, nutgrass, pakopako, purple nutsedge |
| Cyperus squarrosus | awned flat sedge, bearded flatsedge, bearded nutgrass |
| Cyperus strigosus | stawcolored flatsedge, strawcolor flatsedge, strawcolor nutgrass, strawcolored flatsedge, strawcolored nutgrass |
| Cyperus surinamensis | tropical flatsedge |
| Cyperus thyrsiflorus | Southern flat sedge, southern flatsedge |
| Cyperus virens | green flatsedge |
| Cypripedium kentuckiense | Kentucky lady's slipper, southern lady's slipper |
| Cypripedium parviflorum var. pubescens | |
| Cyrilla racemiflora | swamp cyrilla, swamp titi |
| Cystopteris bulbifera | bulb bladderfern, bulblet bladderfern |
| Cystopteris protrusa | lowland bladderfern |
| Dactylis glomerata | cocksfoot, orchard grass, orchardgrass |
| Dalea candida | slender white prairieclover, white dalea, white prairie clover, white prairie-clover, white prairieclover |
| Dalea candida var. candida | white prairie clover, white prairie-clover, white prairieclover |
| Dalea phleoides | slimspike prairie clover, slimspike prairieclover |
| Dalea phleoides var. phleoides | slimspike prairie clover, slimspike prairieclover |
| Dalea villosa | hairy prairieclover, silky prairie clover, silky prairie-clover, Silky prairieclover |
| Dalea villosa var. grisea | silky prairie clover, silky prairieclover |

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| Danthonia spicata | poverty danthonia, poverty oatgrass, poverty wild oat grass |
| Datura stramonium | Jamestown weed, jimsonweed, mad apple, moonflower, stinkwort, thorn apple |
| Daucus carota | bird's nest, Queen Anne's lace, wild carrot |
| Daucus pusillus | American wild carrot, rattlesnake carrot, rattlesnake weed, southwest wild carrot |
| Decodon verticillatus | swamp loosestrife |
| Delphinium carolinianum | Carolina larkspur |
| Delphinium tricorne | dwarf larkspur, rock larkspur |
| Desmanthus illinoensis | illinois bundleflower, prairie bundleflower |
| Desmodium canescens | hoary tickclover, hoary ticktrefoil |
| Desmodium ciliare | hairy small-leaf ticktrefoil, littleleaf tickclover |
| Desmodium ciliare var. ciliare | hairy small-leaf ticktrefoil, hairy smallleaf ticktrefoil |
| Desmodium cuspidatum var. cuspidatum | largebract ticktrefoil |
| Desmodium glabellum | Dillenius' ticktrefoil |
| Desmodium laevigatum | smooth tickclover, smooth ticktrefoil |
| Desmodium lineatum | sand ticktrefoil |
| Desmodium marilandicum | maryland tickclover, smooth small-leaf ticktrefoil |
| Desmodium nudiflorum | barestem tickclover, nakedflower ticktrefoil |
| Desmodium nuttallii | Nuttall's ticktrefoil |
| Desmodium obtusum | stiff tickclover, stiff ticktrefoil |
| Desmodium paniculatum | panicled tickclover, panicledleaf ticktrefoil |
| Desmodium pauciflorum | fewflower ticktrefoil, fewflowered tickclover |
| Desmodium rotundifolium | prostrate ticktrefoil, roundhead tickclover |
| Desmodium sessilifolium | Sessile tickclover, sessileleaf tickclover, sessileleaf ticktrefoil |
| Desmodium strictum | pinebarren ticktrefoil |
| Desmodium tortuosum | Dixie tick trefoil, dixie ticktrefoil |
| Desmodium viridiflorum | velvetleaf tickclover, velvetleaf ticktrefoil |
| Dianthus armeria | Deptford pink, Deptford's pink |
| Diarrhena americana | American beakgrain |
| Dicentra canadensis | squirrel corn |
| Dichanthelium aciculare | needleleaf rosette grass |
| Dichanthelium acuminatum | hotsprings panicum, hotsprings rosette grass, tapered rosette grass |
| Dichanthelium acuminatum var. acuminatum | tapered rosette grass |
| Dichanthelium acuminatum var. fasciculatum | Huachuca panic, tapered rosette grass, western panicgrass |
| Dichanthelium acuminatum var. lindheimeri | Lindheimer panicgrass |
| Dichanthelium boscii | Bosc's panicgrass |
| Dichanthelium clandestinum | deertongue |
| Dichanthelium commutatum | variable panicgrass |
| Dichanthelium consanguineum | blood panicgrass |
| Dichanthelium depauperatum | starved panicgrass |
| Dichanthelium dichotomum | cypress panicgrass |
| Dichanthelium dichotomum var. dichotomum | cypress panicgrass |
| Dichanthelium dichotomum var. ensifolium | cypress panicgrass |
| Dichanthelium dichotomum var. tenue | cypress panicgrass |
| Dichanthelium laxiflorum | openflower rosette grass |
| Dichanthelium longiligulatum | coastalplain panicgrass, coastalplain panicum |
| Dichanthelium oligosanthes | fewanther obscuregrass, Heller's rosette grass |
| Dichanthelium scabriusculum | woolly rosette grass |
| Dichanthelium scoparium | velvet panicum |
| Dichanthelium sphaerocarpon | roundseed panicgrass, roundseed panicum |
| Dichanthelium sphaerocarpon var. isophyllum | roundseed panicgrass, roundseed panicum |
| Dichanthelium sphaerocarpon var. sphaerocarpon | roundseed panicgrass, roundseed panicum |
| Dichanthelium villosissimum | white-hair rosette grass, whitehair rosette grass |
| Dichanthelium villosissimum var. villosissimum | white-hair rosette grass, whitehair rosette grass |
| Dichanthelium wrightianum | Wright's rosette grass |

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| Dichondra carolinensis | Carolina ponysfoot, grass ponyfoot |
| Dichromena latifolia | |
| Dicliptera brachiata | branched foldwing |
| Digitaria ciliaris | fingergrass, Henry's crabgrass, kukaepua'a, saulangi, smooth crabgrass, Southern crab grass, southern crabgrass, tropical crabgrass |
| Digitaria cognata var. cognata | Carolina crabgrass, fall witchgrass |
| Digitaria filiformis | slender crabgrass |
| Digitaria ischaemum | small crabgrass, smooth crab grass, smooth crabgrass |
| Digitaria sanguinalis | Crabgrass, hairy crab grass, hairy crabgrass, large crabgrass, purple crabgrass, redhair crabgrass |
| Digitaria texana | Texas crabgrass |
| Digitaria villosa | shaggy crabgrass |
| Digitaria violascens | violet crabgrass |
| Dioclea multiflora | Boykin's clusterpea |
| Diodia teres | poor joe, poorjoe, rough buttonweed |
| Diodia teres var. teres | poor joe, poor-joe, poorjoe |
| Diodia virginiana | Virginia buttonweed |
| Dioscorea quaternata | fourleaf yam |
| Dioscorea villosa | wild yam |
| Diospyros virginiana | common persimmon, eastern persimmon, Persimmon |
| Diplazium pycnocarpon | glade fern |
| Doellingeria sericocarpoides | Doellingeria sericocarpoides, southern whitetop |
| Doellingeria umbellata | parasol flat-top white aster, parasol whitetop |
| Draba verna | spring draba, spring Whitlowgrass |
| Dracopis amplexicaulis | clasping coneflower, clasping-coneflower |
| Drosera annua | |
| Drosera brevifolia | dwarf sundew |
| Drosera capillaris | pink sundew |
| Drosera intermedia | spoonleaf sundew |
| Dryopteris carthusiana | spinulose wood fern, spinulose woodfern |
| Dryopteris ludoviciana | southern woodfern |
| Duchesnea indica | India mockstrawberry, Indian strawberry |
| Dulichium arundinaceum | threeway sedge |
| Echinacea pallida | pale echinacea, pale purple coneflower, purple coneflower |
| Echinacea purpurea | eastern purple coneflower, purple coneflower |
| Echinacea sanguinea | sanguin purple coneflower |
| Echinochloa colona | jungle rice, Jungle ricegrass, junglerice, watergrass |
| Echinochloa crus-galli | barnyard grass, barnyardgrass, cockspur, Japanese millet, large barnyard grass, watergrass |
| Echinochloa crus-pavonis | gulf cock's-spur grass, gulf cockspur grass |
| Echinochloa muricata | rough barnyard grass, rough barnyardgrass |
| Echinochloa walteri | coast cockspur, coast cockspur grass |
| Echinodorus cordifolius | burhead, creeping burhead, creeping burrhead |
| Eclipta prostrata | eclipta, false daisy, yerba de tago, yerba de tajo |
| Eichhornia crassipes | common water hyacinth, common water-hyacinth, floating water hyacinth, floating waterhyacinth, jacinthe d'eau, jacinto de agua, lirio acuatico, mbekambekairanga, water hyacinth |
| Elaeagnus multiflora | cherry silverberry |
| Elaeagnus pungens | thorny elaeagnus, thorny olive |
| Elaeagnus umbellata | autumn olive, oleaster |
| Eleocharis acicularis | needle spikerush, needle spikesedge |
| Eleocharis atropurpurea | purple spikerush |
| Eleocharis compressa | flat-stem spike-rush, flatstem spikerush, flatstemmed spikesedge |
| Eleocharis elongata | slim spikerush |
| Eleocharis equisetoides | jointed spikesedge |
| Eleocharis fallax | creeping spikerush |

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| Eleocharis microcarpa | smallfruit spikerush |
| Eleocharis minima | small spikerush |
| Eleocharis montevidensis | sand spikerush |
| Eleocharis obtusa | blunt spikerush, blunt spikesedge |
| Eleocharis palustris | common spikerush, creeping spikerush, spikesedge |
| Eleocharis parvula | dwarf spikerush, dwarf spikesedge, little-head spike-rush, little-head spikerush |
| Eleocharis tenuis | slender spikerush |
| Eleocharis tuberculosa | cone-cup spikerush |
| Elephantopus carolinianus | Carolina elephantsfoot, leafy elephantfoot |
| Elephantopus nudatus | naked elephantfoot, smooth elephantsfoot |
| Elephantopus tomentosus | devil's grandmother, hairy elephantfoot |
| Eleusine indica | crowsfoot grass, goose grass, goosegrass, Indian goose grass, Indian goosegrass, manienie ali'I, silver crabgrass, wiregrass |
| Elymus canadensis | Canada wildrye |
| Elymus hystrix | eastern bottle-brush grass, eastern bottlebrush grass |
| Elymus repens | quackgrass |
| Elymus villosus | hairy wild rye, hairy wildrye |
| Elymus virginicus | Virginia wild rye, Virginia wildrye |
| Elymus virginicus var. virginicus | Virginia wild rye, Virginia wildrye |
| Epifagus virginiana | beechdrops |
| Equisetum arvense | field horsetail, scouring rush, western horsetail |
| Equisetum hyemale | horsetail, scouring horsetail, scouringrush, scouringrush horsetail, tall scouring-rush, western scouringrush |
| Equisetum hyemale var. affine | scouringrush horsetail, stout scouringrush, tall scouring-rush |
| Eragrostis capillaris | lace grass, lacegrass |
| Eragrostis elliottii | field lovegrass |
| Eragrostis hirsuta | bigtop lovegrass |
| Eragrostis hypnoides | creeping lovegrass, teal love grass, teal lovegrass |
| Eragrostis japonica | pond lovegrass |
| Eragrostis refracta | coastal lovegrass |
| Eragrostis secundiflora | red lovegrass |
| Eragrostis secundiflora ssp. oxylepis | red lovegrass |
| Eragrostis spectabilis | petticoat-climber, purple lovegrass |
| Erechtites hieraciifolia | American burnweed |
| Erechtites hieraciifolia var. hieraciifolia | American burnweed |
| Eremochloa ophiuroides | centipede grass |
| Erigenia bulbosa | harbinger of spring |
| Erigeron annuus | annual fleabane, eastern daisy fleabane |
| Erigeron philadelphicus | Philadelphia daisy, Philadelphia fleabane |
| Erigeron pulchellus | poor robin fleabane, robin's plantain |
| Erigeron pulchellus var. pulchellus | robin's plantain |
| Erigeron strigosus | Daisy Fleabane, prairie fleabane, rough fleabane |
| Erigeron strigosus var. strigosus | prairie fleabane |
| Erigeron tenuis | slender fleabane, slenderleaf fleabane |
| Eriocaulon aquaticum | sevenangle pipewort |
| Eriocaulon compressum | flattened pipewort |
| Eriocaulon decangulare | tenangle pipewort |
| Eriocaulon koernickianum | gulf pipewort, smallhead pipiwort |
| Eriocaulon texense | Texas pipewort |
| Eriogonum annuum | annual buckwheat, annual eriogonum, annual wild buckwheat, annual wildbuckwheat, umbrella plant, wild buckwheat |
| Eriogonum longifolium | longleaf buckwheat, longleaf eriogonum, longleaf wildbuckwheat |
| Eriogonum longifolium var. longifolium | longleaf buckwheat |
| Eriogonum multiflorum | heartsepal buckwheat, heartsepal wildbuckwheat |
| Eryngium hookeri | Hooker's eryngo |
| Eryngium integrifolium | blueflower eryngo, simpleleaf eryngo |

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| Eryngium prostratum | creeping eryngo |
| Eryngium yuccifolium | button eryngo, button snakeroot, Yuccaleaf eryngo |
| Eryngium yuccifolium var. synchaetum | button eryngo |
| Eryngium yuccifolium var. yuccifolium | button eryngo |
| Erysimum repandum | repand wallflower, spreading wallflower |
| Erythrina herbacea | eastern coralbean, redcardinal |
| Erythronium rostratum | yellow troutlily |
| Erythronium umbilicatum ssp. umbilicatum | dimpled troutlily |
| Euonymus americana | strawberry bush, strawberrybush |
| Euonymus atropurpureus | eastern burningbush |
| Euonymus obovatus | |
| Eupatorium album | white thoroughwort |
| Eupatorium capillifolium | dogfennel |
| Eupatorium compositifolium | dogfennel eupatorium, yankeeweed |
| Eupatorium fistulosum | Joe Pye weed, trumpetweed |
| Eupatorium glaucescens | waxy thoroughwort |
| Eupatorium hyssopifolium | hyssopleaf thoroughwort |
| Eupatorium hyssopifolium var. laciniatum | hyssopleaf thoroughwort |
| Eupatorium lancifolium | lanceleaf thoroughwort |
| Eupatorium leucolepis | justiceweed |
| Eupatorium mohrii | Mohr's thoroughwort |
| Eupatorium perfoliatum | bonset, common boneset |
| Eupatorium purpureum | sweetscented joepyeweed |
| Eupatorium purpureum var. purpureum | sweetscented joepyeweed |
| Eupatorium rotundifolium | roundleaf eupatorium, roundleaf thoroughwort |
| Eupatorium rotundifolium var. ovatum | roundleaf thoroughwort |
| Eupatorium semiserratum | smallflower eupatorium, smallflower thoroughwort |
| Eupatorium serotinum | late eupatorium, lateflowering thoroughwort |
| Eupatorium sessilifolium | upland boneset |
| Euphorbia bicolor | snow on the prairie, snow-on-the-prairie |
| Euphorbia corollata | flowering spurge, floweringspurge euphorbia |
| Euphorbia dentata | toothed euphorbia, toothed spurge, toothedleaf poinsettia |
| Euphorbia dentata | |
| Euphorbia helioscopia | madwoman's milk |
| Eurybia hemispherica | southern prairie aster |
| Eurybia macrophylla | bigleaf aster |
| Eustachys petraea | pinewoods fingergrass |
| Eustoma exaltatum | catchfly prairie gentian, catchfly prairie-gentian, catchfly prairiegentian |
| Eustylis purpurea | |
| Euthamia gymnospermoides | Texas goldentop |
| Euthamia leptocephala | bushy goldentop |
| Evax candida | silver evax, silver pygmycudweed |
| Evax verna | spring pygmy-cudweed, spring pygmycudweed |
| Evolvulus sericeus | silky evolvulus, silver dwarf morning-glory, silver dwarf morningglory, silver dwarf-morning-glory |
| Facelis retusa | annual trampweed |
| Fagus grandifolia | american beech, American beech |
| Festuca ovina | sheep fescue |
| Festuca rubra | ravine fescue, red fescue |
| Festuca subverticillata | nodding fescue |
| Fimbristylis autumnalis | slender fimbry |
| Fimbristylis caroliniana | Carolina fimbry |

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| Fimbristylis dichotoma | forked fimbry |
| Fimbristylis littoralis | fimbry |
| Fimbristylis miliacea | grasslike fimbry |
| Fimbristylis puberula var. puberula | hairy fimbry |
| Fimbristylis tomentosa | woolly fimbry |
| Fimbristylis vahlii | Vahl fimbry, Vahl's fimbry |
| Fleischmannia incarnata | pink thoroughwort |
| Forestiera acuminata | eastern swampprivet, swamp privet, Texas forestiera |
| Forestiera ligustrina | privet, upland swampprivet |
| Fragaria virginiana | thickleaved wild strawberry, Virginia strawberry, wild strawberry |
| Fragaria virginiana ssp. virginiana | Virginia strawberry |
| Frangula caroliniana | Carolina buckthorn |
| Fraxinus americana | white ash |
| Fraxinus caroliniana | carolina ash, Carolina ash |
| Fraxinus pennsylvanica | green ash |
| Fraxinus quadrangulata | blue ash |
| Froelichia floridana | cottonweed, field snakecotton, Florida snakecotton, plains snakecotton, prairie froelichia |
| Fuirena breviseta | saltmarsh umbrella-sedge, saltmarsh umbrellasedge |
| Fuirena bushii | Bush's umbrella-sedge, Bush's umbrellasedge |
| Fuirena pumila | dwarf umbrella-sedge, dwarf umbrellasedge |
| Fuirena squarrosa | hairy umbrella-sedge, hairy umbrellasedge |
| Gaillardia aestivalis | lanceleaf blanketflower, lanceleaf gaillardia |
| Gaillardia aestivalis var. aestivalis | lanceleaf blanketflower, prairie gaillardia |
| Gaillardia aestivalis var. flavovirens | lanceleaf blanketflower |
| Gaillardia aestivalis var. winkleri | Winkler's blanketflower |
| Gaillardia fendleri | |
| Gaillardia pulchella | firewheel, Indian blanket, Indianblanket, rosering gaillardia |
| Gaillardia pulchella var. pulchella | firewheel |
| Gaillardia rosea | |
| Galactia erecta | erect milkpea |
| Galactia regularis | eastern milkpea |
| Galactia volubilis | downy milkpea |
| Galinsoga quadriradiata | fringed quickweed, hairy galinsoga, shaggy soldier, shaggy-soldier |
| Galium aparine | bedstraw, catchweed bedstraw, cleavers, cleaverwort, goose grass, scarthgrass, sticky-willy, stickywilly, white hedge |
| Galium circaezans | licorice bedstraw, woods bedstraw |
| Galium circaezans var. circaezans | licorice bedstraw, northern bedstraw |
| Galium circaezans var. hypomalacum | licorice bedstraw |
| Galium hispidulum | coastal bedstraw |
| Galium obtusum | blunt-leaf bedstraw, bluntleaf bedstraw, bristly bedstraw |
| Galium obtusum ssp. obtusum | bluntleaf bedstraw |
| Galium orizabense ssp. laevicaule | bald bedstraw |
| Galium pilosum | hairy bedstraw |
| Galium tinctorium | dye bedstraw, stiff marsh bedstraw |
| Galium triflorum | fragrant bedstraw, sweet bedstraw, sweetscented bedstraw |
| Gamochaeta pensylvanica | Pennsylvania everlasting |
| Gamochaeta purpurea | spoon-leaf purple everlasting, spoonleaf purple everlasting |
| Gardenia angusta | cape jasmine |
| Gardenia jasminoides | |
| Gaura biennis | biennial beeblossom |
| Gaura lindheimeri | Lindheimer's beeblossom, white gaura |
| Gaura longiflora | longflower beeblossom |
| Gaura parviflora | smallflowered gaura, velvetweed, velvety gaura, willow gaura |

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| Gaura sinuata | wavyleaf beeblossom, wavyleaf gaura |
| Gelsemium sempervirens | Carolina jessamine, evening trumpetflower |
| Gentiana saponaria | harvestbells, moss gentian |
| Gentiana villosa | striped gentian |
| Geranium carolinianum | Carolina crane's-bill, Carolina geranium |
| Geranium carolinianum var. sphaerospermum | Carolina geranium |
| Geranium dissectum | cutleaf geranium |
| Geranium maculatum | spotted crane's-bill, spotted geranium |
| Geum canadense | white avens |
| Geum vernum | heartleaf avens, spring avens |
| Geum virginianum | cream avens |
| Glandularia bipinnatifida | Dakota mock vervain |
| Glandularia bipinnatifida var. bipinnatifida | Dakota mock vervain, Dakota verbena |
| Glandularia canadensis | rose mock vervain, rose verbena |
| Glandularia pulchella | South American mock vervain |
| Glechoma hederacea | creeping charlie, gill-over-the-ground, ground ivy, groundivy, haymaids |
| Gleditsia aquatica | water honeylocust, water locust, waterlocust |
| Gleditsia triacanthos | common honeylocust, Honey locust, honey-locust, honeylocust, honeylocusts |
| Glinus radiatus | spreading sweetjuice |
| Glottidium vesicarium | bagpod |
| Glyceria | mannagrass |
| Glyceria striata | fowl manna grass, fowl mannagrass |
| Gnaphalium obtusifolium | |
| Gratiola brevifolia | sticky hedgehyssop |
| Gratiola neglecta | clammy hedge-hyssop, clammy hedgehyssop, drug hedgehyssop, hedge hyssop, neglected hedgehyssop |
| Gratiola pilosa | shaggy hedgehyssop |
| Gratiola virginiana | roundfruit hedgehyssop, Virginia hedgehyssop |
| Gutierrezia texana | Texas broomweed, Texas snakeweed |
| Gutierrezia texana var. texana | Texas snakeweed |
| Gymnocladus dioicus | Kentucky coffeetree, Kentucy coffeetree |
| Gymnopogon ambiguus | bearded skeletongrass |
| Habenaria nivea | |
| Habenaria repens | waterspider bog orchid, waterspider false reinorchid |
| Hackelia virginiana | beggar's-lice, beggarslice, sticktight |
| Halesia carolina | carolina silverbell, Carolina silverbell, silverbell |
| Halesia diptera | two-wing silverbell, twowing silverbell |
| Hamamelis vernalis | Ozark witchhazel |
| Hamamelis virginiana | American witchhazel, witch-hazel, witchhazel |
| Hedeoma drummondii | drummond falsepennyroyal, Drummond's false pennyroyal, Drummond's falsepennyroyal, Drummond's pennyroyal |
| Hedeoma hispida | false pennyroyal, falsepennyroyal, rough false pennyroyal, rough falsepennyroyal, rough pennyroyal |
| Hedera helix | English ivy |
| Hedyotis | hedyotis, starviolet |
| Hedyotis nigricans | diamondflowers |
| Hedyotis nigricans var. nigricans | diamond-flowers, diamondflowers, prairie bluets |
| Hedyotis purpurea | |
| Helenium amarum | Bitter sneezeweed, yellowdicks |
| Helenium amarum var. amarum | yellowdicks |
| Helenium drummondii | fringed sneezeweed |
| Helenium flexuosum | purplehead sneezeweed |
| Helianthemum carolinianum | Carolina frostweed |
| Helianthemum georgianum | Georgia frostweed |
| Helianthemum rosmarinifolium | rosemary frostweed |

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| Helianthus angustifolius | swamp sneezeweed, swamp sunflower |
| Helianthus annuus | annual sunflower, common sunflower, sunflower, wild sunflower |
| Helianthus debilis | cucumberleaf sunflower |
| Helianthus decapetalus | thinleaf sunflower |
| Helianthus hirsutus | hairy sunflower |
| Helianthus microcephalus | small woodland sunflower |
| Helianthus mollis | ashy sunflower |
| Heliotropium curassavicum | quail plant, salt heliotrope, seaside heliotrope |
| Heliotropium indicum | India heliotrope, Indian heliotrope |
| Heliotropium procumbens | four-spike heliotrope, fourspike heliotrope |
| Hemerocallis fulva | orange day lily, orange daylily, tawny daylily |
| Hepatica nobilis var. acuta | sharplobe hepatica |
| Heteranthera limosa | blue mudplantain, ducksalad, mud plantain |
| Heteranthera rotundifolia | roundleaf mudplantain |
| Heterotheca subaxillaris | camphorweed, golden aster |
| Heuchera americana | alumroot, American alumroot |
| Hexalectris spicata | crested coralroot, spiked crested coralroot, spiked crested-coralroot |
| Hibiscus | hibiscus, rosemallow |
| Hibiscus aculeatus | comfortroot |
| Hibiscus coccineus | scarlet rosemallow |
| Hibiscus laevis | halberdleaf rosemallow, scarlet rosemallow |
| Hibiscus leucophyllus | |
| Hibiscus moscheutos | crimsoneyed rosemallow, swamp rosemallow |
| Hibiscus moscheutos ssp. lasiocarpos | crimsoneyed rosemallow, marshmallow |
| Hibiscus moscheutos ssp. moscheutos | crimsoneyed rosemallow |
| Hieracium gronovii | Gronovis hawkweed, queendevil |
| Hordeum pusillum | little barley, little wildbarley |
| Houstonia caerulea | azure bluet |
| Houstonia canadensis | Canadian summer bluet |
| Houstonia micrantha | southern bluet |
| Houstonia purpurea | purple bluets, Venus' pride |
| Houstonia pusilla | tiny bluet |
| Hybanthus concolor | eastern greenviolet, nodding violet |
| Hydrangea arborescens | smooth hydrangea, wild hydrangea |
| Hydrastis canadensis | goldenseal |
| Hydrocotyle bonariensis | largeleaf pennywort |
| Hydrocotyle umbellata | manyflower marshpennywort, umbrella pennyroyal |
| Hydrocotyle verticillata | whorled marsh pennywort, whorled marshpennywort, whorled pennyroyal |
| Hydrocotyle verticillata var. verticillata | whorled marsh pennywort, whorled marshpennywort |
| Hydrolea ovata | hairy hydrolea, ovate false fiddleleaf |
| Hydrolea uniflora | oneflower false fiddleleaf, oneflower hydrolea |
| Hydrophyllum canadense | bluntleaf waterleaf |
| Hydrophyllum macrophyllum | largeleaf waterleaf |
| Hygrophila lacustris | gulf swampweed |
| Hymenocallis caroliniana | Carolina spiderlily |
| Hymenocallis galvestonensis | Galveston spiderlily |
| Hymenocallis liriosme | |
| Hymenopappus artemisiifolius | oldplainsman, woolly-white |
| Hymenopappus artemisiifolius var. artemisiifolius | oldplainsman, woolly-white |
| Hypericum cistifolium | roundpod St. Johnswort |
| Hypericum crux-andreae | atlantic st. peter's-wort, St. Peterswort |
| Hypericum densiflorum | bushy St. Johnswort, dense st. johnswort |
| Hypericum dolabriforme | straggling St. Johnswort |
| Hypericum drummondii | Drummond St. Johnswort, nits and lice |
| Hypericum fasciculatum | peelbark St. Johnswort, St. Johnswort |

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| Hypericum galioides | bedstraw St. Johnswort |
| Hypericum gentianoides | orangegrass, pinweed st. johnswort |
| Hypericum gymnanthum | claspingleaf St. Johnswort |
| Hypericum hypericoides | St. Andrew's cross, St. Andrews cross |
| Hypericum hypericoides ssp. hypericoides | St Andrews cross, St. Andrew's cross |
| Hypericum hypericoides ssp. multicaule | St. Andrew's cross |
| Hypericum lobocarpum | fivelobe St. Johnswort |
| Hypericum mutilum | dwarf St. Johnswort |
| Hypericum punctatum | spotted St. Johnswort |
| Hypochaeris microcephala | smallhead catsear |
| Hypochaeris microcephala var. albiflora | smallhead catsear |
| Hypoxis curtissii | Curtis' star-grass |
| Hypoxis hirsuta | common goldstar, eastern yellow star-grass |
| Hypoxis rigida | stiff star-grass |
| Hypoxis sessilis | glossyseed yellow star-grass, glossyseed yellow stargrass |
| Hyptis alata | clustered bushmint |
| Ilex ambigua | carolina holly, Carolina holly |
| Ilex coriacea | large gallberry |
| Ilex decidua | possumhaw |
| Ilex decidua decidua | |
| Ilex glabra | inberry, inkberry |
| Ilex longipes | georgia holly, Georgia holly |
| Ilex opaca | american holly, American holly |
| Ilex opaca var. opaca | American holly |
| Ilex vomitoria | yaupon |
| Impatiens capensis | jewelweed, spotted touch-me-not |
| Impatiens pallida | pale snapweed, pale touch-me-not |
| Indigofera suffruticosa | anil de pasto, indigobush |
| Ionactis linariifolius | flaxleaf whitetop aster, savoryleaf aster |
| Ipomoea coccinea | Mexican morningglory, red morningglory, redstar, scarlet morningglory, scarlet morninglory, starglory, wooly tidestromia |
| Ipomoea cordatotriloba | cotton morningglory, tievine |
| Ipomoea cordatotriloba var. cordatotriloba | cotton morningglory, sharppod morningglory, tievine |
| Ipomoea hederacea | entireleaf morningglory, ivy-leaf mornin-glory, ivyleaf morning-glory, ivyleaf morningglory, ivyleaf morninglory, Mexican morningglory |
| Ipomoea hederacea | |
| Ipomoea lacunosa | pitted morningglory, white morninglory, whitestar |
| Ipomoea pandurata | bigroot morningglory, bigroot morninglory, man of the earth, man-of-the-earth |
| Ipomoea sagittata | saltmarsh morning-glory, saltmarsh morningglory |
| Iris brevicaulis | zigzag iris |
| Iris cristata | crested iris, dwarf crested iris |
| Iris virginica | Virginia iris |
| Isanthus brachiatus | fluxweed |
| Isolepis carinata | keeled bulrush |
| Isotria verticillata | purple fiveleaf orchid |
| Itea virginica | Virginia sweetspire |
| Iva angustifolia | narrowleaf marshelder, Narrowleaf sumpweed |
| Iva annua | annual marsh-elder, annual marshelder, seacoast sumpweed |
| Iva annua var. caudata | annual marshelder |
| Iva axillaris | deer-root, Iva poverty weed, lesser marshelder, mouseear pvertyweed, poverty sumpweed, poverty weed, povertyweed, smallflowered marshelder |
| Iva frutescens | bigleaf sumpweed, Jesuit's bark |
| Jacquemontia tamnifolia | clustervine, hairy clustervine |
| Jeffersonia diphylla | twinleaf |
| Juglans nigra | black walnut |

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| Juncus acuminatus | tapertip rush |
| Juncus brachycarpus | whiteroot rush |
| Juncus bufonius | toad rush |
| Juncus capitatus | leafybract dwarf rush |
| Juncus coriaceus | leathery rush |
| Juncus debilis | weak rush |
| Juncus dichotomus | forked rush |
| Juncus diffusissimus | slimpod rush |
| Juncus effusus | common rush, lamp rush |
| Juncus effusus var. exiguus | lamp rush, small rush |
| Juncus effusus var. solutus | lamp rush |
| Juncus elliottii | Elliott's rush |
| Juncus elliottii var. elliottii | Elliott's rush |
| Juncus exiguus | |
| Juncus interior | inland rush |
| Juncus marginatus | grassleaf rush |
| Juncus nodatus | stout rush |
| Juncus polycephalus | flatleaf rush, manyhead rush |
| Juncus repens | lesser creeping rush |
| Juncus scirpoides | needlepod rush |
| Juncus tenuis | field rush, path rush, poverty rush, slender rush, slender yard rush, wiregrass |
| Juncus torreyi | torrey rush, Torrey's rush |
| Juncus validus | roundhead rush |
| Juncus validus var. validus | roundhead rush |
| Juniperus virginiana | eastern red-cedar, eastern redcedar, red cedar juniper |
| Justicia ovata var. lanceolata | loose justica, looseflower water-willow |
| Krigia caespitosa | weedy dwarfdandelion |
| Krigia cespitosa | weedy dwarfdandelion |
| Krigia gracilis | |
| Krigia occidentalis | western dwarfdandelion |
| Krigia virginica | Virginia dwarfdandelion |
| Krigia wrightii | Wright's dwarfdandelion |
| Kummerowia stipulacea | Korean clover, korean lespedeza |
| Kummerowia striata | common lespedeza, Japanese clover |
| Kyllinga odorata | fragrant spikesedge |
| Kyllinga pumila | low spikesedge |
| Lachnocaulon anceps | whitehead bogbutton |
| Lachnocaulon digynum | pineland bogbutton |
| Lactuca | lettuce |
| Lactuca canadensis | Canada lettuce, Florida blue lettuce, wild lettuce |
| Lactuca floridana | Florida lettuce, woodland lettuce |
| Lactuca hirsuta | hairy lettuce |
| Lactuca hirsuta var. albiflora | hairy lettuce |
| Lactuca ludoviciana | biannual lettuce, Louisiana lettuce, wild lettuce |
| Lagenaria siceraria | bottle gourd |
| Lagerstroemia indica | crapemyrtle |
| Lamium amplexicaule | common henbit, giraffehead, henbit, henbit deadnettle |
| Lantana camara | lantana, largeleaf lantana |
| Lantana urticoides | West Indian shrubverbena, western lantana |
| Laportea aestuans | West Indian woodnettle |
| Laportea canadensis | Canada lettuce, Canada woodnettle, Canadian wood-nettle, Canadian woodnettle |
| Lathyrus hirsutus | Caley pea, Singletary pea |
| Lechea mucronata | hairy pinweed |
| Lechea san-sabeana | San Saba pinweed |

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| Lechea tenuifolia | narrowleaf pinweed |
| Leersia | cutgrass |
| Leersia lenticularis | catchfly grass |
| Leersia oryzoides | rice cut grass, rice cutgrass |
| Leersia virginica | white grass, whitegrass |
| Lemna minor | common duckweed, least duckweed, lesser duckweed |
| Lepidium campestre | cream-anther field pepperwort, field pepperweed |
| Lepidium virginicum | peppergrass, poorman pepperweed, poorman's pepper, poorman's-pepperwort, Virginia pepperweed, Virginian peppercress |
| Lespedeza | lespedeza, perennial lespedeza |
| Lespedeza capitata | roundhead lespedeza |
| Lespedeza cuneata | Chinese lespedeza, sericea lespedeza |
| Lespedeza hirta | hairy lespedeza |
| Lespedeza hirta ssp. hirta | hairy lespedeza |
| Lespedeza procumbens | trailing lespedeza |
| Lespedeza repens | creeping lespedeza |
| Lespedeza stuevei | stuves lespedeza, tall lespedeza |
| Lespedeza violacea | violet lespedeza |
| Lespedeza virginica | slender lespedeza |
| Leucanthemum vulgare | ox-eye daisy, oxeye daisy, oxeye-daisy, oxeyedaisy |
| Leucothoe axillaris | coastal doghobble |
| Leucothoe racemosa | swamp doghobble |
| Leymus triticoides | beardless lyme grass, beardless wildrye, creeping wildrye |
| Liatris acidota | sharp blazing star, sharp gayfeather |
| Liatris aspera | rough gayfeather, tall blazing star, tall gayfeather |
| Liatris elegans | pinkscale blazing star, pinkscale gayfeather |
| Liatris elegans var. elegans | pinkscale blazing star, pinkscale gayfeather |
| Liatris pycnostachya | cat-tail gayfeather, Kansas gayfeather, prairie blazing star |
| Liatris squarrosa | scaly blazing star, scaly gayfeather |
| Liatris squarrosa var. alabamensis | Alabama blazing star, scaly gayfeather |
| Liatris squarrosa var. hirsuta | scaly blazing star, scaly gayfeather |
| Liatris squarrosa var. squarrosa | scaly blazing star |
| Liatris tenuis | Gulf blazing star, Gulf gayfeather |
| Ligustrum lucidum | glossy privet, tree privet |
| Ligustrum sinense | chinese privet, Chinese privet, common chinese privet |
| Lilium michauxii | Carolina lily |
| Limnodea arkansana | Ozark grass, Ozarkgrass |
| Limnosciadium pinnatum | tansy dogshade |
| Limnosciadium pumilum | prairie dogshade |
| Lindera benzoin | northern spicebush, spicebush |
| Lindernia crustacea | Malaysian false pimpernel |
| Lindernia dubia | moistbank pimpernel, shortstalk lindernia, yellow-seed false pimpernel, yellowseed false pimpernel |
| Lindernia dubia var. anagallidea | false pimpernel, falsepimpernel, yellow-seed false pimpernel, yellowseed false pimpernel |
| Lindernia dubia var. dubia | yellow-seed false pimpernel, yellowseed false pimpernel |
| Linum berlandieri | Berlandier's yellow flax |
| Linum medium | stiff yellow flax |
| Linum medium var. texanum | stiff yellow flax, sucker flas |
| Linum rigidum | orange flax, Stiff flax, stiffstem flax |
| Linum striatum | ridged yellow flax, rigid flax |
| Linum sulcatum | grooved flax, grooved yellow flax |
| Linum sulcatum var. sulcatum | grooved flax, grooved yellow flax |
| Liparis liliifolia | brown widelip orchid |
| Liquidambar styraciflua | sweetgum |
| Liriodendron tulipifera | tulip poplar, tuliptree, yellow poplar, yellow-poplar |

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| Listera australis | southern twayblade |
| Lithospermum canescens | hoary gromwell, hoary puccoon |
| Lithospermum caroliniense | Carolina gromwell, Carolina puccoon, hairy puccoon |
| Lithospermum latifolium | American stoneseed |
| Lithospermum tuberosum | tuberous gromwell, tuberous stoneseed |
| Lobelia | lobelia |
| Lobelia appendiculata | earflower lobelia, pale lobelia |
| Lobelia cardinalis | Cardinal flower, cardinalflower |
| Lobelia flaccidifolia | foldear lobelia |
| Lobelia inflata | Indian tobacco, Indian-tobacco |
| Lobelia puberula | downy lobelia |
| Lobelia puberula var. pauciflora | downy lobelia |
| Lobelia siphilitica | great blue lobelia |
| Lobelia siphilitica var. siphilitica | great blue lobelia |
| Lobelia spicata | pale-spike lobelia, palespike lobelia |
| Lobelia spicata var. spicata | palespike lobelia |
| Loeflingia squarrosa | California loeflingia, spreading pygmyleaf |
| Lolium arundinaceum | Lolium arundinaceum, tall fescue |
| Lolium perenne | italian ryegrass, perennial rye grass, perennial ryegrass |
| Lolium pratense | meadow fescue, meadow ryegrass |
| Lonicera japonica | Chinese honeysuckle, Japanese honeysuckle |
| Lonicera maackii | Amur honeysuckle, Amur honeysuckle bush |
| Lonicera sempervirens | trumpet honeysuckle |
| Lonicera sempervirens var. sempervirens | trumpet honeysuckle |
| Ludwigia alternifolia | bushy seedbox, seedbox |
| Ludwigia decurrens | wingleaf primrose-willow, wingleaf waterprimrose |
| Ludwigia glandulosa | creeping seedbox, cylindricfruit primrose-willow |
| Ludwigia grandiflora | |
| Ludwigia hirtella | spindleroot |
| Ludwigia leptocarpa | anglestem primrose-willow, anglestem waterprimrose |
| Ludwigia linearis | narrowleaf primrose-willow, narrowleaf primrosewillow |
| Ludwigia microcarpa | smallfruit primrose-willow, smallfruit primrosewillow |
| Ludwigia octovalvis | Mexican primrose-willow, Mexican primrosewillow |
| Ludwigia octovalvis ssp. octovalvis | Mexican primrose-willow, Mexican primrosewillow |
| Ludwigia palustris | marsh primrose-willow, marsh seedbox |
| Ludwigia peploides | creeping waterprimrose, floating primrose, floating primrose-willow, floating primrosewillow |
| Ludwigia pilosa | hairy primrose-willow, hairy primrosewillow |
| Ludwigia repens | creeping primrose-willow, creeping primrosewillow, creeping waterpurslane |
| Ludwigia sphaerocarpa | globefruit primrose-willow, globefruit primrosewillow |
| Ludwigia uruguayensis | Uruguay waterprimrose, Uruguayan primrose-willow, Uruguayan primrosewillow, water primrose |
| Lupinus | lupine |
| Lupinus perennis | sundial lupine |
| Lupinus subcarnosus | Texas bluebonnet |
| Lupinus texensis | Texas bluebonnet, Texas lupine |
| Luzula echinata | hedgehog woodrush |
| Luzula multiflora | common wood-rush, common woodrush |
| Lycopodiella alopecuroides | foxtail clubmoss |
| Lycopodiella appressa | southern bog clubmoss |
| Lycopodiella caroliniana | slender clubmoss |
| Lycopodiella caroliniana var. caroliniana | slender clubmoss |
| Lycopodium digitatum | fan clubmoss |
| Lycopus rubellus | taperleaf bugleweed, taperleaf water horehound |
| Lycopus virginicus | Virginia bugleweed, Virginia water horehound |

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| Lygodium japonicum | Japanese climbing fern |
| Lyonia ligustrina | he-huckleberry, maleberry |
| Lyonia ligustrina var. foliosiflora | maleberry |
| Lyonia mariana | piedmont staggerbush, staggerbush |
| Lysimachia radicans | trailing yellow loosestrife |
| Lythrum alatum var. lanceolatum | winged lythrum |
| Lythrum salicaria | purple loosestrife, purple loosestrife or lythrum, purple lythrum, rainbow weed, salicaire, spiked loosestrife |
| Maclura pomifera | bois d'arc, osage orange, osage-orange, osageorange |
| Magnolia grandiflora | southern magnolia |
| Magnolia virginiana | sweetbay |
| Maianthemum racemosum | false Solomon's-seal, feathery false lily of the vally, feathery false Solomon's seal, feathery false Solomon's-seal |
| Maianthemum racemosum ssp. racemosum | false Solomon's-seal, feather Solomons seal, feathery false lily of the vally, feathery false Solomon's-seal |
| Malaxis unifolia | green adder's-mouth orchid, green addersmouth orchid |
| Malus | apple |
| Malvastrum coromandelianum | threelobe false mallow |
| Malvaviscus arboreus | Malvaviscus arboreus, wax mallow |
| Manfreda virginica | false aloe |
| Manihot esculenta | tapioca |
| Manihot grahamii | Graham's manihot |
| Marshallia graminifolia | grassleaf Barbara's buttons |
| Marshallia graminifolia var. cynanthera | grassleaf Barbara's buttons |
| Marsilea vestita | hairy pepperwort, hairy water-clover, hairy waterclover, water clover |
| Matelea cynanchoides | prairie milkvine |
| Matelea decipiens | oldfield milkvine |
| Matelea gonocarpos | angularfruit milkvine |
| Matelea obliqua | climbing milkvine |
| Mayaca fluviatilis | stream bogmoss |
| Mazus pumilus | Japanese mazus |
| Mecardonia acuminata | axilflower |
| Mecardonia procumbens | baby jump-up, baby jumpup |
| Medicago lupulina | black medic, black medic clover, black medick, hop clover, hop medic, nonesuch, yellow trefoil |
| Medicago minima | burr medick, little burclover |
| Medicago polymorpha | bur clover, burclover, California burclover, toothed medick |
| Melanthium virginicum | Virginia bunchflower |
| Melia azedarach | chinaberry, Chinaberry tree, Chinaberrytree, Indian lilac, lelah, paraiso, pride of India, white cedar |
| Melica mutica | oniongrass, twoflower melic, twoflower melicgrass |
| Melilotus alba | white sweetclover |
| Melilotus officinalis | yellow sweet-clover, yellow sweetclover |
| Melochia corchorifolia | chocolateweed |
| Melothria pendula | drooping melonnettle, Guadeloupe cucumber |
| Menispermum canadense | Canadian moonseed, common moonseed |
| Micranthemum umbrosum | shade mudflower |
| Microstegium vimineum | Japanese stiltgrass, Nepalese browntop |
| Mikania scandens | climbing hempvine, climbing hempweed |
| Mimosa hystricina | |
| Mimosa latidens | Kairn's sensitive-briar, Mimosa latidens |
| Mimosa microphylla | littleleaf sensitive-briar, sensitive brier |
| Mimosa quadrivalvis var. hystricina | |
| Mimosa strigillosa | herbaceous mimosa, powderpuff |
| Mimulus alatus | sharpwing monkeyflower |
| Minuartia patula | pitcher's stitchwort |
| Mitchella repens | partridgeberry |

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| Mitracarpus hirtus | tropical girdlepod |
| Mitreola petiolata | lax hornpod |
| Mitreola sessilifolia | swamp hornpod |
| Modiola caroliniana | Carolina bristlemallow, Carolina modiola |
| Mollugo verticillata | carpetweed, green carpetweed |
| Monarda clinopodia | white bergamot |
| Monarda didyma | scarlet beebalm |
| Monarda fistulosa | wildbergamot beebalm |
| Monarda fistulosa | mintleaf beebalm, Oswego-tea, wild bergamot, wildbergamot beebalm, wildbergamot horsemint |
| Monarda fistulosa var. mollis | wild bergamot |
| Monarda punctata | spotted beebalm |
| Monarda punctata ssp. punctata var. arkansana | spotted beebalm |
| Monarda punctata ssp. punctata var. punctata | spotted beebalm |
| Monotropa uniflora | Indianpipe, one-flower Indian-pipe |
| Morella caroliniensis | evergreen bayberry, southern bayberry |
| Morella cerifera | wax myrtle, waxmyrtle |
| Morella inodora | scentless bayberry |
| Morus alba | mulberry, white mulberry |
| Morus rubra | red mulberry |
| Morus rubra var. rubra | red mulberry |
| Muhlenbergia capillaris | hairawn muhly |
| Muhlenbergia capillaris var. capillaris | hairawn muhly |
| Muhlenbergia capillaris var. trichopodes | cutover muhly |
| Muhlenbergia cuspidata | plains muhly |
| Muhlenbergia schreberi | nimblewill, nimblewill muhly |
| Muhlenbergia sobolifera | rock muhly |
| Myosotis macrosperma | largeseed forget-me-not, southern forget me not |
| Myosotis verna | spring forget me not, spring forget-me-not |
| Myrica cerifera | southern bayberry, wax myrtle |
| Myriophyllum aquaticum | brazilian watermilfoil, parrot feather, parrot feather watermilfoil, parrot's-feather, parrotfeather |
| Myriophyllum pinnatum | cut-leaf water-milfoil, cutleaf watermilfoil, green parrotfeather |
| Najas gracillima | slender waternymph |
| Nama stenocarpum | mud fiddleleaf |
| Nassella leucotricha | Texas tussockgrass, Texas wintergrass |
| Neeragrostis reptans | creeping lovegrass |
| Nemophila aphylla | smallflower baby blue eyes |
| Neptunia lutea | yellow neptunia, yellow puff |
| Nothoscordum bivalve | crowpoison |
| Nuphar lutea ssp. advena | yellow pond-lily, yellow pondlily |
| Nuttallanthus canadensis | Canada toadflax, oldfield toadflax, oldfield-toadflax |
| Nuttallanthus texanus | Texas toadflax, Texas-toadflax |
| Nymphaea odorata | American waterlily, American white waterlily, white waterlily |
| Nymphoides aquatica | big floatingheart |
| Nyssa aquatica | water tupelo |
| Nyssa biflora | swamp tupelo |
| Nyssa sylvatica | black gum, black tupelo, blackgum |
| Obolaria virginica | Virginia pennywort |
| Oenothera biennis | common evening primrose, common evening-primrose, common eveningprimrose, evening primrose (common), hoary eveningprimrose, king's-cureall |
| Oenothera elata ssp. hookeri | Hooker's evening-primrose |
| Oenothera grandis | largeflower eveningprimrose, showy evening-primrose, showy eveningprimrose |
| Oenothera heterophylla | largeflower eveningprimrose, variableleaf evening-primrose, varileaf eveningprimrose |

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| Oenothera laciniata | cut-leaf evening-primrose, cut-leaved evening primrose, cutleaf evening-primrose, cutleaf eveningprimrose |
| Oenothera linifolia | threadleaf evening-primrose, threadleaf sundrop |
| Oenothera mexicana | Mexican evening-primrose, Mexican eveningprimrose |
| Oenothera speciosa | pinkladies, Showy evening primrose, showy eveningprimrose |
| Oldenlandia boscii | Bosc's mille graines |
| Oldenlandia uniflora | clustered mille graines, oneflower oldenlandia |
| Oligoneuron nitidum | shiny goldenrod |
| Oligoneuron rigidum | Oligoneuron rigidum, stiff goldenrod |
| Onoclea sensibilis | sensitive fern |
| Ophioglossum vulgatum | Southern adder's-tongue, southern adderstongue |
| Oplismenus hirtellus | bristle basketgrass |
| Opuntia compressa | |
| Opuntia engelmannii var. lindheimeri | Texas prickly pear, Texas pricklypear |
| Opuntia ficus-indica | indian fig, Indian-fig, tuna cactus |
| Opuntia humifusa | devil's-tongue, pricklypear |
| Opuntia stricta var. dillenii | erect pricklypear |
| Orbexilum simplex | simple scurfpea, singlestem leather-root |
| Ornithogalum umbellatum | Pyrenees Star of Bethlehem, sleepydick, Star-of-Bethlehem |
| Osmorhiza claytonii | Clayton's sweetroot, hairy sweet-cicely |
| Osmorhiza longistylis | aniseroot, longstyle sweetroot |
| Osmunda cinnamomea | cinnamon fern |
| Osmunda regalis | royal fern |
| Osmunda regalis var. spectabilis | royal fern |
| Ostrya virginiana | eastern hophornbeam, hophornbeam |
| Oxalis albicans ssp. albicans | radishroot woodsorrel |
| Oxalis corniculata | 'ihi, creeping oxalis, creeping woods, creeping woodsorrel, oxalis, yellow oxalis, yellow wood sorrel |
| Oxalis debilis var. corymbosa | pink woodsorrel |
| Oxalis dillenii | Dillen's oxalis |
| Oxalis priceae | tufted yellow woodsorrel |
| Oxalis stricta | common yellow oxalis, erect woodsorrel, sheep sorrel, sourgrass, toad sorrel, upright yellow wood-sorrel, upright yellow woodsorrel, yellow woodsorrel |
| Oxalis violacea | purple woodsorrel, violet wood-sorrel, violet woodsorrel |
| Oxypolis filiformis | water cowbane |
| Oxypolis rigidior | stiff cowbane |
| Oxypolis ternata | piedmont cowbane |
| Packera anonyma | Small's ragwort |
| Packera aurea | golden ragwort |
| Packera glabella | butterweed |
| Packera obovata | roundleaf ragwort |
| Palafoxia hookeriana | sand palafox, showy palafoxia |
| Palafoxia reverchonii | Reverchon's palafox |
| Panax quinquefolius | American ginseng |
| Panicum anceps | beaked panicgrass, beaked panicum |
| Panicum brachyanthum | prairie panicgrass |
| Panicum dichotomiflorum | fall panic, fall panicgrass, fall panicum, western witchgrass |
| Panicum dichotomiflorum var. dichotomiflorum | fall panicgrass, fall panicum, western witchgrass |
| Panicum flexile | wiry panic grass, wiry panicgrass |
| Panicum gymnocarpon | |
| Panicum hemitomon | maidencane, mountain panic |
| Panicum repens | couch panicum, creeping panic, panic rampant, torpedo grass, torpedograss, wainaku grass |
| Panicum rigidulum | redtop panicgrass, redtop panicum |
| Panicum tenerum | bluejoint panicgrass, bluejoint panicum |

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| Panicum verrucosum | warty panicgrass |
| Panicum virgatum | switchgrass |
| Parapholis incurva | curved sicklegrass |
| Paronychia canadensis | smooth forked nailwort |
| Paronychia drummondii | Drummond's nailwort |
| Parthenium hysterophorus | ragweed parthenium, Santa Maria feverfew, whitetop weed |
| Parthenium integrifolium | American feverfew, wild quinine |
| Parthenium integrifolium var. integrifolium | wild quinine |
| Parthenocissus quinquefolia | American ivy, fiveleaved ivy, Virginia creeper, woodbine |
| Paspalum | crowngrass, paspalum |
| Paspalum bifidum | pitchfork crowngrass |
| Paspalum boscianum | bull crowngrass |
| Paspalum dilatatum | dallas grass, dallis grass, dallisgrass, herbe de miel, herbe sirop, hiku nua, palpalum dilate, water grass |
| Paspalum floridanum | Florida paspalum |
| Paspalum fluitans | horsetail paspalum |
| Paspalum hartwegianum | Hartweg's paspalum |
| Paspalum laeve | field paspalum |
| Paspalum lividum | longtom |
| Paspalum minus | mat paspalum, matted paspalum |
| Paspalum notatum | Bahia grass, bahiagrass |
| Paspalum plicatulum | brownseed paspalum |
| Paspalum plicatulum plicatulum | |
| Paspalum praecox | early paspalum |
| Paspalum pubiflorum | hairyseed paspalum |
| Paspalum setaceum | fringeleaf paspalum, sand paspalum, slender crown grass, thin paspalum |
| Paspalum setaceum var. muehlenbergii | |
| Paspalum urvillei | Vasey grass, Vasey's grass, vaseygrass |
| Passiflora edulis | passionflower, purple granadilla |
| Passiflora incarnata | purple passionflower |
| Passiflora lutea | passionflower, yellow passionflower |
| Pedicularis canadensis | Canadian lousewort, early lousewort |
| Pellaea atropurpurea | purple cliffbrake, purple-stem cliffbrake |
| Peltandra virginica | green arrow arum, Virginia peltandra |
| Penstemon laxiflorus | nodding beardtongue |
| Penstemon pallidus | pale beardtongue |
| Penstemon tenuis | sharpsepal beardtongue |
| Penthorum sedoides | ditch stonecrop, ditch-stonecrop, Virginia penthorum |
| Perilla frutescens | beefsteak, beefsteak mint, beefsteakplant, Purple mint |
| Persea borbonia | redbay |
| Persea palustris | swamp bay |
| Phacelia purshii | Miami mist |
| Phalaris arundinacea | reed canary grass, reed canarygrass |
| Phalaris caroliniana | Carolina canarygrass |
| Phanopyrum gymnocarpon | Savannah panic grass, savannah panicum, savannah-panicgrass |
| Phegopteris hexagonoptera | broad beechfern |
| Phleum pratense | common timothy, timothy |
| Phlox | phlox, phlox spp. |
| Phlox divaricata | wild blue phlox |
| Phlox divaricata ssp. divaricata | wild blue phlox |
| Phlox drummondii | annual phlox, drummond phlox |
| Phlox nivalis | trailing phlox |
| Phlox nivalis ssp. texensis | Texan phlox, texas trailing phlox |
| Phlox pilosa | downy phlox |
| Phoradendron leucarpum | oak mistletoe |

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| Phoradendron tomentosum | bigleaf mistletoe, Christmas mistletoe, downy mistletoe |
| Photinia pyrifolia | red chokeberry |
| Phryma leptostachya | American lopseed, lopseed |
| Phyla lanceolata | frog fruit, lanceleaf fogfruit, lanceleaf frog fruit, northern fogfruit |
| Phyla nodiflora | frog fruit, sawtooth fogfruit, turkey tangle, turkey tangle fogfruit |
| Phyllanthus caroliniensis | Carolina leaf-flower, Carolina leaflower |
| Phyllanthus pudens | birdseed leaf-flower, birdseed leafflower |
| Phyllanthus urinaria | chamber bitter |
| Phyllostachys aurea | golden bamboo |
| Physalis angulata | cut-leaf ground-cherry, cutleaf groundcherry, lanceleaf groundcherry |
| Physalis cordata | heartleaf groundcherry |
| Physalis heterophylla | clammy ground-cherry, clammy groundcherry |
| Physalis heterophylla var. heterophylla | clammy groundcherry |
| Physalis pubescens | groundcherry, husk tomato, husk-tomato |
| Physalis pumila | dwarf groundcherry |
| Physalis viscosa | grape groundcherry, groundcherry, starhair groundcherry |
| Physostegia digitalis | finger false dragonhead |
| Physostegia intermedia | intermediate dragonhead, slender false dragonhead |
| Physostegia longisepala | longsepal false dragonhead |
| Physostegia virginiana | obedient plant, obedient-plant |
| Physostegia virginiana ssp. praemorsa | obedient plant |
| Phytolacca americana | American pokeweed, common pokeweed, inkberry, pigeonberry, poke, pokeberry, pokeweed |
| Phytolacca americana var. americana | American pokeweed |
| Pilea pumila | Canada clearweed, Canadian clearweed |
| Pinguicula pumila | small butterwort |
| Pinus echinata | arkansas pine, shortleaf pine, shortleaf yellow pine, shortstraw pine, southern yellow pine, yellow pine |
| Pinus elliottii | slash pine |
| Pinus palustris | longleaf pine |
| Pinus strobus | easter white pine, eastern white pine, northern white pine, soft pine, weymouth pine, white pine |
| Pinus taeda | loblolly pine |
| Pinus virginiana | jersey pine, scrub pine, virginia pine, Virginia pine |
| Piptochaetium avenaceum | blackseed needlegrass, blackseed speargrass |
| Pistia stratiotes | apon-apon, laitue d'eau, lechuguita de qgua, pistie, tropical duckweed, water lettuce, water-lettuce |
| Pityopsis graminifolia | narrowleaf silkgrass |
| Pityopsis graminifolia var. graminifolia | narrowleaf silkgrass |
| Planera aquatica | planertree, water elm, water-elm |
| Plantago aristata | bottlebrush Indianwheat, largebracted plantain |
| Plantago hookeriana | California plantain |
| Plantago lanceolata | buckhorn plantain, English plantain, lanceleaf Indianwheat, lanceleaf plantain, narrowleaf plantain, ribgrass, ribwort |
| Plantago major | broadleaf plantain, buckhorn plantain, common plantain, great plantain, rippleseed plantain |
| Plantago pusilla | dwarf plantain, wooly Indianwheat, wooly plantain |
| Plantago rugelii | black-seed plantain, blackseed plantain, Rugel's plantain |
| Plantago virginica | paleseed Indianwheat, Virginia plantain |
| Platanthera chapmanii | Chapman's bog orchid, Chapman's fringed orchid |
| Platanthera ciliaris | yellow fringed orchid |
| Platanthera clavellata | green woodland orchid, small green wood orchid |
| Platanthera cristata | crested yellow orchid |
| Platanthera lacera | green fringed orchid |
| Platanthera nivea | snowy orchid |
| Platanus occidentalis | American sycamore, sycamore |
| Pleopeltis polypodioides ssp. michauxiana | resurection fern, resurrection fern |
| Pleopeltis polypodioides ssp. polypodioides | resurrection fern |

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| Pluchea camphorata | camphor pluchea, camphor weed |
| Pluchea foetida | stinking camphorweed |
| Pluchea foetida var. foetida | stinking camphorweed |
| Pluchea odorata var. odorata | marsh fleabane, sweet scent, sweetscent |
| Pluchea rosea | rosy camphorweed |
| Poa annua | annual blue grass, annual bluegrass, walkgrass |
| Poa autumnalis | autumn bluegrass |
| Poa chapmaniana | Chapman's bluegrass |
| Poa pratensis | Kentucky bluegrass |
| Poa sylvestris | woodland bluegrass |
| Poaceae | grasses |
| Podophyllum peltatum | mayapple |
| Pogonia ophioglossoides | snake-mouth orchid, snakemouth orchid |
| Polanisia erosa | large clammyweed |
| Polanisia erosa ssp. erosa | large clammyweed |
| Polemonium reptans | creeping polemonium, Greek valerian |
| Polygala cruciata | drumheads |
| Polygala cruciata var. cruciata | drumheads |
| Polygala incarnata | procession flower |
| Polygala leptocaulis | swamp milkwort |
| Polygala mariana | Maryland milkwort |
| Polygala nana | candyroot |
| Polygala polygama | bitter milkwort, racemed milkwort |
| Polygala ramosa | low pinebarren milkwort |
| Polygala verticillata | whorled milkwort |
| Polygonatum biflorum | king Solomon's seal, King Solomon's-seal, smooth Solomon's seal, Solomon's seal |
| Polygonatum biflorum var. commutatum | king Solomon's seal, King Solomon's-seal, smooth Solomon's seal |
| Polygonatum pubescens | hairy Solomon's seal |
| Polygonum caespitosum | bristled knotweed, bunchy knotweed, oriental ladysthumb |
| Polygonum caespitosum var. longisetum | oriental ladysthumb |
| Polygonum convolvulus | black bindweed, black-bindweed, climbing buckwheat, climbing knotweed, cornbind, dullseed cornbind, pink smartweed, wild buckwheat |
| Polygonum densiflorum | denseflower knotweed |
| Polygonum hydropiper | annual smartweed, marshpepper knotweed, mild water-pepper |
| Polygonum hydropiperoides | swamp smartweed |
| Polygonum lapathifolium | curltop ladysthumb, curlytop knotweed, curlytop smartweed, dock-leaf smartweed, nodding smartweed, pale smartweed, smartweed |
| Polygonum pensylvanicum | Pennsylvania knotweed, Pennsylvania smartweed, pinkweed, pinweed |
| Polygonum persicaria | lady's-thumb, ladysthumb, ladysthumb smartweed, smartweed, spotted knotweed, spotted ladysthumb, spotted smartweed |
| Polygonum punctatum | dotted smartweed |
| Polygonum punctatum var. confertiflorum | dotted smartweed |
| Polygonum setaceum | bog smartweed |
| Polygonum virginianum | jumpseed, Virginia smartweed |
| Polypogon monspeliensis | annual rabbit's-foot grass, annual rabbitsfoot grass, rabbit'sfootgrass, rabbitfoot beardgrass, rabbitfoot grass, rabbitfoot polypogon, rabbitfootgrass |
| Polypremum procumbens | juniper leaf |
| Polystichum acrostichoides | Christmas fern |
| Polystichum acrostichoides var. acrostichoides | Christmas fern |
| Poncirus trifoliata | hardy orange |
| Pontederia cordata | pickerelweed |
| Populus alba | white poplar |
| Populus deltoides | common cottonwood, cottonwood, eastern cottonwood, plains cottonwood |
| Populus heterophylla | swamp cottonwood |
| Portulaca oleracea | akulikuli-kula, common purslane, duckweed, garden purslane, little hogweed, little-hogweed, purslane, pursley, pusley, wild portulaca |

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| Portulaca pilosa | chisme, kiss me quick, kiss-me-quick |
| Portulaca umbraticola | wing-pod purslane, wingpod purslane |
| Potamogeton diversifolius | waterthread, waterthread pondweed |
| Potamogeton natans | broadleaf pondweed, floating pondweed, floatingleaf pondweed |
| Potamogeton pulcher | heartleaf pondweed, spotted pondweed |
| Potamogeton pusillus | baby pondweed, small pondweed |
| Potamogeton spirillus | spiral pondweed |
| Potentilla recta | roughfruit cinquefoil, sulfur (or erect) cinquefoil, sulfur cinquefoil, sulphur cinquefoil |
| Potentilla simplex | common cinquefoil, oldfield cinquefoil, oldfield fivefingers, spreading cinquefoil |
| Prenanthes altissima | rattlesnakeroot, tall rattlesnakeroot |
| Prenanthes barbata | barbed rattlesnakeroot |
| Prenanthes trifoliolata | gall of the earth |
| Proserpinaca palustris | marsh mermaidweed |
| Proserpinaca palustris var. amblyogona | marsh mermaidweed |
| Proserpinaca pectinata | combleaf mermaidweed, mermaidweed |
| Prunella vulgaris | common selfheal, heal all, healall, selfheal |
| Prunus americana | american plum, American plum |
| Prunus angustifolia | Chickasaw plum |
| Prunus caroliniana | Carolina laurelcherry |
| Prunus mexicana | Mexican plum |
| Prunus persica | peach |
| Prunus serotina | black cherry, black chokecherry |
| Prunus serotina var. serotina | black cherry |
| Prunus umbellata | flatwood plum, hog plum |
| Pseudognaphalium obtusifolium | rabbittobacco |
| Pseudognaphalium obtusifolium ssp. obtusifolium | rabbittobacco |
| Psilotum nudum | whisk fern |
| Psoralea simplex | |
| Ptelea trifoliata | common hoptree, hoptree |
| Pteridium aquilinum | bracken, bracken fern, brackenfern, northern bracken fern, western brackenfern |
| Pteridium aquilinum var. latiusculum | bracken, bracken fern, northern bracken fern, western brackenfern |
| Pteridium aquilinum var. pseudocaudatum | bracken, bracken fern, western brackenfern |
| Ptilimnium capillaceum | herbwilliam, threadleaf mockbishopweed |
| Ptilimnium costatum | ribbed mock bishopweed |
| Pueraria montana var. lobata | acha, aka, Japanese arrowroot, kudzu, nepalem, wa yaka |
| Pycnanthemum albescens | whiteleaf mountainmint, whiteleaf mountianmint |
| Pycnanthemum pycnanthemoides | southern mountainmint |
| Pycnanthemum tenuifolium | narrowleaf mountainmint, narrowleaf mountianmint |
| Pyrrhopappus carolinianus | Carolina desert chicory, Carolina desert-chicory, Carolina false dandelion, Carolina false-dandelion |
| Pyrrhopappus pauciflorus | desert chicory, desertchicory, manystemmed false-dandelion, smallflower desert-chicory |
| Pyrus arbutifolia | |
| Pyrus calleryana | Callery pear |
| Quercus alba | white oak |
| Quercus arkansana | arkansas oak, Arkansas oak |
| Quercus falcata | southern red oak |
| Quercus hemisphaerica | Darlington's oak |
| Quercus imbricaria | shingle oak |
| Quercus incana | bluejack oak |
| Quercus laurifolia | laurel oak |
| Quercus lyrata | overcup oak |
| Quercus margarettiae | runner oak, sand post oak |
| Quercus marilandica | blackjack oak |

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| Quercus michauxii | swamp chestnut oak |
| Quercus muehlenbergii | chinkapin oak |
| Quercus nigra | water oak |
| Quercus pagoda | cherrybark oak, texas oak |
| Quercus palustris | pin oak |
| Quercus phellos | willow oak |
| Quercus prinus | chestnut oak |
| Quercus rubra | northern red oak |
| Quercus shumardii | shumard oak, Shumard's oak |
| Quercus similis | bottomland post oak, delta post oak |
| Quercus stellata | post oak |
| Quercus velutina | black oak |
| Quercus virginiana | live oak |
| Ranunculus abortivus | early woodbuttercup, kidney-leaf buttercup, littleleaf buttercup, smallflower buttercup, smallflower crowfoot |
| Ranunculus fascicularis | early buttercup, prairie buttercup, tufted buttercup |
| Ranunculus hispidus var. nitidus | bristly buttercup, swamp buttercup |
| Ranunculus micranthus | rock buttercup |
| Ranunculus muricatus | spinyfruit buttercup |
| Ranunculus parviflorus | smallflower buttercup, sticktight buttercup |
| Ranunculus pusillus | low spearwort, weak buttercup |
| Ranunculus recurvatus | blisterwort, littleleaf buttercup |
| Ranunculus sardous | hairy buttercup |
| Ratibida columnifera | Prairie coneflower, prairie coneflower (upright), prairieconeflower, redspike Mexican hat, upright prairie coneflower |
| Ratibida pinnata | grayhead prairieconeflower, pinnate prairie coneflower |
| Rhamnus caroliniana | |
| Rhexia lutea | yellow meadowbeauty |
| Rhexia mariana | Maryland meadowbeauty |
| Rhexia mariana var. interior | Maryland meadowbeauty |
| Rhexia mariana var. mariana | Maryland meadowbeauty |
| Rhexia petiolata | fringed meadowbeauty |
| Rhexia virginica | common meadowbeauty, handsome Harry |
| Rhododendron | azaleas, rhododendron |
| Rhododendron canescens | mountain azalea, piedmont azalea |
| Rhododendron catawbiense | catawba rhododendron, Catawba rosebay |
| Rhododendron oblongifolium | Texas azalea |
| Rhododendron prinophyllum | early azalea |
| Rhododendron viscosum | swamp azalea |
| Rhus aromatica | fragrant sumac |
| Rhus aromatica var. serotina | fragrant sumac |
| Rhus copallinum | flameleaf sumac |
| Rhus copallinum var. latifolia | winged sumac |
| Rhus glabra | smooth sumac |
| Rhynchosia difformis | doubleform snoutbean |
| Rhynchosia latifolia | broadleaf snoutbean, prairie snoutbean |
| Rhynchosia minima | least snoutbean |
| Rhynchosia reniformis | dollarleaf |
| Rhynchosia tomentosa | twining snoutbean |
| Rhynchospora caduca | anglestem beaksedge |
| Rhynchospora cephalantha | bunched beaksedge |
| Rhynchospora colorata | starrush whitetop |
| Rhynchospora corniculata | shortbristle horned beaksedge |
| Rhynchospora debilis | savannah beaksedge |
| Rhynchospora divergens | spreading beaksedge |
| Rhynchospora elliottii | Elliott's beaksedge |

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| Rhynchospora fascicularis | fascicled beaksedge |
| Rhynchospora filifolia | threadleaf beaksedge |
| Rhynchospora globularis | globe beakrush, globe beaksedge |
| Rhynchospora globularis var. pinetorum | globe beaksedge |
| Rhynchospora glomerata | clustered beaksedge |
| Rhynchospora gracilenta | slender beaksedge |
| Rhynchospora grayi | Gray's beaksedge |
| Rhynchospora harveyi | Harvey's beaksedge |
| Rhynchospora inexpansa | nodding beaksedge |
| Rhynchospora latifolia | sandswamp whitetop |
| Rhynchospora microcarpa | southern beaksedge |
| Rhynchospora mixta | mingled beaksedge |
| Rhynchospora nitens | shortbeak beaksedge |
| Rhynchospora oligantha | featherbristle beaksedge |
| Rhynchospora perplexa | pineland beaksedge |
| Rhynchospora plumosa | plumed beaksedge |
| Rhynchospora pusilla | fairy beaksedge |
| Rhynchospora pusilla | fairy beaksedge |
| Rhynchospora rariflora | fewflower beaksedge |
| Rhynchospora recognita | globe beaksedge |
| Ribes cynosbati | eastern prickly gooseberry, pasture currant |
| Richardia brasiliensis | tropical Mexican clover |
| Richardia scabra | rough Mexican clover |
| Robinia pseudoacacia | black locust, false acacia, yellow locust |
| Rorippa sessiliflora | stalkless yellowcress |
| Rosa bracteata | Macartney rose |
| Rosa carolina | Carolina rose |
| Rosa multiflora | multiflora rose |
| Rotala ramosior | lowland rotala, lowland toothcup, rotala |
| Rubus apogaeus | falling dewberry |
| Rubus argutus | prickly Florida blackberry, sawtooth blackberry |
| Rubus arvensis | field blackberry |
| Rubus flagellaris | northern dewberry, whiplash dewberry |
| Rubus hispidus | bristly dewberry |
| Rubus occidentalis | black raspberry |
| Rubus persistens | persistent blackberry |
| Rubus phoenicolasius | Japanese wineberry, wine raspberry, wineberry |
| Rubus trivialis | southern dewberry |
| Rudbeckia fulgida | orange coneflower |
| Rudbeckia grandiflora | rough coneflower |
| Rudbeckia grandiflora var. alismifolia | rough coneflower |
| Rudbeckia hirta | blackeyed Susan, blackeyedsusan |
| Rudbeckia hirta var. angustifolia | blackeyed Susan |
| Rudbeckia maxima | great coneflower, great conflower |
| Rudbeckia nitida | shiny coneflower |
| Rudbeckia scabrifolia | roughleaf coneflower |
| Ruellia caroliniensis | Carolina wild petunia |
| Ruellia humilis | fringeleaf wild petunia, low ruellia, wild petunia |
| Ruellia humilis | fringeleaf wild petunia |
| Ruellia pedunculata ssp. pinetorum | stalked wild petunia |
| Ruellia strepens | limestone wild petunia, limestone wildpetunia |
| Rumex acetosella | common sheep sorrel, field sorrel, red (or sheep) sorrel, red sorrel, sheep sorrel |
| Rumex crispus | Curley dock, curly dock, narrowleaf dock, sour dock, yellow dock |
| Rumex hastatulus | heartwing dock, heartwing sorrel |

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| Rumex obtusifolius | bitter dock, bluntleaf dock |
| Rumex pulcher | fiddle dock |
| Sabal minor | dwarf palmetto |
| Sabatia angularis | rosepink, squarestem rosegentian |
| Sabatia arenicola | sand rose gentian, sand rosegentian |
| Sabatia calycina | coastal rose gentian, coastal rosegentian |
| Sabatia campanulata | slender rose gentian, slender rosegentian |
| Sabatia campestris | meadow pink, Prairie rose gentian, Texas star |
| Sabatia gentianoides | pinewoods rose gentian, pinewoods rosegentian |
| Saccharum alopecuroidum | silver plumegrass |
| Saccharum baldwinii | narrow plumegrass |
| Saccharum brevibarbe var. contortum | bentawn plumegrass, sortbeard plumegrass |
| Saccharum giganteum | sugarcane plumegrass |
| Sacciolepis indica | glenwoodgrass |
| Sacciolepis striata | American cupscale |
| Sagittaria | arrowhead |
| Sagittaria graminea | grass-leaf arrowhead, grassy arrowhead |
| Sagittaria latifolia | broadleaf arrowhead, common arrowhead, duck-potato |
| Sagittaria papillosa | nipplebract arrowhead |
| Sagittaria platyphylla | delta arrowhead |
| Salicornia bigelovii | dwarf saltwort |
| Salicornia virginica | Virginia glasswort |
| Salix exigua | coyote willow, desert willow, narrowleaf willow, sandbar willow |
| Salix interior | sandbar willow |
| Salix nigra | black willow |
| Salvia azurea | azure blue sage, blue sage |
| Salvia azurea var. grandiflora | blue sage, pitcher sage, Pitchers sage |
| Salvia coccinea | blood sage |
| Salvia lyrata | lyreleaf sage |
| Salvinia | watermoss |
| Sambucus canadensis | american elder |
| Sambucus nigra ssp. canadensis | blue elder, common elderberry, elder, elderberry, Mexican elderberry |
| Samolus ebracteatus | bractless brookweed, limewater brookweed, Mojave water pimpernel |
| Samolus ebracteatus ssp. alyssoides | limewater brookweed |
| Samolus valerandi ssp. parviflorus | seaside brookweed, smallflower water pimpernel, water brookweed |
| Sanguinaria canadensis | bloodroot |
| Sanicula canadensis | Canada sanicle, Canadian blacksnakeroot |
| Sanicula canadensis var. canadensis | Canadian blacksnakeroot |
| Sanicula odorata | cluster sanicle, clustered blacksnakeroot |
| Sanicula smallii | Small's blacksnakeroot |
| Saponaria officinalis | bouncing bet, bouncing-bett, bouncingbet, bouncingbet soapweed, soapwort, sweet Betty |
| Sarracenia alata | pitcherplant, yellow trumpets |
| Sassafras albidum | sassafras |
| Satureja brownei | |
| Saururus cernuus | lizard's tail, lizards tail |
| Saxifraga virginiensis | early saxifrage |
| Schizachyrium littorale | shore little bluestem |
| Schizachyrium scoparium | little bluestem |
| Schizachyrium scoparium var. divergens | little bluestem |
| Schizachyrium scoparium var. scoparium | little bluestem |
| Schizachyrium tenerum | slender bluestem, slender little bluestem |
| Schoenolirion croceum | yellow sunnybell |
| Schoenoplectus californicus | California bulrush |
| Schoenoplectus tabernaemontani | great bulrush, soft-stem bulrush, softstem bulrush |

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| Schrankia hystricina | |
| Scirpus atrovirens | dark-green bulrush, green bulrush |
| Scirpus cyperinus | bulrush, woolgrass |
| Scirpus divaricatus | spreading bulrush |
| Scleria baldwinii | Baldwin's nutrush |
| Scleria ciliata | fringed nutrush |
| Scleria georgiana | slenderfruit nutrush |
| Scleria hirtella | riverswamp nutrush |
| Scleria muehlenbergii | Muehlenberg's nutrush |
| Scleria oligantha | littlehead nutrush |
| Scleria pauciflora | fewflower nutrush |
| Scleria pauciflora var. pauciflora | fewflower nutrush |
| Scleria reticularis | netted nutrush |
| Scleria triglomerata | whip nutrush |
| Scoparia dulcis | licorice weed |
| Scutellaria cardiophylla | gulf skullcap |
| Scutellaria elliptica | hairy skullcap |
| Scutellaria integrifolia | helmet flower |
| Scutellaria ovata | eggleaf skullcap, heartleaf skullcap |
| Scutellaria ovata ssp. ovata | heartleaf skullcap |
| Scutellaria parvula | small skullcap |
| Sebastiania fruticosa | Gulf Sebastian-bush, Gulf sebastiana |
| Sedum ternatum | woodland stonecrop |
| Selaginella apoda | meadow spikemoss |
| Selaginella arenicola | sand spikemoss |
| Selaginella arenicola ssp. riddellii | Riddell's spikemoss |
| Senecio ampullaceus | Texas ragwort |
| Senecio glabellus | butterweed, cressleaf, cressleaf groundsel |
| Senecio obovatus | roundleaf ragwort |
| Senecio plattensis | prairie groundsel |
| Senna marilandica | Maryland senna, wild senna |
| Senna obtusifolia | Java-bean, sicklepod |
| Senna occidentalis | coffee senna, septicweed |
| Sesbania drummondii | poisonbean |
| Sesbania herbacea | bigpod sesbania, hemp sesbania, peatree |
| Sesbania punicea | rattelbox, rattlebox |
| Setaria faberi | Chinese foxtail, Chinese millet, giant bristlegrass, giant foxtail, Japanese bristlegrass, nodding foxtail, tall green bristlegrass |
| Setaria parviflora | knotroot bristlegrass, marsh bristle grass, marsh bristlegrass, yellow bristlegrass |
| Setaria pumila | cattail grass, yellow bristle grass, yellow bristlegrass |
| Sherardia arvensis | blue field-madder, blue fieldmadder, field madder |
| Sibara virginica | sibara, Virginia sibara, Virginia winged rockcress |
| Sida lindheimeri | showy fanpetals |
| Sida rhombifolia | arrowleaf sida, cuban jute, Cuban-jute |
| Sida spinosa | prickly fanpetals, prickly sida |
| Sideroxylon lanuginosum | gum bully |
| Sideroxylon lanuginosum ssp. lanuginosum | chittamwood, gum bully, gum bumelia, woolybucket bumelia |
| Sideroxylon lanuginosum ssp. oblongifolium | gum bully |
| Silene antirrhina | catchfly, sleepy campion, sleepy catchfly, sleepy silene |
| Silene gallica | common catchfly, windmill catchfly |
| Silene stellata | whorled catchfly, widowsfrill |
| Silene subciliata | Louisiana catchfly |
| Silene virginica | fire pink, firepink |
| Silphium gracile | slender rosinweed |
| Silphium radula | roughstem rosinweed, Starry rosinweed |

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| Silphium simpsonii | simpson rosinweed, Simpson's rosinweed |
| Silphium trifoliatum | whorled rosinweed |
| Silphium trifoliatum var. trifoliatum | whorled rosinweed |
| Sinapis arvensis | charlock, charlock mustard, corn mustard, corn-mustard, wild mustard |
| Sisymbrium altissimum | Jim Hill mustard, tall hedge-mustard, tall mustard, tall tumblemustard, tumble mustard, tumblemustard, tumbleweed mustard |
| Sisyrinchium albidum | white blue-eyed grass, white blueeyed grass |
| Sisyrinchium angustifolium | blue eyegrass, blue-eyed grass, common blue eyedgrass, common blue-eyedgrass, narrowleaf blue-eyed grass |
| Sisyrinchium atlanticum | eastern blue-eyed grass, eastern blueeyed grass |
| Sisyrinchium campestre | prairie blue-eyed grass, prairie blueeyed grass |
| Sisyrinchium exile | |
| Sisyrinchium langloisii | roadside blue-eyed grass, roadside blueeyed grass |
| Sisyrinchium minus | dwarf blue-eyed grass, dwarf blueeyed grass |
| Sisyrinchium montanum | mountain blue eyedgrass, mountain blueeyed grass, strict blue-eyed grass, strict blue-eyed-grass |
| Sisyrinchium rosulatum | annual blue-eyed grass, annual blueeyed grass |
| Sisyrinchium sagittiferum | spearbract blue-eyed grass, spearbract blueeyed grass |
| Smallanthus uvedalius | hairy leafcup |
| Smilax bona-nox | saw greenbrier |
| Smilax ecirrata | greenbriar, upright carrion-flower, upright carrionflower |
| Smilax glauca | cat greenbrier |
| Smilax herbacea | herbaceous greenbriar, smooth carrionflower |
| Smilax laurifolia | laurel greenbrier |
| Smilax pumila | sarsparilla vine |
| Smilax rotundifolia | bullbriar, common catbriar, common greenbrier, greenbrier, horsebriar, roundleaf greenbriar, roundleaf greenbrier |
| Smilax smallii | lanceleaf greenbrier, small greenbrier |
| Smilax tamnoides | bristly greenbrier |
| Smilax walteri | coral greenbrier |
| Solanum americanum | American black nightshade |
| Solanum carolinense | apple of Sodom, bull nettle, Carolina horsenettle, devil's tomato, horsenettle, sand briar |
| Solanum carolinense var. carolinense | apple of Sodom, bull nettle, Carolina horse-nettle, Carolina horsenettle, devil's tomato, horsenettle, sand briar |
| Solanum elaeagnifolium | silverleaf nightshade, tomato weed, trompillo, white horsenettle, white nightshade |
| Solanum pseudocapsicum | Jerusalem cherry |
| Solanum ptychanthum | black nightshade, eastern black nightshade, nightshade, West Indian nightshade |
| Solidago | goldenrod, goldenrod species |
| Solidago altissima | Canada goldenrod |
| Solidago bicolor | white goldenrod |
| Solidago caesia | wreath goldenrod |
| Solidago canadensis | Canada goldenrod, Canadian goldenrod, common goldenrod |
| Solidago gigantea | giant goldenrod |
| Solidago juncea | early goldenrod |
| Solidago ludoviciana | Louisiana goldenrod |
| Solidago missouriensis | Missouri goldenrod, prairie goldenrod |
| Solidago missouriensis var. fasciculata | Missouri goldenrod |
| Solidago odora | anisescented goldenrod, fragrant goldenrod |
| Solidago odora var. odora | anisescented goldenrod |
| Solidago petiolaris | downy goldenrod, downy ragged goldenrod |
| Solidago radula | rough goldenrod, western rough goldenrod |
| Solidago rugosa | wrinkleleaf goldenrod |
| Solidago rugosa ssp. aspera | wrinkled goldenrod, wrinkleleaf goldenrod |
| Solidago rugosa var. aspera | |
| Solidago rugosa var. rugosa | wrinkleleaf goldenrod |

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|---|---|
| Solidago sempervirens | seaside goldenrod |
| Solidago sphacelata | autumn goldenrod |
| Solidago tortifolia | twistleaf goldenrod |
| Solidago ulmifolia | elmleaf goldenrod |
| Soliva mutisii | Mutis' burrweed |
| Soliva sessilis | field burrweed, field soliva |
| Sonchus | sow thistle, sowthistle |
| Sonchus asper | perennial sowthistle, prickly sowthistle, spiny sowthistle, spiny-leaf sow-thistle |
| Sonchus oleraceus | annual sowthistle, common sow-thistle, common sowthistle, pualele, sow thistle, sow-thistle |
| Sophora affinis | Eve's necklacepod, Texas sophora |
| Sorghastrum elliottii | slender Indiangrass |
| Sorghastrum nutans | Indiangrass |
| Sorghum halepense | aleppo milletgrass, herbe de Cuba, Johnson grass, Johnsongrass, sorgho d'Alep, sorgo de alepo, zacate Johnson |
| Sparganium americanum | American bur-reed, American burreed |
| Spermacoce glabra | buttonplant, smooth false buttonweed |
| Spermolepis divaricata | forked scaleseed, roughfruit scaleseed |
| Sphenoclea zeylanica | chickenspike, sphenoclea |
| Sphenopholis obtusata | prairie wedgegrass, prairie wedgescale |
| Spigelia loganioides | Florida pinkroot |
| Spigelia marilandica | Indianpink, woodland pinkroot |
| Spiranthes cernua | nodding ladies'-tresses, nodding ladiestresses, white nodding ladies'-tresses |
| Spiranthes floridana | |
| Spiranthes lacera | northern slender ladies'-tresses, slender ladiestresses |
| Spiranthes lacera var. gracilis | northern slender ladies'-tresses, northern slender ladiestresses |
| Spiranthes laciniata | lacelip ladies'-tresses, lacelip ladiestresses |
| Spiranthes longilabris | giantspiral ladies'-tresses, giantspiral ladiestresses |
| Spiranthes parksii | navasota ladies' tresses, Navasota ladies'-tresses, Navasota ladiestresses |
| Spiranthes praecox | greenvein ladies'-tresses, greenvein ladiestresses |
| Spiranthes tuberosa | little ladies'-tresses, little ladiestresses |
| Spiranthes vernalis | spring ladies'-tresses, upland ladiestresses |
| Spirodela | duckmeat, duckweed |
| Sporobolus clandestinus | rough dropseed |
| Sporobolus compositus | composite dropseed, dropseed |
| Sporobolus compositus var. compositus | composite dropseed, dropseeed, tall dropseed |
| Sporobolus compositus var. macer | composite dropseed, Mississippi dropseed |
| Sporobolus cryptandrus | sand dropseed |
| Sporobolus indicus | Rattail smutgrass, smut grass, smutgrass |
| Sporobolus junceus | pineywoods dropseed |
| Sporobolus silveanus | Silveus' dropseed |
| Stachys crenata | mouse's-ear, mousesear |
| Stachys floridana | Florida betony, Florida hedgenettle |
| Stachys tenuifolia | slender betony, smooth hedge-nettle, smooth hedgenettle |
| Staphylea trifolia | american bladdernut, American bladdernut |
| Steinchisma hians | gaping grass, gaping panicum |
| Stellaria media | chickweed, common chickweed, nodding chickweed |
| Stemodia durantifolia | white-woolly twintip, whitewoolly twintip |
| Stenanthium gramineum | eastern featherbells |
| Stenotaphrum secundatum | St. Augustine grass, St. Augustinegrass |
| Stillingia sylvatica | queen's-delight, queens delight, Queensdelight |
| Stillingia sylvatica ssp. sylvatica | queen's-delight, queensdelight |
| Streptanthus hyacinthoides | smooth jewelflower, smooth twistflower |
| Strophostyles helvula | trailing fuzzybean, Trailing wildbean |
| Strophostyles umbellata | perennial wildbean, pink fuzzybean |

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|---|---|
| Stylisma aquatica | water dawnflower |
| Stylisma pickeringii | Pickering's dawnflower |
| Stylisma pickeringii var. pattersonii | Patterson's dawnflower |
| Stylisma villosa | hairy dawnflower |
| Stylodon carneus | Carolina false vervain |
| Stylophorum diphyllum | celandine poppy |
| Stylosanthes biflora | endbeak pencilflower, sidebeak pencilflower |
| Styrax americanus | American snowbell, snowbell |
| Styrax grandifolius | bigleaf snowbell |
| Symphoricarpos orbiculatus | coralberry, coralberry (buck brush), Indiancurrant coralberry |
| Symphyotrichum cordifolium | common blue wood aster |
| Symphyotrichum drummondii var. texanum | Drummond's aster |
| Symphyotrichum dumosum | rice button aster |
| Symphyotrichum dumosum var. dumosum | rice button aster |
| Symphyotrichum lateriflorum | calico aster |
| Symphyotrichum lateriflorum var. lateriflorum | calico aster |
| Symphyotrichum novae-angliae | New England aster |
| Symphyotrichum patens | late purple aster |
| Symphyotrichum patens var. patens | late purple aster |
| Symphyotrichum pratense | barrens silky aster |
| Symphyotrichum racemosum | smooth white oldfield aster |
| Symphyotrichum shortii | Short's aster |
| Symphyotrichum subulatum | eastern annual saltmarsh aster |
| Symphyotrichum tenuifolium | perennial saltmarsh aster |
| Symphyotrichum undulatum | waxyleaf aster |
| Symplocos tinctoria | common sweetleaf, sweetleaf |
| Taenidia integerrima | yellow pimperal, yellow pimpernel |
| Taraxacum officinale | blowball, common dandelion, dandelion, faceclock |
| Taxodium distichum | bald cypress, baldcypress |
| Tephrosia onobrychoides | multibloom hoarypea, multibloom tephrosia |
| Tephrosia virginiana | Virginia tephrosia |
| Tetragonotheca ludoviciana | Louisiana nerveray |
| Teucrium canadense | American germander, Canada germander, Candad germander, germander, hairy germander, wood sage |
| Teucrium canadense var. canadense | American germander, Canada germander |
| Thalia dealbata | powdered thalia, powdery alligator-flag |
| Thalictrum dasycarpum | purple meadow-rue, purple meadowrue |
| Thalictrum dioicum | early meadow-rue |
| Thalictrum thalictroides | rue anemone |
| Thaspium barbinode | hairyjoint meadowparsnip, hairyspine thaspium |
| Thaspium trifoliatum | purple meadowparsnip, purple thaspium |
| Thaspium trifoliatum var. aureum | purple meadowparsnip |
| Thelesperma filifolium | greenthread, plains greenthread, stiff greenthread |
| Thelesperma flavodiscum | East Texas greenthread |
| Thelypteris kunthii | Kunth's maiden fern |
| Thelypteris ludoviciana | |
| Thelypteris palustris | eastern marsh fern, marsh fern, meadow fern |
| Tilia americana | american basswood, American basswood |
| Tilia americana var. caroliniana | Carolina basswood |
| Tillandsia usneoides | Spanish moss |
| Tipularia discolor | crippled cranefly |
| Torilis arvensis | Canada hedgeparsley, hedge parsley, hedgeparsley, spreading hedgeparsley |
| Toxicodendron pubescens | Atlantic poison oak, poison oak |
| Toxicodendron radicans | eastern poison ivy, poison ivy, poisonivy |
| Toxicodendron vernix | poison sumac |

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|---|---|
| Trachelospermum difforme | climbing dogbane |
| Tradescantia hirsutiflora | hairyflower spiderwort |
| Tradescantia occidentalis | prairie spiderwort, spiderwort |
| Tradescantia ohiensis | bluejacket, Ohio spiderwort |
| Tradescantia reverchonii | reverchon spiderwort, Reverchon's spiderwort |
| Tradescantia virginiana | Virginia spiderwort |
| Tragia cordata | heartleaf noseburn |
| Tragia smallii | Small's noseburn |
| Tragia urens | wavyleaf noseburn |
| Tragia urticifolia | nettleleaf noseburn |
| Trepocarpus aethusae | aethusae, whitenymph |
| Triadenum tubulosum | lesser marsh St. Johnswort |
| Triadenum virginicum | Virginia marsh St. Johnswort |
| Triadenum walteri | greater marsh St. Johnswort |
| Triadica sebifera | tallowtree |
| Triantha racemosa | |
| Trichostema dichotomum | blue curls, forked bluecurls |
| Trichostema setaceum | narrowleaf bluecurls |
| Tridens ambiguus | pine barren fluffgrass, pinebarren tridens |
| Tridens flavus | Purpletop, purpletop tridens |
| Tridens flavus var. flavus | purpletop tridens |
| Tridens strictus | longspike tridens |
| Trifolium arvense | hairy clover, hare's foot clover, oldfield clover, rabbit-foot clover, rabbitfoot clover, stone clover |
| Trifolium campestre | Field (Big-hop) clover, field clover, large hop clover, lesser hop clover, low hop clover |
| Trifolium dubium | hop clover, smallhop clover, suckling clover |
| Trifolium pratense | red clover |
| Trifolium repens | Dutch clover, ladino clover, white clover |
| Trifolium resupinatum | Persian clover, reversed clover |
| Trillium flexipes | nodding wakerobin |
| Trillium gracile | Sabine River wakerobin |
| Trillium ludovicianum | Louisiana wakerobin |
| Trillium pusillum var. texanum | |
| Trillium recurvatum | bloody butcher, prairie trillium |
| Trillium sessile | toadshade |
| Triodanis biflora | |
| Triodanis perfoliata | clasping bellwort, clasping Venus' looking-glass, clasping Venus' lookingglass, clasping venuslookingglass, clasping-leaf venus'-looking-glass, common Venus' lookingglass, roundleaved triodanis, Venus lookingglass |
| Triphora trianthophora | three birds orchid, threebirds |
| Triplasis purpurea | purple sand grass, purple sandgrass |
| Tripsacum dactyloides | eastern gamagrass |
| Triticum aestivum | common wheat, wheat |
| Typha latifolia | broadleaf cattail, cattail, cattail (common), common cattail |
| Ulmus alata | winged elm |
| Ulmus americana | american elm, American elm |
| Ulmus crassifolia | cedar elm |
| Ulmus rubra | slippery elm |
| Urochloa platyphylla | broadleaf signalgrass |
| Urtica chamaedryoides | heartleaf nettle, slim stingingnettle |
| Urtica dioica | California nettle, slender nettle, stinging nettle, tall nettle |
| Utricularia | bladderwort |
| Utricularia gibba | conespur bladderpod, humped bladderwort |
| Utricularia juncea | southern bladderwort |

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|---|---|
| Utricularia macrorhiza | common bladderpod, common bladderwort, greater bladderwort |
| Utricularia purpurea | eastern purple bladderwort |
| Utricularia radiata | little floating bladderwort |
| Utricularia subulata | zigzag bladderwort |
| Uvularia grandiflora | large-flower bellwort, largeflower bellwort |
| Uvularia perfoliata | perfoliate bellwort |
| Vaccinium arboreum | farkleberry, tree sparkleberry, tree-huckelberry |
| Vaccinium corymbosum | highbush blueberry |
| Vaccinium elliottii | Elliott's blueberry |
| Vaccinium fuscatum | black highbush blueberry |
| Vaccinium pallidum | Blue Ridge blueberry, blueridge blueberry |
| Vaccinium stamineum | deerberry |
| Vaccinium virgatum | smallflower blueberry |
| Valeriana pauciflora | largeflower valerian |
| Valerianella locusta | Lewiston cornsalad |
| Valerianella radiata | beaked cornsalad |
| Valerianella stenocarpa | narrowcell cornsalad |
| Verbascum thapsus | big taper, common mullein, flannel mullein, flannel plant, great mullein, mullein, velvet dock, velvet plant, woolly mullein |
| Verbena bipinnatifida | |
| Verbena bonariensis | pretty verbena, purpletop vervain |
| Verbena brasiliensis | Brazilian vervain |
| Verbena halei | slender verbena, Texas verbena, Texas vervain |
| Verbena rigida | tuberous vervain |
| Verbena scabra | sandpaper vervain |
| Verbena urticifolia | white verbena, white vervain |
| Verbena xutha | Gulf vervain |
| Verbesina alternifolia | wingstem |
| Verbesina helianthoides | gravelweed, gravelweed crownbeard |
| Verbesina virginica | iceweed, Virginia crownbeard, white crownbeard |
| Vernonia baldwinii | baldwin ironweed, Baldwin's ironweed, Ironweed, western ironweed |
| Vernonia gigantea | giant ironweed, tall ironweed |
| Vernonia gigantea ssp. gigantea | giant ironweed |
| Vernonia missurica | Missouri ironweed |
| Vernonia texana | Texas ironweed |
| Veronica agrestis | field speedwell, green field speedwell |
| Veronica arvensis | common speedwell, corn speedwell, rock speedwell, wall speedwell |
| Veronica officinalis | common gypsyweed |
| Veronica peregrina | neckweed, purslane speedwell |
| Veronica persica | bird-eye speedwell, birdeye speedwell, birdseye speedwell, Persian speedwell, winter speedwell |
| Viburnum acerifolium | mapleleaf viburnum |
| Viburnum dentatum | arrow-wood viburnum, arrowwood, southern arrowwood |
| Viburnum nudum | possumhaw, possumhaw viburnum |
| Viburnum nudum var. cassinoides | possumhaw, withe-rod |
| Viburnum nudum var. nudum | possumhaw |
| Viburnum prunifolium | blackhaw |
| Viburnum rafinesquianum | downy arrow-wood, downy arrowwood |
| Viburnum rufidulum | rusty blackhaw, rusty viburnum |
| Vicia caroliniana | Carolina vetch |
| Vicia ludoviciana | deerpea vetch, Louisiana vetch, slim vetch |
| Vicia minutiflora | pygmyflower vetch, smallflower vetch |
| Vicia sativa | Common Vetch, garden vetch, narrowleaf vetch, sweetpea (garden vetch) |
| Vicia sativa ssp. nigra | common vetch, garden vetch, slimleaf vetch, vetch |
| Vicia sativaflora | |
| Vinca minor | common periwinkle, lesser periwinkle, myrtle |

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|---|---|
| Viola | violet |
| Viola affinis | Arizona bog violet, sand violet |
| Viola canadensis | Canada violet, Canadian white violet |
| Viola canadensis var. canadensis | Canadian white violet |
| Viola esculenta | |
| Viola lanceolata | bog white violet, lanceleaf violet |
| Viola lanceolata ssp. vittata | bog white violet |
| Viola langloisii | |
| Viola lovelliana | lovell violet, Lovell's violet |
| Viola missouriensis | Missouri violet |
| Viola palmata | early blue violet, trilobed violet |
| Viola palmata var. palmata | violet |
| Viola palmata var. triloba | |
| Viola pedata | birdfoot violet |
| Viola primulifolia | |
| Viola pubescens var. pubescens | downy yellow violet, smooth yellow violet |
| Viola pubescens var. scabriuscula | downy yellow violet |
| Viola sagittata | arrowleaf violet |
| Viola sororia | common blue violet, hooded blue violet |
| Viola striata | striped cream violet |
| Viola triloba | |
| Viola villosa | Carolina violet, violet |
| Viola walteri | prostrate blue violet |
| Viola X palmata | |
| Viola X primulifolia | primrose violet, violet |
| Vitex negundo var. intermedia | negundo chastetree |
| Vitis aestivalis | summer grape |
| Vitis aestivalis var. aestivalis | summer grape |
| Vitis aestivalis var. lincecumii | long grape, pinewoods grape |
| Vitis cinerea | graybark grape, sweet grape |
| Vitis cinerea var. cinerea | graybark grape |
| Vitis labrusca | fox grape |
| Vitis mustangensis | mustang grape |
| Vitis palmata | catbird grape |
| Vitis riparia | river-bank grape, riverbank grape |
| Vitis rotundifolia | muscadine, muscadine grape |
| Vitis vulpina | fox grape, frost grape, wild grape |
| Vulpia bromoides | brome fescue, brome six-weeks grass, desert fescue |
| Vulpia octoflora | eight-flower six-weeks grass, pullout grass, sixweeks fescue, sixweeks grass |
| Wahlenbergia marginata | southern rockbell |
| Waldsteinia fragarioides | Appalachian barren strawberry |
| Waldsteinia fragarioides ssp. fragarioides | Appalachian barren strawberry |
| Wisteria frutescens | American wisteria |
| Wisteria sinensis | Chinese wisteria |
| Wolffia | watermeal |
| Wolffiella | bogmat, wolffiella |
| Woodsia obtusa ssp. obtusa | bluntlobe cliff fern |
| Woodwardia areolata | chainfern, netted chainfern |
| Woodwardia virginica | Virginia chainfern |
| Xanthium strumarium | cocklebur, cockleburr, common cocklebur, rough cocklebur, rough cockleburr |
| Xanthium strumarium var. glabratum | cocklebur, common cocklebur, rough cocklebur, rough cockleburr |
| Xyris ambigua | coastalplain yelloweyed grass |
| Xyris baldwiniana | Baldwin's yelloweyed grass |
| Xyris caroliniana | Carolina yelloweyed grass |

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|---|---|
| Xyris difformis | bog yelloweyed grass, southern yelloweyed grass |
| Xyris difformis var. difformis | bog yelloweyed grass |
| Xyris drummondii | Drummond's yelloweyed grass |
| Xyris jupicai | Richard's yelloweyed grass |
| Xyris laxifolia var. iridifolia | irisleaf yelloweyed grass, yelloweyegrass |
| Xyris louisianica | Louisiana yelloweyed grass |
| Xyris platylepis | tall yelloweyed grass |
| Xyris scabrifolia | Harper's yelloweyed grass |
| Xyris stricta | pineland yelloweyed grass |
| Xyris torta | common yelloweyed grass, slender yelloweyed grass |
| Yeatesia viridiflora | yellow bractspike |
| Youngia japonica | oriental false hawksbeard |
| Yucca | yucca, yucca species |
| Yucca filamentosa | Adam's needle |
| Yucca louisianensis | Gulf Coast yucca, Louisiana yucca |
| Zanthoxylum clava-herculis | Hercules' club, hercules-club, hercules-club pricklyash |
| Zizaniopsis miliacea | giant cutgrass |
| Zizia aurea | golden alexanders, golden zizia |
| Zornia bracteata | viperina |

Appendix D.

**NEPA and NHPA Compliance**

On June 5, 2003, two new categorical exclusions were published in the *Federal Register* (Vol 68, No. 108, pages 33814-33824), and are applicable to the fire management program at Big Thicket National Preserve. The exclusions permit hazardous fuels reduction activities using prescribed fire (each project not to exceed 4,500 acres), and mechanical methods [crushing, piling, thinning, pruning, cutting, chipping, mulching, and mowing (each project not to exceed 1,000 acres)] if they meet the following criteria:

- Shall be limited to wildland-urban interface areas, or areas in Condition Classes 2 or 3 in Fire Regime Groups I, II, or III, outside the wildland urban interface;
- Shall be identified through a collaborative framework as described in ''A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy Implementation Plan;''
- Shall be conducted consistent with agency and Departmental procedures and applicable land and resource management plans;
- Shall not be conducted in wilderness areas or impair the suitability of wilderness study areas for preservation as wilderness;
- Shall not include the use of herbicides or pesticides or the construction of new permanent roads or other new permanent infrastructure; and may include the sale of vegetative material if the primary purpose of the activity is hazardous fuels reduction.

The second categorical exclusion permits post-fire rehabilitation [such as tree planting, fence replacement, habitat restoration, heritage site restoration, repair of roads and trails, and repair of damage to minor facilities such as campgrounds (not to exceed 4,200 acres)] to repair or improve lands unlikely to recover to a management approved condition from wildland fire damage, or to repair or replace minor facilities damaged by fire, if they meet the following criteria:

- Shall be conducted consistent with agency and Departmental procedures and applicable land and resource management plans;
- Shall not include the use of herbicides or pesticides or the construction of new permanent roads or other new permanent infrastructure; and
- Shall be completed within three years following a wildland fire.

Any projects with the potential to affect park resources must be reviewed by a multidisciplinary team through internal scoping, and only those with minor impacts implemented under this management plan. In addition to review for exceptions to the categorical exclusions (*Director's Order-12, Conservation Planning, Environmental Impact Analysis, and Decision-Making Handbook*, §3.5), other cautions found in §3.6 of the DO-12 Handbook also apply.
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Prescribed burns within the preserve are primarily conducted to treat hazardous fuels in urban interface areas, with a secondary goal of restoring and maintaining fire dependant ecosystems. All project areas are less than 4,500 acres and are identified through internal scoping by an multidisciplinary team, and with collaboration of Texas Nature

Conservancy, the Texas Forest Service, local US Fish & Wildlife staff, and conservation foresters with Temple Inland Timber Company. The burns are planned and implemented in accordance with Directors Order 18, Reference Manual 18 (Chapter 10 –Fuels Management), and the Interagency Standards for Fire & Fire Aviation Operations, and the preserves Resource Management Plan. No wilderness areas have been designated on the preserve, nor would the treatments impair project areas for consideration as wilderness. The use of herbicides will be considered as separate treatments and will be covered under different NEPA documents. No use of pesticides or road construction is anticipated, or will be conducted under this management plan. The sale of vegetative material to reduce hazardous fuels may occur with a treatment plan, or disposed of under a separate NEPA document.
Post-fire rehabilitation is limited to immediate fireline rehabilitation and repair of trail features to approved management conditions (i.e. pre-fire). No use of herbicides, pesticide or construction of roads or new permanent infrastructure will occur under this management plan.

In accordance with PEP Environmental Statement Memorandum No. ESM03-02, a “Decision Memorandum” template [ESM03-2] and a standard environmental screening form has been prepared.

*Appendix E*

**Unit-specific Supplemental Information**

**Key Interagency Contacts**

| | | | |
|---|---|---|---|
| Art Hutchinson | Superintendent | 409 839-2690 | ex. 222 |
| Curtis Hoagland | Chief of Resource Management | " | 224 |
| David McHugh | Fire Management Officer | 283-5824 | |
| Krystal Tolar | Fire Program Assistant | " | |
| Fulton Jeansonne | Fire Ecologist | " | |
| DW Ivans | Prescribed Fire Specialist | " | |
| Rodney Monk | Equipment Technician | " | |

**Preparedness inventory**

| ITEM | AMOUNT | ITEM | AMOUNT |
|---|---|---|---|
| Shirts small | 19 | Tents | 10 |
| Shirts medium | 13 | headlamps | 15 |
| Shirts large | 47 | face&neck shrouds | 17 |
| Shirts X-large | 32 | Compass | 24 |
| Shirts XX-large | 10 | leg guards | 8 |
| Pants 26-30x30 | 14 | Chain saw chaps | 15 |
| Pants 28-32x30 | 2 | Red bags | 12 |
| Pants 28-32x34 | 9 | Sleeping bags | 13 |
| Pants 30-34x30 | 9 | Sleeping mats | 4 |
| Pants 30-34x34 | 14 | Blue back packs, complete | 11 |
| Pants 32-36x30 | 14 | Yellow back packs, complete | 4 |
| Pants 32-36x34 | 6 | Fire shelter, complete , new | 8 |
| Pants 34-38x30 | 15 | Fire shelter, complete , old | 7 |
| Pants 34-38x34 | 14 | Fire shelter chest harness | 2 |
| Pants 36-40x30 | 7 | Head ban suspension | 3 |
| Pants 36-40x34 | 10 | Vest high visibility | 4 |
| Pants 38-42x30 | 9 | Case belt weather kit | 1 |
| Pants 38-42x34 | 8 | Goggle retainer | 15 |
| Pants 40-44x30 | 6 | Rain jacket large | 13 |
| Pants 40-44x34 | 6 | Rain jacket X-large | 10 |
| Gloves small | 10 pr | Rain pants large | 10 |
| Gloves medium | 10 pr | Rain pants X-large | 10 |
| Gloves large | 6 pr | | |
| Gloves X-large | 24 pr | | |
| Helmets | 17 | | |
| First aid 20 person | 1 | | |
| First aid 10 person | 1 | | |
| First aid individual | 19 | | |

| ITEM | AMOUNT | ITEM | AMOUNT |
|---|---|---|---|
| Pulaski | 13 | Shovel cover | 8 |
| Single bit axe | 1 | Pulaski cover | 12 |
| Double bit axe | 14 | Bar and chain oil (gal) | 6 |
| Sledge hammer | 3 | 55 Gallon water bladder | 3 |
| Combination tool | 3 | Signal lights , new | 4 |
| Collapsible rakes | 8 | Signal lights , old | 5 |
| regular rakes | 10 | Water bag nylon duck 4 qt | 3 |
| Fire rake | 3 | 2500 gallon pumpkin | 1 |
| yard rake | 2 | Fusee (case) | 2 |
| Shovel | 11 | | |
| Modified mcleod , crow's feet | 4 | | |
| Mcleod | 11 | | |
| Flappers | 29 | | |
| Blowers | 2 | | |
| Weed eaters , fs 550 & 250 | 1 each | | |
| power limb saw | 1 | | |
| Mark 3 pump | 2 | | |
| ATV plow | 1 | | |
| Hose roller | 1 | | |
| Smoke warning sign | 1 | | |
| Mop-up wand assembly | 11 | | |
| Chain saw , 011 | 2 | | |
| Chain saw , 038 | 1 | | |
| Chain saw, 044 ,440 | 2 | | |
| Chain saw , 460 | 1 | | |
| Plastic wedges | 18 | | |
| Barricades | 9 | | |
| Mcleod cover | 12 | | |

| ITEM | AMOUNT | ITEM | AMOUNT |
|---|---|---|---|
| Ice chest | 5 | 1" hose , 100 ft | 1 |
| Water coolers | 6 | Reducer 1.5"nh x 1"npsh | 6 |
| Fire gel (5 gal. Pail) | 3 | Reducer 1.5"npsh x 1.5"nh | 8 |
| Class A foam (5 gal pail) | 5.5 | Reducer 1.5"nh x 1.5"npsh | 7 |
| MRE's (case) | 2 | Reducer 1"npsh x .75nh | 5 |
| 1 1/8 cotton rope (feet) | 600 | Reducer 2.5" npsh x 1.5 nh | 7 |
| Canteens | 95 | Increaser .75nh x 1"npsh | 6 |
| Lantern batteries | 30 | Increaser 1"npsh x 1.5nh | 5 |
| Ear plugs ( 200 per box ) | 2 | 1" Barrel nozzle | 16 |
| Spotlight | 2 | 1/4" nozzle tip brass | 20 |
| Hose pack boxes | 3 | 1/4" nozzle tip aluminum | 7 |
| Cotton blue flagging (roll) | 31 | Nozzle fire hose mop-up | 6 |
| Yellow/black stripe flagging (Case) | 2 | 1 1/2" gated wye | 2 |
| killer-tree flagging (case) | 1 | Valve wye firehose | 5 |
| Glo-orange/black stripe flagging (cases) | 2 | Valve shut-off firehose | 4 |
| Pink flagging (rolls) | 3 | Spanner wrench | 16 |
| Yellow flagging (rolls) | 3 | Gasket fire hose 1" , 10 per pack | 19 |
| | | Gasket fire hose1.5",10 per pack | 2 |
| | | Gasket fire hose2.5",10 per pack | 1 |
| Flat file handles | 9 | Motorola handi talkie fm radio | 3 |
| Chainsaw file handles | 1 | Tent, tarp | 17 |
| 14" Mill bastard file | 5 | | |
| 10" Mill bastard file | 10 | | |
| 8"x 1/4 chainsaw file | 11 | | |
| 8" x 7/32 chainsaw file | 17 | | |
| 8" x 5/32 chainsaw file | 2 | | |
| Sharpening stone | 1 | | |
| 1 1/2" hose , 100 ft | 22 | | |

## Prescription Weather Parameters

| National Fire Behavior Fuel Model | 2 (Open Pine Savanna) | | |
|---|---|---|---|
| | ***LOW*** | | ***HIGH*** |
| **Temperature** | **30** | **-** | **100** |
| **Relative Humidity** | **20** | **-** | **80** |
| **Wind Speed (mid-flame)** | **1** | **-** | **6** |
| **Spread (Ch/hr)** | **2** | **-** | **70** |
| **H/UA (BTU/Ft2)** | **300** | **-** | **50** |
| **Fireline Intensity** | **25** | **-** | **500** |

| National Fire Danger Rating System | | | |
|---|---|---|---|
| **Model-Slope-Herbacious-Climate Class** | **C-1-P-3** | | |
| **Buring Index Component** | **5** | **-** | **40** |
| **Energy Release Component** | **5** | **-** | **25** |
| **Spread Component** | **2** | **-** | **12** |

| National Fire Behavior Fuel Model | 4 (Southern Rough >6') | | | 7 (Southern Rough <6') | | |
|---|---|---|---|---|---|---|
| | ***LOW*** | | ***HIGH*** | ***LOW*** | | ***HIGH*** |
| **Temperature** | **30** | **-** | **100** | **30** | **-** | **100** |
| **Relative Humidity** | **40** | **-** | **80** | **20** | **-** | **80** |
| **Wind Speed (mid-flame)** | **1** | **-** | **4** | **1** | **-** | **6** |
| **Spread (Ch/hr)** | **3** | **-** | **50** | **2** | **-** | **60** |
| **H/UA (BTU/Ft2)** | **2400** | **-** | **2700** | **400** | **-** | **600** |
| **Fireline Intensity** | **300** | **-** | **1000+** | **20** | **-** | **500** |

| National Fire Danger Rating System | | | | | | |
|---|---|---|---|---|---|---|
| **Model-Slope-Herbacious-Climate Class** | **D-1-P-3** | | | **D-1-P-3** | | |
| **Buring Index Component** | **5** | **-** | **40** | **15** | **-** | **80** |
| **Energy Release Component** | **5** | **-** | **25** | **20** | **-** | **60** |
| **Spread Component** | **2** | **-** | **12** | **1** | **-** | **30** |

| National Fire Behavior Fuel Model | 8 (Hardwood Litter) | | | 9 (Pine Litter) | | |
|---|---|---|---|---|---|---|
| | ***LOW*** | | ***HIGH*** | ***LOW*** | | ***HIGH*** |
| **Temperature** | **30** | **-** | **100** | **30** | **-** | **100** |
| **Relative Humidity** | **20** | **-** | **80** | **20** | **-** | **80** |
| **Wind Speed (mid-flame)** | **1** | **-** | **10** | **1** | **-** | **10** |
| **Spread (Ch/hr)** | **1** | **-** | **7** | **1** | **-** | **40** |
| **H/UA (BTU/Ft2)** | **150** | **-** | **300** | **300** | **-** | **500** |
| **Fireline Intensity** | **1** | **-** | **30** | **6** | **-** | **300** |

| National Fire Danger Rating System | | | | | | |
|---|---|---|---|---|---|---|
| **Model-Slope-Herbacious-Climate Class** | **R-1-P-3** | | | **E-1-P-3** | | |
| **Buring Index Component** | **15** | **-** | **30** | **10** | **-** | **50** |
| **Energy Release Component** | **10** | **-** | **30** | **10** | **-** | **35** |
| **Spread Component** | **1** | **-** | **5** | **1** | **-** | **15** |

## Prescribed Burn Plan Format

# BIG THICKET NATIONAL PRESERVE

# Prescribed Burn Plan

***Turkey Creek Unit - Pitcher Plant Trail***
***FMU 3201 & 3202***
***191 Acres***

Prepared By: ____________________ __/__/__

Reviewed By: ____________________ __/__/__
Fulton Jeansonne - Fire Ecologist

Reviewed By: ____________________ __/__/__
DW Ivans - Rx Fire Specialist

Reviewed By: ____________________ __/__/__
- Chief RM

**External Technical Review:** ____________________ __/__/__

Recommended:__________________ ___/___/___
David F. McHugh - FMO

Approved: ____________________ ___/___/___
Art Hutchinson - Superintendent

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## B. Executive Summary

The act establishing the Big Thicket National Preserve states: "...shall be administered...in a manner which will assure their natural and ecololgical integrity in perpetuity...." Congress's intent was to assure the preservation of numerous representative areas typical of the Big Thicket region and to protect and preserve the natural values that make this 'biological crossroads' unique in the United States. Many of the vegetative communities which comprise the 'biological crossroads' require fire at frequent intervals to maintain stand structure, species balance and diversity, and ecosystem function.

The Resource Management Plan states that fire has significantly influenced the evolution of ecosystems throughtout the Southeast Coastal Plain and has maintained a diverse mosaic of vegetative communities, particularly in the Big Thicket region. The absence of fire has disrupted the natural processes of plant succession that was dependant upon periodic interruption by wildfire. Restoring fire's role as a dynamic force that shapes the vegetative structure will restore the conditions that occurred in the natural forest of the Big Thicket. The management of wildland fires, including the judicious use of planned ignitions to restore and maintain the ecological integrity...in a manner which minimizes the risk to persons, property, and other resources is the primary purpose of this planning document...A second objective is to minimize the risk of wildland fires escaping the preserve by conducting hazardous fuel reduction burns along specific boundaries in a manner consistant with the preceding objective.

The preserve's Fire Management Plan states that the purpose of the fire program is to restore vegetative 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 grass/forb groundcover.

The potential vegetation types in the Turkey Creek Unit were described by Harcombe and Marks (1979) . This burn area targets Wetland Pine Savannah (Pitcher Plant Bog), and Upland Pine. Less flammable vegetation types are included within the burn perimeter as natural barriers are used.
Fire Management Unit 3201 [east of road] has been prescribed burned 7 times since 1983, with an intended 3-year rotation period. The last burn was conducted 3/11/2002.
FMU 3202 [west of road] has been prescribed burned 8 times since 1980 (3 year rotation), with the last burn conducted 2/18/2002. The switch to a 2-year rotation is possible due to increasing grass, and will accelerate restoration.
Fuels are predominately grass and pine litter, with small brush adding intensity.
Understory brush reduction goals are being achived.

## C. Description of Prescribed Fire Area

1. Area Description: The Rx fire area includes the Pitcher Plant Trail area north of Muscadyne Oil Road to the drainage, and east across CR 4850 to the preserve boundary. The trail parking area is the southern edge of the burn.
2. TFS Grid 232 - Y- 5,12, 15
   Lat. 30 35' 15"
   Long 94 20' 10"
3. 191 acres (total within perimeter)
4. Description of Unit Boundaries:
   NORTH - Intermittant Drainage, Handline along pasture
   EAST - County Road 4850 (dirt - serves scattered homes) and handline along boundary
   SOUTH - Muscadyne Oil Road (Dirt)
   WEST - Intermittant Drainage
5. Vegetation Types
   The Pitcher Plant Bog (9 acres) is designated as Wetland Pine Savannah and is an open grassy area with scattered pine trees. Some brush occurs, but is not highly flammable. A Baygall (intermittant drainage) west of the bog provides a natural barrier. Two smaller 'bogs' occur east of the road.

   The area east of the county road is designated as Upland Pine, and has a mature pine overstory, low density brush understory, and a grass & pine litter ground cover. The northeast corner has an abandoned farmfield (18 acres) that has a dense pine canopy with a heavy pine litter ground cover. A 'swampy' hardwood area ( .1 ac.) along the northern boundary feeds a Baygall (with intermittent stream). It passes southwest through the burn area, crosses the county road, and becomes a natural barrier for the Pitcher Plant Bog.
   The eastern area also contains a Cypress pond (.3 acre) and a 'Mayhaw Pond' (1.5 acres).

| Veg Type | Fuel Model | % of Unit | Acres | Estimated Tons/Acre (burnable) |
|---|---|---|---|---|
| Savannah | 2 | 5 % | 9 | 4 |
| Upland Pine | 7 | 45 % | 85 | 5 |
| Upper Slope Pine Oak | 7 | 10 % | 19 | 5 |
| Old Field | 9 | 12% | 23 | 3 |

***Approximately 55 acres [ 28%] is non flammable baygall.***

***SEE VEGETATION MAP IN APPENDIX***

# D. Goals and Objectives

1. Restore Nature Processes - This burn is a continuation of burns used to restore a fire dependant ecosystem. Frequent burns will reduce the brush, and promote a grass/forb ground cover. The canopy will eventually convert to Longleaf, as only their seedlings will survive frequent fire.

2. Hazardous Fuel Reduction - Reduce the shrub fuel loading that can produce a high intensity headfire, and create spotting onto adjacent timberlands or private lands with houses.

| SPECIFIC OBJECTIVES | CHANGE (within 1 year) | RESULTS |
|---|---|---|
| Upland Pine | Canopy - remove up to 25% mature pine<br>Brush - 40 to 80% top-kill<br>Promote grass/forbs over 60 % area | |
| Savannah | Brush - 40 to 80% top kill<br>Consume >30% grass/forb loading and promote increased vigor | |
| Upper Slope Pine Oak | Top Kill brush 20 to 80 %<br>Kill 25 to 100% Loblolly Pine seedlings | |
| Old Field | Canopy - remove 1 to 20% mature pine<br>Consume 25% litter layer and promote grass/forb growth | |

## Range of Acceptable Results

The Upland Pine area contains a mature pine overstory with scattered brush understory. It can produce a moderate intensity fire. Scorching of the canopy is expected, but mortality should be minimized. Targeted brush reduction will promote grass/forb developement.

The Pitcher Plant Bog will be headfired to produce a uniform, moderate intensity fire in grassy fuels. This will push the fire into pockets of low-flammability brush. Soil moisture and standing water in the savannahs will affect consumption, and may produce unburned pockets (up to 30' diameter). Damage to the boardwalks on the Pitcher Plant Trail will be prevented.

The Upper Slope Pine Oak (mixed pine / hardwood) north of the trail parking area will be burned with a moderate intensity fire. Some canopy tree mortality (<10%) is acceptable with maximum 'hole' size of < 1 acre. Reduction of the litter & duff layers is a goal, but high soil moistures may limit consumption to newly fallen needles. Unburned pockets are also expected.

The 'Old Field' area has a dense pine overstory which must be reduced to 60 - 80 BA. However, fire along will not accomplish this, as the light surface fuels produce a low intensity burn. Increasing the sunlight to the forest floor and removing the litter & duff layers will promote grass/forb developement.

# E. Risk Management Summary

This is a low complexity / low risk prescribed burn due to the following factors:

Historic Fire Mgmt: This area has been previously burned, under similar conditions, without control problems.

Fuels: Fuel levels are low (2-year rough), and will produce a short duration fire with low risk of a spotfire developing downwind.

Size: The burn block is divided by a county road, hiking trail, and ATV trail along the boundary. It has excellant accessibility.

Urban/Interface: Several homes are located nearby. A thin strip of heavy brush separates the Pitcher Plant trailhead form the south boundary, with an adjacent residence.

**Control Features: FMU 3201**

NORTH - The burn will be contained by a handline along the boundary. Private pasture lands, with several homes, are adjacent. Northeast winds will push the fire away from the line.

WEST - County Road 4850 (sand 2-lane) provides an established control line. FMU 3202 is west of the road and provides additional buffer.

SOUTH - The southern handline is on the boundary, with a commercial pine plantation adjacent. The pines are 25' to 35' tall with thick brush understory. Southeast winds will push the fire away from the line. Under northeast winds a burnout will buffer the control line, and an engine hoselay will support ignition/holding operations.

EAST - A handline will be constructed along the boundary. Ignition and holding will be supported by ATV units. Prescribed winds will push the fire away from the line, reducing control actions.

**Control Features: FMU3202**

NORTH / WEST - A Intermittent stream and Baygall provide a natural barrier. The area north of the stream was recently burned and is not expected to carry a fire.

SOUTH - The Muscadyne Oil Road (dirt - single lane) will be raked of needles, and provides an excellent control line with ready access.

EAST - Country Road 4850 (sand - two lanes) is well maintained. Prescribed winds will push the fire away from the road.

A Dozer / Plow will be on-scene as suppression equipment for escapes.

**Prescribed Fire Complexity Rating Worksheet**

| F | Complexity Element | L | M | H |
|---|---|---|---|---|
| Primary Factors | 1. Life and Safety | X | | |
| | 2. Threats to Boundaries | | X | |
| | 3. Management Organization | | X | |
| | 4. Political Concerns | X | | |
| | *SUBTOTAL OF PRIMARY FACTORS* | 2 | 2 | 0 |
| Secondary Factors | 5. Objectives | X | | |
| | 6. Fuels and Fire Behavior | X | | |
| | 7. Air Quality Values | X | | |
| | 8. Improvements | | X | |
| | 9. Logistics | X | | |
| | 10. Natural, Cultural and Social Values | X | | |
| | 11. Tactical Operations | X | | |
| | 12. Interagency Coordination | X | | |
| | *SUBTOTAL OF SECONDARY FACTORS* | 7 | 1 | 0 |
| | TOTAL COUNT OF COMPLEXITY VALUES | 9 | 3 | 0 |

**Qualifications Determination Table:**

| | Prescribed Fire Burn Boss Type 2 (RXB2) | Prescribed Fire Burn Boss Type 1 (RXB1) |
|---|---|---|
| Primary Factors rated "H" | Less than 2 | 2 or more |
| | AND | OR |
| Total Count rated "H" | Less than 4 | 4 or more |
| | | OR |
| | **Minimum** required on all prescribed fires. | When deemed appropriate by the agency administrator or unit Fire Management Officer. |

Prescribed Fire Burn Boss Level Indicated (check one): RXB1 ____ RXB2 XXXXX

PREPARED BY:____________________ Date:____________

APPROVAL BY:____________________ Date:____________
Agency Administrator

REVIEWED BY:____________________ Date:____________
(Burn Boss immediately prior to burning)

# G. ORGANIZATION

The described organization is the minimum resources required to implement the project under the prescribed conditions. All non-preserve resources will be ordered through the Texas Interagency Coordination Center. Specific resources will be identified in the Incident Action Plan (Shift Plan) prepared prior to each operational period.

**IGNITION & BURN-OUT --- no night shift is expected**

Overhead Personnel
1 Burn Boss (RXB2)
1 Engine Boss (ENGB)
2 Squadboss (FFT1)

Equipment
Eng 73 or 74

Line Staff
Eng Crew - 1 Firefighter (FFT2)
Holding - 6 Firefighters (FFT2)
Ignition - 2 Firefighters (FFT2)
Scout - 1 Firefighter (FFT1)

3 ATV pump units
2 drip torches - 5 gal fuel

Monitor
Fire Monitors - 1 FEMO
1 FFt2

Security
Ranger

Patrol Vehicle

**Contingency Reserve**

Dozer / plow

PATROL & MOP-UP

Overhead Personnel
1 Engine Boss (ENGB)

Eng 73 or 74

Line Personnel
Mop-up - 4 Firefighters (FFT2)

2 ATV pump units
Chainsaw

## H. ESTIMATED PROJECT COSTS

| | |
|---|---|
| **Base Funded Costs (includes ONPS and FIREPRO)** | 4150 |
| ***NON-Base Costs (FIREPRO)*** | 2945 |
| ADDITIONAL PROJECT COSTS | |
| TOTAL PROJECT COSTS | 7095 |
| COSTS / ACRE | 37.34 |

| Phase | Planning | Preparation | Execution | Evaluation |
|---|---|---|---|---|
| Personnel | 333 | 903 | 4337 | 1219 |
| Equipment | 22 | 39 | 169 | 47 |
| Supplies | | 2 | 25 | |
| Aircraft | | | | |
| Costs | 354 | 944 | 4530 | 1266 |

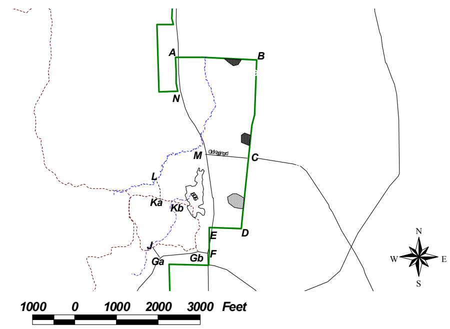
# I. Scheduling

Proposed Ignition Date.......FALL or WINTER - 2004

Project Duration..........Ignition & Burn Out - 2 Day
..........Mopup - 2 Days

No Burn Days ............ NONE

## J. PreBurn Considerations




1. Mow fenceline A-B; Rake Handline B-C-D-E; Kb-Ka-L, and J-Ga-Gb
   Blow drainage J-Kb
2. Clear around snags 200' in
3. Clear fuels around restroom
4. Pre-Burn Day: Post temporary signs (trail closed, and burn signs), and contact adjacent homes.
5. Burn Day [FMU3201] - lay hose E-D if N-Ne-E winds are forecast

## K. Prescription
**FMU 3201 / 3202**

Temperture **40 - 90**
Relative Humidity **< 20**
Dead fuel 0 to 1/4" dia. - 1 hr Time Lag Fuel **4 - 8**
Dead fuel 1/4 to 1/2" dia. - 10 Hr Time Lag Fuel **6 - 28**
Dead fuel 1/2 to 1" dia. - 100 Hr Time Lag Fuel **14 - 28**
Wind **NNE - East - SSE**
**1-12 mph (surface) gust<16 mph**

| ***HEADFIRE*** | Fuel Model 2 Savannah COOL | HOT | Fuel Model 7 Old Field COOL | HOT | Fuel Model 9 Upland Pine COOL | HOT | Fuel Model 4 Timberland COOL | HOT |
|---|---|---|---|---|---|---|---|---|
| WIND *mph* | 1 | 3 | 1 | 3 | 1 | 3 | 0 | 1 |
| Rate of Spread *chains/hr* | 4 | 21 | 5 | 22 | 1 | 5 | 6 | 9 |
| BTU/sq ft *btu* | 464 | 524 | 485 | 574 | 342 | 416 | 2687 | 3093 |
| Flame Length *feet* | 2 | 5 | 3 | 6 | 1 | 2 | 6 | 8 |
| Spotting Distance *feet* | 636 | 1055 | 672 | 1128 | 363 | 636 | 1226 | 1426 |
| Scorch *feet* | 8 | 25 | 10 | 28 | 3 | 7 | 65 | 50 |

| ***FLANKFIRE*** | COOL | HOT | COOL | HOT | COOL | HOT | COOL | HOT |
|---|---|---|---|---|---|---|---|---|
| WIND *mph* | 0 | .5 | .2 | .5 | 0 | 0 | 0 | .1 |
| Rate of Spread *chains/hr* | 2 | 4 | 2 | 4 | <1 | <1 | 6 | 9 |
| BTU/sq ft *btu* | 464 | 524 | 485 | 574 | 342 | 416 | 2687 | 3093 |
| Flame Length *feet* | 1.5 | 2.5 | 1.7 | 2.5 | .7 | 1.1 | 6 | 8 |
| Scorch *feet* | 4 | 7 | 4 | 7 | 1.5 | 1.3 | 35 | 46 |

| ***BACKING FIRE*** | COOL | HOT | COOL | HOT | COOL | HOT | COOL | HOT |
|---|---|---|---|---|---|---|---|---|
| WIND *mph* | 0 | 0 | 0 | .1 | 0 | 0 | 0 | 0 |
| Rate of Spread *chains/hr* | 1 | 2 | 1 | 2 | <1 | <1 | 6 | 9 |
| BTU/sq ft *btu* | 464 | 524 | 485 | 574 | 342 | 416 | 2687 | 3093 |
| Flame Length *feet* | 1 | 2 | 1.4 | 2 | <1 | <1 | 6 | 8 |
| Scorch *feet* | 3 | 4 | 4 | 4 | 1 | <1 | 26 | 34 |

The ignition plan utilizes a perimeter flank-firing pattern, with the intent of adjusting the fire intensity by varying the amount of headfire produced. The fire is expected to develop a uniform fire front (3' to 6' flame lengths is typical) which spreads at a consistant rate. These are fully sheltered, open stands (under a mature canopy), so wind reduction is significant (.2 to .3). The adjacent timberlands are dense stands with a wind reduction factor of .1.

***SEE Fire Behavior Chart in Appendix***

## L1. IGNITION and HOLDING ACTIONS
**FMU 3202 (Pitcher Plant Bog)**
***(see ignition maps in operational plan)***

Ignition of the perimeter will be under the control of the Squadboss conducting holding operations, and will be hand ignited by drip torch. The ignition map is in the shift plan, and will be covered at the pre-burn briefing.
All personnel will receive a copy.
The burn will take 1 day for ignition and burnout, with mop-up actions lasting 1 additional day.

TEST FIRE: A test fire will be conducted to check fire behavior during the afternoon of the day preceeding the burn. A short handline will be constructed, and a room sized area ignited by drip torch. A engine will be on-scene to control the test fire (100% mop-up).

IGNITION - SE WINDS: Ignition will begin in the northeast corner and proceed south along the county road (M-E). This will create a flanking fire of moderate intensity. The rate of ignition will adjust the amount of headfire produced, allowing the intensity to be adjusted. Ignition will simultaneously burn out along the western control lines (L-Ka-Kb) including burning out around the trail boardwalk [use ATV units to prevent damage]. The final stage of ignition is completing perimeter firing along the drainage [Kb-J-Ga], Muscadyne Road (Ga-F), and the county road (F-E).

IGNITION - NE WINDS Ignition will begin in the southwest corner of the burn at the junction of Muscadyne Road and a intermittent drainage, and head east to the county road (J-Ga-F, hold with engine). The drainage will be fired simultaneously north to the trail (J-Kb, hold with handtools). This will create a long backing fire of low intensity.
The second stage is burning-out around the trail boardwalk (protect with ATV Units).
The final stage of firing involves burning out the intermittant drainage (Ka-L-M) and the county road north to the drainage (F-E-M). Northeast winds will push the fire away from the road. Firing off the road may be necessary to lower intensity, reducing canopy tree mortality near the road.

MOP-UP: Residual burning will be allowed to consume all light surface fuels. Stumps and heavy fuels within 25' of the boundary or roads will be extinguished. Burning snags that are within 4-times their height to the perimeter will be extinguished (if possible), or cut if risk to personnel is evaluated and mitigated.

## L2. IGNITION and HOLDING ACTIONS

**FMU 3201 (Upland Pine area - east of county road)**
***(see ignition maps in operational plan)***

Ignition of the perimeter will be under the control of the Squadboss conducting holding operations, and will be hand ignited by drip torch. The ignition map is in the shift plan, and will be covered at the pre-burn briefing.
All personnel will receive a copy.
The burn will take 1 day for ignition and burnout, with mop-up actions lasting 1 additional day (reduced staffing).

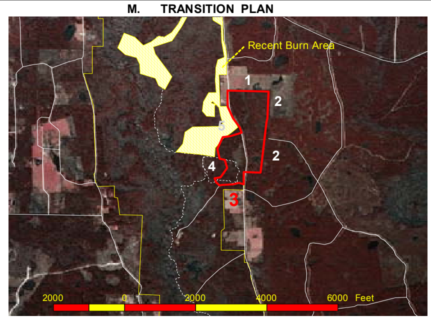
TEST FIRE: A test fire will be conducted to check fire behavior during the afternoon of the day preceeding the burn. A short handline will be constructed, and a room sized area ignited by drip torch. A engine will be on-scene to control the test fire (100% mop-up).

IGNITION - SE WINDS Ignition will begin in the northwest corner and proceed East along the boundary (A-B; pasture adjacent - hold with ATV Units). This will create a backing fire of low intensity. Strip firing will be used to create a buffer to prevent spotting into the pasture. Ignition will simultaneously head south along the county road (A-N-M; hold with engine).
The second stage of ignition includes firing the east boundary (B-C-D, hold with ATV units) which will create a long flanking fire of moderate intensity; and continuing ignition south along the county road.
The final stage of ignition is firing the southern boundary (D-E). This will promote rapid burnout as multiple lines of fire pull together. The increased intensity balances the rising relative humidity during late afternoon.

IGNITION - NE WINDS Ignition will begin in the northwest corner of the burn and proceed east along the southern boundary (E-D, protect with ATV Units and hoselay), and north along the county road (E-M, protect with engine).
This will build a long flanking fire of moderate intensity.
The second stage of ignition builds intensity as the eastern boundary is fired (D-C-B, hold with ATV Units).
The final stage of firing involves burning out the northwest corner (M-N-A east to the intermittant drainage, strip firing in litter fuels) and the northern boundary east to the drainage. Northeast winds will push the fire away from the pasture.

MOP-UP: Residual burning will be allowed to consume all light surface fuels. Stumps and heavy fuels within 25' of the boundary or roads will be extinguished. Burning snags that are within 4-times their height to the perimeter will be extinguished (if possible), or cut if risk to personnel is evaluated and mitigated.

## M. TRANSITION PLAN




1. Fire escaping north through a mowed pasture is unlikely. A wildfire will be declared if size exceeds 1 acre, or a home is threatened. If containment is not expected within 1/2 hour, a Texas Forest Service Dozer & Supervisor, and the Warren VFD will be requested. Command will transfer to TFS after briefing. The 6-wheel ATV engine, Coop Dozer, 1 Squad Boss and 4 firefighters will be available for wildfire duties. The remaining Rx resources will secure the prescribed burn.
2. Recently logged timberlands and a young plantation. A secondary control line will be established. The adjoining land may be burned in cooperation with Temple Inland. An escape we be declared a wildfire if Temple Inlands Goals are not being achieved, and a Texas Forest Service Dozer will be requested. Command will transfer to TFS after briefing. The Coop Dozer, 1 Squad Boss and 3 firefighters will be available for wildfire duties. The remaining Rx resources will suspend the prescribed burn until control is achieved.
3. An escape that threatens homes south of the Muscadyne Road will be declared a wildfire, and the Warren VFD requested. The NPS engine, Coop Dozer, 1 Squad Boss, and 6 firefighters will be available for assignment. The remaining resources will secure the Rx burn until control is achieved.
4. HOLDING AREA: The area west of the Pitcher Plant Bog is a research area used by Rice University. Any escape will be suppressed by Minimum-Impact-Suppression-Tactics, no wildfire will be declared.
5. The area north of the drainage was prescribe burned during the summer 2003, and will not carry a fire.

## N. PROTECTION OF SENSITIVE FEATURES

Review of a 'Gazetteer of Archeological Sites and Cultural Resources Survey' by Moore Archeological Consulting (Houston, TX) did not reveal any sites.

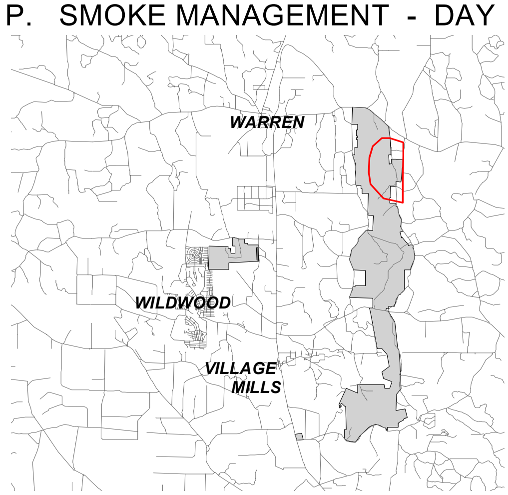
Resource Management staff will review the burn plan and determine if any special plant or wildlife management considerations are necessary.

NO ATV traffic will be allowed in the pitcher plant bog (s).

## O. PUBLIC and FIREFIGHTER SAFETY

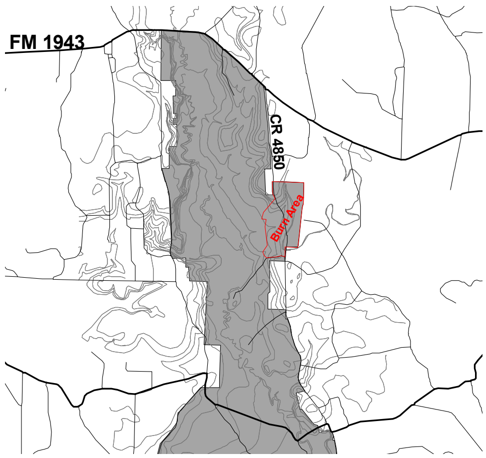
1. The Pitcher Plant Trail will be closed during the burn, and the trail checked for hikers prior to ignition.
2. Smoke will be monitored along CR 4850 and traffic controlled if driver visibility is impacted. This road serves a few scattered houses, and carries very few cars.
3. A safety briefing will be conducted prior to each operational period. Personnel will be advised of ignition pattern, holding actions, look-outs, communications, escape routes & safety zones.
4. All line personnel will wear standard Personnel Protective Equipment, and carry a fire shelter & tool at all times.
5. All standard firefighting safety rules will be enforced (ref. Fireline handbook).
6. Fire Monitoring staff will obtain clearance from Burn Boss before entering an unburned area during ignition or burnout, and will maintain effective communications with ignition and holding teams.

## P. SMOKE MANAGEMENT - DAY




MITIGATION:
This fire will involve predominately flashy fuels (grass/litter & light brush). Smoke production will only occur for several hours, and will produce a short duration, light gray smoke plume. The area supports scattered rural housing. The smoke will dissipate over timber lands before reaching high density housing on US 69. Smoke impacts will be monitored on CR 4850, and any traffic control will be brief.

# P2. SMOKE MGMT NIGHT




MITIGATION:
Recent rains have soaked the heavy fuels and soils. As the fine fuels will burn out rapidly, no significant night time smoke production is expected. Any heavy fuels within 25' of the county road will be extinguished. Smoke movement to FM 1943 is unlikely due to gentle topographic gradients.

## Q. INTERAGENCY - PUBLIC CONTACT

1. Adjacent homeowners will be contacted during the line construction phase.
2. Preserve staff will be notified by email, attendance at meetings, and briefings on approaching burn window
3. The following persons/agencies will be notified the day before ignition:
   - A. Texas Forest Service Dispatch
   - B. Texas Interagency Coordination Center (TICC)
   - C. Nat'l Weather Service - Spot Forecast thru TICC
   - D. Texas Natural Resourses Consesrvation Commission
   - E. Preserve Staff - Superintendent - Chief Ranger - Chief of Resources Management
   - F. Residents near burn area
   - G. Tyler County Sheriff's Office
4. The following persons/agencies will be notified the morning of the burn:
   - A. Texas Forest Service Dispatch (TFS)
   - B. Texas Interagency Coordination Center
   - C. Nat'l Weather Service thru TICC
   - D. Preserve Staff (see above)
   - E. Tyler County Sheriff's Office

## R. MONITORING

1. The Fire Ecologist and fire monitors will collect and document weather conditions, smoke, and fire behavior observations in accordance with the preserve's Monitoring Plan. They will review the burn plan, attend the pre-burn meeting and maintain radio contact when within the burn.
2. General weather patterns will be tracked by the RAWS unit in Turkey Creek (3 miles South).
3. A spot weather forecast will be requested the day before burn ignition, and each day of active burning.
4. The Fire Ecologist will prepare a post fire report that summarizes weather and fire behavior observations, a fire intensity / burn pattern map, and initial observations of first order fire effects.

## S. POST FIRE REHABILITATION

Hand built fireline will not require rehabilitation; any dozer line will have the berms rolled back over, and damaged brush or small trees removed. Signs will be removed during mop-up.

## T. POST FIRE REPORTS

1. The Burn Boss will prepare an Individual Fire Report, DI-1202, which will include a map and narrative, within 10 days after declaring the fire out.
2. The Fire Management Officer will prepare an accomplishment report in the NPS - Shared Application Computer System (SACS).
3. The Fire Program Assistant will prepare a financial statement, enter the DI-1202 into SACS, and maintain a project file that includes the fire report, burn unit plan, shift plans, spot weather forecast, and costs.
4. The Fire Ecologist will prepare a summary of weather, fire behavior, and smoke observations within 2 weeks after the fire.

## U. APPENDIX

| | COMMENTS | By/When |
|---|---|---|
| Fire Risk Worksheets | | |
| Fire Behavior Chart | | |
| Resources Wrksht | | |
| Vicinity Map | | |
| Vegetation Map | | |
| Arch/Cultural Clearance | | |
| Agency Approval Checklist | | |
| DRAFT Shift Plan | | |

| PRE-BURN PREP CHECKLIST | By/When |
|---|---|
| Burn Unit prep work completed | |
| Research Plot preburn measurements | |
| Adjacent Residents Notified - during prep work | |
| Supt & Division Chiefs - 3 to 5 days & 1 day before | |
| Neighbors Notified - 1 day before | |
| Warren VFD Notified -1 day before | |
| Corner Signs Posted - 1 day before | |
| TICC Notified - 1 day before & burn day | |
| TFS Notified - 1 day before & burn day | |
| Tyler Cty SO Notified - burn day | |
| Burn Signs Posted - burn day | |
| Spot Weather Forecast (TICC) each burn day | |

## Agency Administrator
## Go/NoGo Pre-ignition Approval

Prescribed Fire Name ____________________ Date: ______________

The Agency Administrator's Go/NoGo Pre-Ignition Approval is the first of two Go/NoGo decisions that must be completed before a presrcibed burn can be implemented. The Adgency Administrator's Go/NoGo Pre-Ignition Approval is the final managment approval prior to execution of the prescribed fire and evaluates wheather compliance requirements, prescribed fire plan elements, and internal and external notifications have been completed. The Agency Administrator's Go/NoGo Pre-Ignition Approval is good for 30 days. If ignition of the prescribed fire is not initiated prior to the expiration date determined by the agency administrator, a new approval will be required.

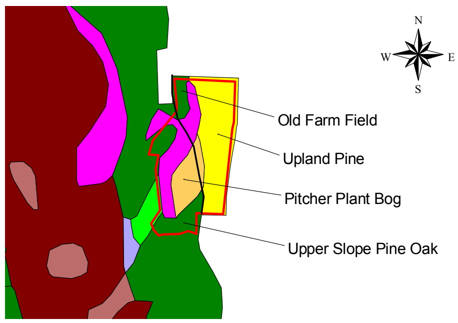
| *KEY ELEMENTS OF DISCUSSION:* | Yes | No |
|---|---|---|
| Is the prescribed fire plan up to date? | | |
| Have all complience requirements been completed? (Cultural, T&E Species, Smoke Mgmt) | | |
| Is Risk Management in place and the residual risk acceptable? [Rx Fire Mitigation Table and Complexity Rating Guide with rational and mitigations identified] | | |
| Will all elements of the Rx fire plan be met? (Prep work, mitigation, weather, organization, prescription) | | |
| Have all internal and external notifications and media releases been completed? | | |
| Are key park staff fully briefed, and understand the implementation of the prescribed fire? | | |
| OTHER: | | |
| | | |
| | | |

Recommended By: ______________________ Date ____________
FMO / Burn Boss

Approved By: ______________________ Date ____________
Superintendent

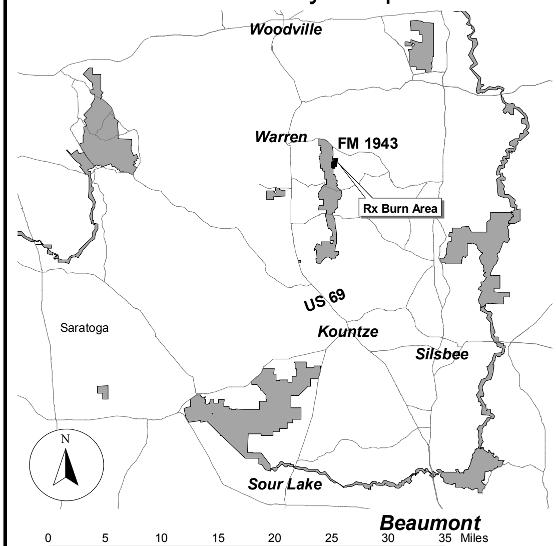
Approval Expires: __________ (May not be more than 30 days after approval date).

VEGETATION COMPOSITION

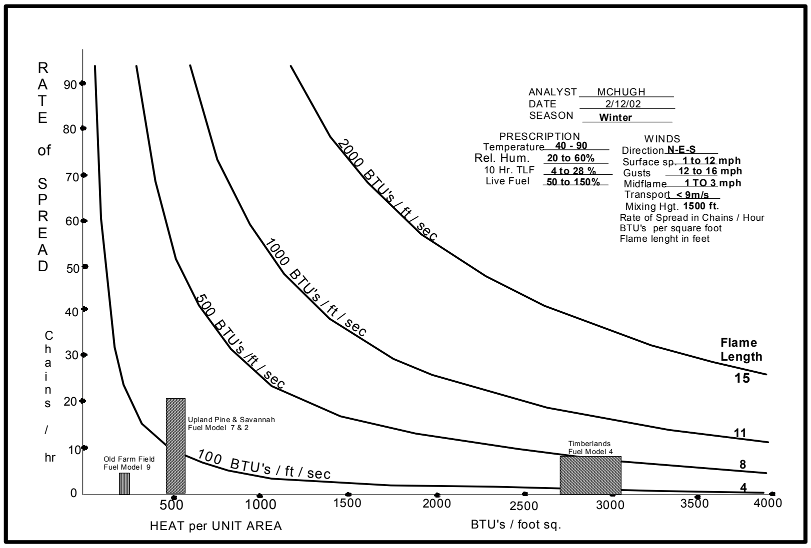



| TYPE_Pitcher Plant Savannah_(5 %) Fuel Model__2___ | Upland Pine - 40% and Upper Slope Pine Oak - 4 % (FM 7) | Old Farm Field Dense Pine (FM9) |
|---|---|---|
| CANOPY Height 50' 12" dbh; Closure __5 % Species_Scattered Longleaf Pine | Height 80 - 100'; Closure 70 % Species: Longleaf & Loblolly Pine 6" to 18" dbh | Height _100'_, Closure 90 % Species_Loblolly Pine 10" to 18" dbh |
| MIDLEVEL - Height _20-40'; Closure <1% Species: Blackgum | Height _25' - 85' Closure <1% Species: Scattered Oaks, Gum | Height _25' - 65' Closure: scattered Species: Oak & Gum |
| UNDERSTORY - Height _4'_, Closure 15 % (pockets 15' dia.) Species: White Bay, Wax Myrtle | Height _2'_, Closure 10 % Species: Youpon, Wax Myrtle | Height _3' _, Closure 15 % Species_Youpon, Wax Myrtle |
| GROUND COVER Height _8"-18", Continous Species_Grass/Forbs, Shrub seedlings | Height _8"_;, Continous Species: Needles & grass | Height _.5", Continous Species Leaf - Needle Mat |
| | USPO: Slightly more Hardwoods in mid-story; leaves reduce flamability of litter. | **Small shrub component will add some intensity** |

Vicinity Map




Turn left in Warren on FM1943 and drive 4.3 miles to the east side of the Turkey Creek Unit. Look for the Pitcher Plant trail sign, and turn south (right) on FM 4850. Drive 2 miles to the trail parking area (Staging).



FMU 3201 and 3202

| Hazard Element | Hazard Probability | | | Potential Consequences | | | * Risk |
|---|---|---|---|---|---|---|---|
| | L | M | H | L | M | H | (Exhibit 4) |
| 1. Environmental Data | | | | | | | |
| a. Seasonal severity | X | | | X | | | L |
| b. Fire Behavior | X | | | X | | | L |
| c. Fuels | X | | | | X | | L |
| d. Weather | | X | | X | | | M |
| e. Topography | X | | | X | | | L |
| 2. Agency Values | | | | | | | |
| a. Ecological and Environmental Considerations | X | | | X | | | L |
| b. Social and Cultural Values | X | | | X | | | L |
| c. Project Duration and Logistics | X | | | X | | | L |
| d. Smoke and Air Quality Management | X | | | X | | | L |
| 3. Public Values | | | | | | | |
| a. Land use values | | X | | X | | | M |
| b. Dwellings | | X | | X | | | M |
| c. Non-dwellings | X | | | X | | | L |
| 4. Human Factors | | | | | | | |
| a. Firefighter | X | | | X | | | L |
| b. Public | | X | | X | | | M |
| c. Fire Management | X | | | X | | | L |

Prescribed Fire Risk Mitigation Table — Project FMU3201 +02

| Hazard Element | Risk | Mitigations / Controls<br>Briefly explain what actions will be taken relative to each hazard element that will reduce the risk. | Residual Risk | Reference:<br>In Prescribed Fire Plan |
|---|---|---|---|---|
| 1. Environmental Data | | | | |
| a. Seasonal Severity | L | None needed | L | |
| b. Fire Behavior | L | Intensity will be controlled by the rate of ignition on the upwind perimeter. | L | K1: Ignition and Holding Actions Shift Plan - Ign Maps |
| c. Fuels | L | None needed | L | |
| d. Weather | M | Perimeter ignition pattern reduces the amount of fire adjacent to the line at any one time, and promotes rapid burn out of the line if a sustained wind shift occurs. | L | Ignition Plan |
| e. Topography | L | None Needed | L | |
| 2. Agency Values | | | | |
| a. Ecological and environmental considerations | L | None Needed | L | |
| b. Social and Cultural values | L | None Needed | L | |
| c. Project duration and logistics | L | None Needed | L | |
| d. Smoke and Air Quality Management | L | None Needed | L | |

Prescribed Fire Risk Mitigation Table — Project FMU3201 +02

| Hazard Element | Risk | Mitigations / Controls<br>Briefly explain what actions will be taken relative to each hazard element that will reduce the risk. | Residual Risk | Reference:<br>In Prescribed Fire Plan |
|---|---|---|---|---|
| 1. Environmental Data | | | | |
| a. Seasonal Severity | L | None needed | L | |
| b. Fire Behavior | L | Intensity will be controlled by the rate of ignition on the upwind perimeter. | L | K1: Ignition and Holding Actions Shift Plan - Ign Maps |
| c. Fuels | L | None needed | L | |
| d. Weather | M | Perimeter ignition pattern reduces the amount of fire adjacent to the line at any one time, and promotes rapid burn out of the line if a sustained wind shift occurs. | L | Ignition Plan |
| e. Topography | L | None Needed | L | |
| 2. Agency Values | | | | |
| a. Ecological and environmental considerations | L | None Needed | L | |
| b. Social and Cultural values | L | None Needed | L | |
| c. Project duration and logistics | L | None Needed | L | |
| d. Smoke and Air Quality Management | L | None Needed | L | |

ADEQUATE HOLDING RESOURCES WORKSHEET FOR Rx FIRE

Project Name: FMU 3201 & 3202 — Fuel Models Inside Project Area: FM 7 Upland Pine
Prepared By/Date: McHugh 10/6/2003 — Fuel Models Outside Project Area: FM4 timberlands - NE winds

| Characteristics | Output type | Modeling Predictions Inside Project Area | Modeling Predictions Outside Project Area | Unit of Measure |
|---|---|---|---|---|
| CRITICAL | 1 Hr Fuel Moisture | 4 | 4 | % |
| FIRE INPUTS | Wind Speed | 3 | 1 | MPH |
| | Slope | 0 | 0 | % |
| KEY | Rate of Spread (ROS) | 4 to 22 | 6 to 9 | ch/hr |
| FIRE BEHAVIOR | Fireline Intensity | 485 to 575 | 2687 to 3093 | BTU/ft/sec |
| OUTPUTS | Flame Length | 1 to 6 | 6 to 8 | Feet |
| | Probability of Ignition | 70 | 70 | % |
| | Spotting Distance | 1055 | 1426 | Feet |
| | Scorch Height | 28 | 50 | Feet |
| FIRE SIZE | Projection Time | | 5 | Minutes |
| | Forward Spread | | 8 | Chains |
| | Backward Spread | | 0 | Chains |
| FIRE | Method Of Attack | line will be | rear | Head/Rear |
| CONTAINMENT | Max Escape Target | put in | 1 | Acres |
| | Max Containment Time | before | 5 | minutes |
| | Total Line Building Rate | ignition | 48 | Ch/hr |
| 1. Choose greater total line building rate from inside and outside the project area | | | 48 | Ch/hr |
| 2. Estimate potential number spot fires or slopovers at one time: | | | 1 | |
| 3. TOTAL LINE BUILDING RATE NEEDED (multiply line 1 times line 2) | | | 48 | Ch/hr |

Production Rates: **handbook** Ease of Access: POOR-FAIR-GOOD-**EXCELLENT**
(refer to fireline handbook other sources and local knowledge)

| On Site Organization | Total # Planned On Burn | Total # Dedicated to Prescribed Fire | Total # Available for Spot Fire or Slopover Control | | Line Building Production Rates | | Spot Fire Line Bldg Capacity |
|---|---|---|---|---|---|---|---|
| Overhead | 3 | 1 | 1 (plus dozer op) | X | 0 | ch/hr | 0 |
| Firing Crew | 2 | 0 | 2 | X | 0.7 | ch/hr | 1.4 |
| Holding | 6 | 2 | 4move to engines | X | | ch/hr | |
| Monitoring | 2 | 1 | 1 | X | 0.7 | ch/hr | 0.7 |
| Engine (Crew of 2) | 1 | | 2 engines - 7 crew | X | 10 & 15 | ch/hr | 25 |
| Scout | 1 | | on 2nd engine | X | | ch/hr | |
| Support Staff | | | | X | | ch/hr | |
| Other - Security | 1 | 1 | | X | | ch/hr | |
| Dozer (Type 4) | reserve | | 1 | X | 40 | ch/hr | 30 |
| 4. TOTAL CAPACITY | 16 | 5 | 7 | | | | 57.1 |
| TOTAL LINE BUILDING RATE NEEDED (from table above- Line 3) | | | | | | | 48 |
| 5. DETERMINATION OF ADEQUATE HOLDING RESOURCES (Line 4 minus Line 3) | | | | | | ch/hr | 9.1 |

If number on line 5 is positive then adequate holding forces will be available. If number is negative, more holding resources are needed.

This worksheet reflects an escaped fire south of burn into timberlands (dense pine plantation). A hoselay will be in place for rapid IA, and the Coop dozer on scene. County Road 4850 and a timber road provides 2 control features, so only a NE to SW fire

**ADEQUATE HOLDING RESOURCES WORKSHEET**
**FOR PRESCRIBED FIRE**

Project Name: FMU 3201 & 3202 | Fuel Models Inside Project Area: 7
Prepared By/Date: McHugh 10/06/2003 | Fuel Models Outside Project Area: FM 1 pastureland - SE wind

| Characteristics | Output type | Modeling Predictions Inside Project Area | Modeling Predictions Outside Project Area | Unit of Measure |
|---|---|---|---|---|
| CRITICAL | 1 Hr Fuel Moisture | 4 | 4 | % |
| FIRE INPUTS | Wind Speed | 3 | 5 | MPH |
| | Slope | 0 | 0 | % |
| KEY | Rate of Spread (ROS) | 4 to 22 | 107 | ch/hr |
| FIRE BEHAVIOR | Fireline Intensity | 485 to575 | 188 | BTU/ft/sec |
| OUTPUTS | Flame Length | 1 to 6 | 5 | Feet |
| | Probability of Ignition | 70 | 80 | % |
| | Spotting Distance | 1055 | 1282 | Miles |
| | Scorch Height | 28 | 27 | Feet |
| FIRE SIZE | Projection Time | | 3 | Minutes |
| | Forward Spread | | 5 | Chains |
| | Backward Spread | | 0 | Chains |
| FIRE | Method Of Attack | line will be | rear | Head/Rear |
| CONTAINMENT | Max Escape Target | in place | <1 | Acres |
| | Max Containment Time | before | | Hours |
| | Total Line Building Rate | ignition | 50 | Ch/hr |
| 1. Choose greater total line building rate from inside and outside the project area | | | 50 | Ch/hr |
| 2. Estimate potential number spot fires or slopovers at one time: | | | 1 | |
| 3. TOTAL LINE BUILDING RATE NEEDED (multiply line 1 times line 2) | | | 50 | Ch/hr |

Production Rates: handbook | Ease of Access: | POOR-FAIR-GOOD-**EXCELLENT** (circle)
(refer to fireline handbook other sources and local knowledge)

| On Site Organization | Total # Planned On Burn | Total # Dedicated to Prescribed Fire | Total # Available for Spot Fire or Slopover Control | | Line Building Production Rates | | Spot Fire Line Blding Capacity |
|---|---|---|---|---|---|---|---|
| Overhead | 3 | 1 | 1 (plus dozer op) | X | 0 | ch/hr | |
| Firing Crew | 2 | 0 | 2 | X | 4 | ch/hr | 8 |
| Holding | 6 | 2 | 4 | X | 6 | ch/hr | 24 |
| Monitoring | 2 | 1 | 1 | X | 4 | ch/hr | 4 |
| Engine (Crew of 2) | 1 | | 1 | X | 4 | ch/hr | 4 |
| Scout | 1 | | 1 | X | 4 | ch/hr | 4 |
| Support Staff | | | | X | | ch/hr | |
| Other - Security | 1 | 1 | | X | | ch/hr | |
| Dozer (Type 4) | reserve | | 1 | X | 80 | ch/hr | 80 |
| 4. TOTAL CAPACITY | 16 | 5 | 11 | | | | 124 |
| TOTAL LINE BUILDING RATE NEEDED (from table above- Line 3) | | | | | | | 50 |
| 5. DETERMINATION OF ADEQUATE HOLDING RESOURCES (Line 4 minus Line 3) | | | | | | ch/hr | 74 |

This worksheet reflects an escaped fire moving with SE winds in a short grass pasture. Fuel Model 1 over predicts fire behavior, particulary when soils are moist. Line production factors do not include rapid attack provided by ATV Units that can smother

A 6-wheeled ATV engine will be in the pasture for initial attack during the ignition phase, and a Type V engine will be available for structure defense. TheCoop dozer will also be available as contingency reserve.

## Incident Objectives

| Incident Name | Date | Time |
|---|---|---|
| *FMU 3201* | 10/23/03 | DAY |

Operational Period (Date/Time) Thursday 10/23/03 1000-1800

General Control Objectives (include Alternatives)

Reduce hazardous fuels adjacent to boundary and trail bridges.
Provide for the safety of firefighters and public.
Prevent fire spread onto private lands.
Reduce shrub biomass by 40-80% and promote a grass/forb grd cover.
In the Upland Pine and Upper Slope Pine Oak communities,
keep canopy tree mortality <10%.
In the Old Farm Field keep mortality <40%.

### Weather Forecast for Operational Period

| TODAY | TONIGHT | TOMORROW |
|---|---|---|
| Temp | Temp | Temp |
| Sky | Sky | Sky |
| R.H. | R.H. | R.H. |
| Wind Dir | Wind Dir | Wind Dir |
| Wind Sp | Wind Sp | Wind Sp |
| KBDI | KBDI | KBDI |

***GENERAL SAFETY MESSAGE***

**This area will be ignited in 2 parts to reduce complexity and staffing.**

Maintain situational awareness - listen to radio traffic

Initial Attack on 'catch-outs' should be from within the black
(i.e. burned out interior), get help headed your way ASAP

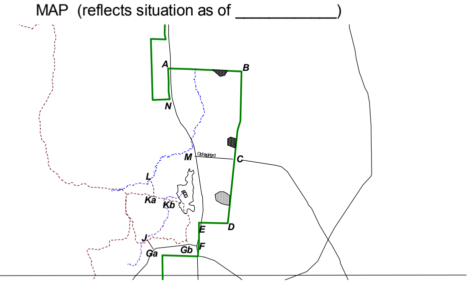
L.C.E.S

ATTACHMENTS
- ☐ Organization / Assignments
- ☐ Ignition Maps
- ☐ Escape Fire Plan
- ☐ Escape Routes
- ☐ Medical Plan
- ☐ Communications

## INCIDENT BRIEFING

Date 10/23/03 Time 1000 - 1800

MAP (reflects situation as of ____________)




**DAY 1 (no night shift is expected)**

Burn Boss - Dave McHugh

Ignition - Fulton
Rodney - torch
Brandee - torch

Fire Monitoring
Debbie & Doug

Smoke / Security
Smitty

Sqd 1
JD Sqd Boss
Johnny Mule
Katie
Cole
Kevin ATV
Dave ATV
Wes ATV

Sqd 2
DW Sqd Boss
Ryan ATV ?
John Engine Boss
Doug Engine Crw

Radio Freq's

| | Rx | tone | Tx |
|---|---|---|---|
| BITH Local 1 | 166.900 | 146.2 | 166.900 |
| BITH Rept 2 | 166.900 | 146.2 | 166.300 |
| TFS Disp 3 | 159.375 | 94.8 | 159.375 |
| TAC 10 10 | 159.435 | 127.3 | 159.435 |

*IF Reggie needs to run the dozer, John moves to ENGB*

PREPARED BY (Name & Position)

## MEDICAL PLAN

| Incident Name | Date | Time | Operational Period |
|---|---|---|---|
| FMU 3201 | 10/23/03 | | day |

### *Medical Aid Personnel*

| NAME | LOCATION - ASSIGNMENT | MEDIC KIT |
|---|---|---|
| Johnny Stafford | Sqd 1 | Engine |
| Doug | Monitoring | |
| Cole | Yell Module | |

### *AMBULANCE SERVICE*

| NAME | ADDRESS | PHONE |
|---|---|---|
| Gold Star | Hwy 69, Woodville | 283-8107 |
| | | |
| **Eastex** | **Kountze** | **246-4145** |

### *HOSPITALS*

| NAME | LOCATION | TRAVEL TIME AIR | TRAVEL TIME GRD | PHONE | HELIPAD | BURN CENTER YES/NO |
|---|---|---|---|---|---|---|
| Tyler Cty | 1100 W Bluff Woodville | | 35m | 283-8141 | YES | NO |
| St Elizabeth | 2830 Calder Beaumont | | 40m | 899-7000 | | YES |
| **Gold Star** | **Angel Flt & Abulance** | 30 m | 40 m | 877-545-5544 | | |
| Baptist | College & 11st Bmt | | 40m | 654-5214 | YES | ? |
| Herman | LifeFlight | 60m | n/a | 713-704-4014 | Yes | Yes |

### *MEDICAL EMERGENCY PROCEEDURES*
### *LZ Lat 30 35' 40" Long 94 20' 00"*

Provide First Aid Care and determine extent of injury.
Notify firefighter EMTs and Burn Boss
Suspend firing operations & non-emergency radio communication
Initiate ambulance or MedLink (St E's) if needed -
provide location & grd contact
Prepare LZ in pasture north of boundary
Hand off patient care to professionals
Notify Superintendent - Relatives
Resume fire operations - conduct investigation

Prepared By:__________________ Reviewed By:______________

## OPERATIONAL GO/NO-GO CHECKLIST

| | *yes* | *no* |
|---|---|---|
| Agency Administrator Approval discussed and signed? | | |
| Are ALL fire prescription specifications met ? | | |
| Has ALL the preburn preparation work been completed? | | |

***IF ALL CRITERIA ANSWERED "YES" YOU MAY PROCEED WITH TEST BURN***

Location of test fire:____________________
Date/Time of test fire: ___________________
Results of test fire: ______________________________

| | *YES* | *NO* |
|---|---|---|
| Are the fuels and weather representative of the burn unit? | | |
| Is the fire behavior within prescription parameters? | | |
| With existing holding forces, is fire behavior within means of control? | | |
| Do the test burn results indicate objectives will be met? | | |

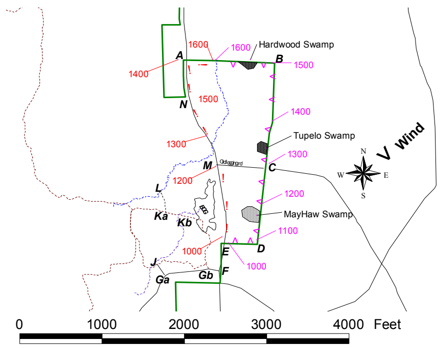
***IF TEST BURN WAS SUCCESSFUL YOU MAY PROCEED***

| | *YES* | *NO* |
|---|---|---|
| Are ALL smoke managment prescription specifications met and/or has smoke mgmt clearance been given for the project? | | |
| Are ALL personnel required in the Rx Burn Plan on site? | | |
| Is ALL the equipment identified in the RX Burn Plan in place and functional? | | |
| Have ALL personnel been briefed? | | |
| Have ALL notifications been made? | | |
| Is current and forecasted weather favorable for execution of the burn? | | |

***IF ALL CRITERIA ANSWERED "YES" YOU MAY PROCEED WITH Rx BURN***

| | *Date* |
|---|---|
| Rx BURN BOSS ______________________ | ________ |
| IGNITION SPECIALIST______________________ | ________ |
| HOLDING OPERATIONS______________________ | ________ |

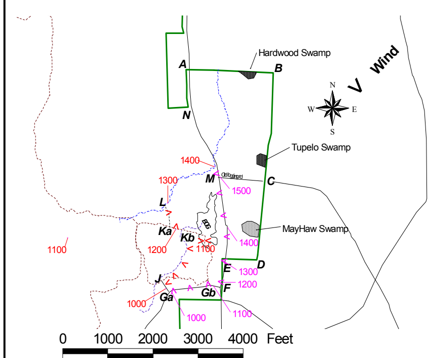
## IGNITION PLAN - FMU 3201
NNE - East Winds




0800 Crew Install hoseline E-D

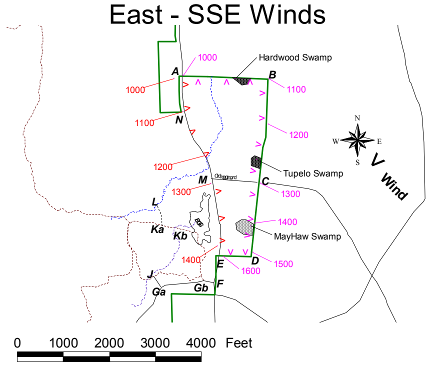
0930 ALL Preburn meeting at Trailhead [Gb]
1000 Sqd 1 Ignite & hold E-D, hook engine to hoselay
Sqd 2 Burn-out corner E
1100 Sqd 1 Ignite / hold D-C (slowly)
Sqd 2 Ignite / hold E-M
1200 Sqd 1 Ignite / hold C-B (slowly)
Sqd 2 Ignite / hold M-N-A [engine support] and burn-out east to drainage
1400 Sqd 1 Ignite / hold B-A
Sqd 2 Ignite / hold A-B
1500 ALL Patrol and mop-up

## IGNITION PLAN - FMU 3202
NNE - East Winds




0930 ALL Preburn meeting at Trailhead [Gb]
1000 Sqd 1 Ignite / hold Ga-Gb (create 50' blackline)
Sqd 2 Ignite / hold Ga-J-Kb
1100 Sqd 1 Ignite / hold Gb-F-E, create 50' blackline
Engine at Bdry near house
Sqd 2 Burn-out around boardwalk (Support with ATV Unit)
1200 Sqd 1 Ignite / Hold E-M - slowly (reduce intensity along road)
Sqd 2 Ignite / hold L-Ka-Kb
1500 ALL Patrol and mop-up

## IGNITION PLAN - FMU 3201
East - SSE Winds

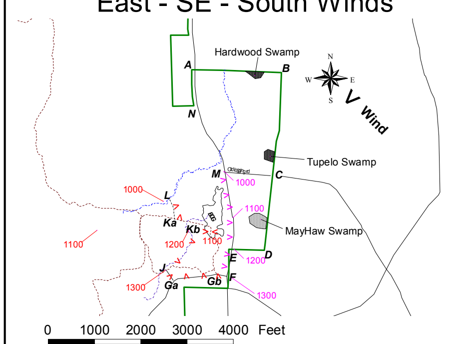



0915 ALL Preburn meeting at Trailhead [Gb]
1000 Sqd 1 Ignite & hold A-B
Sqd 2 Ignite / hold A-N, Burn-out corner A
1100 Sqd 1 Ignite / hold B-C (slowly)
Sqd 2 Ignite / hold N-M, burn-out east to drainage
1300 Sqd 1 Ignite / hold C-D (slowly)
Sqd 2 Ignite / hold M-E
1400 Sqd 1 Ignite / hold D-E

Sqd 2 Patrol and mop-up

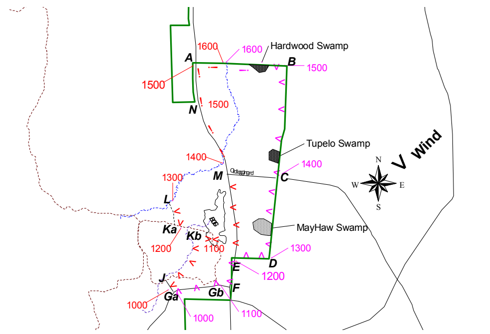
1500 ALL Patrol and mop-up

## IGNITION PLAN - FMU 3202
East - SE - South Winds



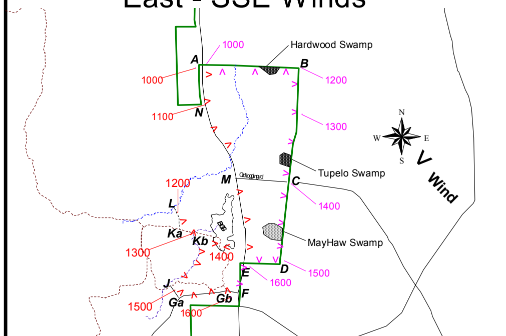

0915 ALL Preburn Meeting at trailhead [Gb]
1000 Sqd 1 Ignite / Hold M-E (slowly)
Sqd 2 Ignite / hold L-Ka-Kb
1100 Sqd 1 Continue Ignition South, reduce intensity near road
Sqd 2 Burn-out around boardwalk (support with ATV unit)
1200 Sqd 1 Continue ignition south (slowly - reduce intensity near road)
Sqd 2 Ignite / hold drainage Kb-J and J-Ga-Gb
1300 Sqd 1 Complete Ignition along road E-F
Sqd 2 Ignite / hold Gb-F
1400 ALL Patrol and mop-up

## IGNITION PLAN - FMU 3201 & 3202
NNE - East Winds



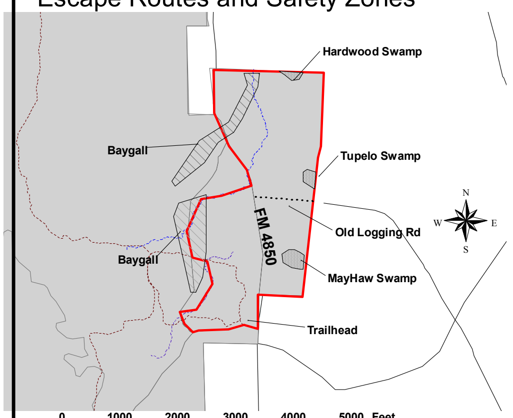

0800 Crew Install hoseline E-D
0915 ALL Preburn meeting at Trailhead [Gb]
1000 Sqd 1 Ignite / hold Ga-Gb (create 50' blackline)
Sqd 2 Ignite / hold Ga-J-Kb
1100 Sqd 1 Ignite / hold Gb-F, create 50' blackline
Engine at Bdry near house
Sqd 2 Burn-out around boardwalk (Support with ATV Unit)
1200 Sqd 1 Ignite & hold E-D, Burn out corner E
hook engine to hoselay
Sqd 2 Ignite / hold Kb-Ka-L
1300 Sqd 1 Ignite / hold D-C (slowly)
Sqd 2 Ignite E-M [both sides - slowly)
1400 Sqd 1 Ignite / hold C-B (slowly)
Sqd 2 Ignite / hold M-N-A [engine support], and burn-out east to drainage
1500 Sqd 1 Ignite / hold B-A
Sqd 2 Ignite / hold A-B
1600 ALL Patrol and mop-up

## IGNITION PLAN - FMU 3201
East - SSE Winds




0930 ALL Preburn meeting at Trailhead
1000 Sqd 1 Ignite & hold A-B
Sqd 2 Ignite / hold A-N, Burn-out corner A
1100 Sqd 2 Ignite / hold N-M, burn-out east to drainage
1200 Sqd 1 Ignite / hold B-C (slowly)
Sqd 2 Ignite / hold L-Ka-Kb
1400 Sqd 1 Ignite / hold C-D (slowly)
Sqd 2 Burn-out around boardwalk, then slowly ignite M-E (both sides of road)
1500 Sqd 1 Ignite / Hold D-E (slowly)
Sqd 2 Ignite / hold drainage Kb-J and J-Ga-Gb
1600 Sqd 1 Complete Ignition along road E-F
Sqd 2 Ignite / hold Gb-F
1700 ALL Patrol and mop-up

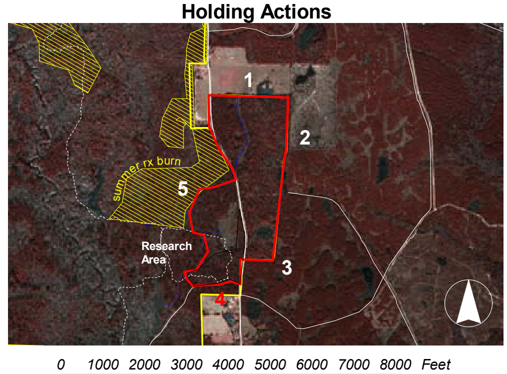
## Escape Routes and Safety Zones




**Safety Zones**
**The 'swamps' indicated on the map provide safety Zones when they are wet. If they are dry they are deployment areas as the leaves will carry a creeping fire and will require light raking.**

ESCAPE ROUTES
- Most firefighters will be on the perimeter, igniting as they go, so the fireline is the escape route into the "black".
- The Old Logging Road, Pitcher Plant Trail, and FM4800 provide rapid travel routes.
- The Baygalls on the west side of the fire provide natural barriers to fire spread and can be used for travel routes or Safety Zones.
- Personnel should collect at the Trailhead for re-assignment

## Holding Actions




1. The short grass of the pasture will not carry an intense fire. ATV Units will be used to suppress escapes. The fire edge will be 'cold trailed' or a scratch line used to prevent rekindling.
2. An escape across the boundary is unlikely, as winds will be pushing the fire away. Escapes will be initial atttacked by ATV Units & Handtools; use dozer if needed.
3. Fire escape across the boundary is unlikely, as the prescribed winds will push the fire off the line. NE winds increase the threat on the southern boundary, but the threat is reduced by an ignition pattern that burns-out the line with a backing fire. A hoselay will be in place to support a burn-out with NE winds. Suppress escapes with ATV Units, handtools, and hoselay. Use dozer if growth or behavior exceeds capability.
4. An escape south of Muscadyne Rd will be suppressed by a Type V engine and handtools (line any escapes to prevent rekindling). If direct attack is not successful, move engine to house( south of boundary and burn-out along boundary (request Warren VFD).

Fire escaping into the RESEARCH AREA will be initial attacked by ATV Unit, Handtools, and hoseline from a Type V Engine.

5. This area was prescribed burn during the summer and will not carry a fire.

**Cooperative agreements**

1. All-Risk MOU
   Provides for interagency assistance during emergencies.

2. Big Thicket National Preserve & Texas Forest Service CA
   Creates a Mutual Aid Zone, provides space at the TFS Woodville facilities for preserve fire staff, and allows sharing of a TFS dozer/plow unit for fire management activities.

3. National Park Service & Texas Forest Service CA
   Allows for the passing of funds under the National Fire Plan.

4. Big Thicket National Preserve and the Alabama - Coushatta Indian Tribe CA
   Payment of tribal personnel for fire management assistance.

5. Interpark Agreements with:
   Padre Island National Seashore
   Lyndon B. Johnson National Historical Park
   San Antonio Missions National Historical Park

# MEMORANDUM OF UNDERSTANDING
BETWEEN

U.S. FISH AND WILDLIFE SERVICE
REGION 2

AND
NATIONAL PARK SERVICE
INTERMOUNTAIN REGION

AND
TEXAS FOREST SERVICE

**AND**
THE NATURE CONSERVANCY,
TEXAS CHAPTER

AND
NATIONAL FORESTS AND GRASSLANDS
IN TEXAS

## I. INTRODUCTION:

Land management and conservation agencies have an obligation to provide for public protection from wildfire, and other "all risk" type incidents such as hurricanes, floods, and acts of terrorism. These agencies also have a responsibility to sustain diverse and productive ecosystems. These ecosystems provide cultural, scientific and recreational needs for a diverse cross-section of Americans. In order to meet these responsibilities, agencies must work together, and when possible, provide support to other agencies in their conservation efforts.

## II. PURPOSE:

**The purpose of this MOU is to provide mutual support, cooperation and assistance between the U. S. Fish and Wildlife Service Region 2, Texas Forest Service, National Park Service Intermountain Region, National Forests and Grasslands in Texas, and The Nature Conservancy, Texas Chapter for prescribed fire management; fire prevention; fire preparedness; and for emergency management and assistance on incidents such as wildfire, floods, acts of terrorism, and hurricanes, etc., at no cost to the benefiting agency. It will also provide for technical support, and will allow each party to obtain equipment and appropriate personal safety items as**

**necessary to ensure the safety of employees participating in interagency incident management efforts.**

III. AUTHORITY:

**This MOU is entered into under the authority provided in:**

Reciprocal Fire Protection Act of May 27, 1955 (69 Stat. 66; 42 U.S.C. 1856a) (F&WS, NPS, USFS)

Disaster Relief Act of May 22, 1974 (NPS)

Organic Act of August 1916 (16USC1) (NPS)

Federal Grant and Cooperative Agreement Act of 1977 [P.L. 960224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003;31 U.S.C. 6301 thru 6308)] (NPS)

Vernon's Texas Civil Statutes (Sub Chapter B. Section 88.106) (TFS)

IV. STATEMENT OF MUTUAL BENEFIT:

State and private lands, for which the State of Texas is responsible for protection, Nature Conservancy lands, for which the Conservancy is responsible for, and Federal lands for which the Federal government is responsible, are intermingled and adjacent to each other throughout the State of Texas. Emergency incidents and their management, on these lands for which one agency is responsible for may present a threat to, or affect, lands for which the other agency is responsible for.

Management of prescribed fire, wildland fire, or other emergency incidents, on one or another of the parties' land, could require greater resources and expertise than that party can handle. It is in the best interest of each party to have available service from the other party to aid and assist them in management of, preparation for, and response to, these incidents.

It is to the mutual advantage of the U.S. Fish and Wildlife Service, State of Texas, National Park Service, The Nature Conservancy, and U.S. Forest Service to coordinate efforts for prevention, training for, detection, and suppression of wildfires; and management and training for other incidents and similar projects, to limit duplication and to improve efficiency and effectiveness.

It is the intent of the parties hereto that State, Federal, and Nature Conservancy resources be available to assist in the above activities on each others' lands, and on other lands upon which the Federal government provides fire suppression support including other States, Canada, and Mexico; and with non-fire state and national emergencies and logistical support activities in this state and other states.

Each party will have the benefit of utilizing personnel and equipment of the other party as available at no cost for the first operational period, other than optional reimbursement for use of aircraft. (After the first operational period, costs would be reimbursable if covered in a separate Agreement.) Also, each can obtain training, equipment and services from the other that may not be otherwise available.

V. RESPONSIBILITIES:

1. **Each party will designate a contact person for the implementation of this Memorandum of Understanding.**
2. Each party may request prescribed fire management; fire prevention; fire preparedness or other emergency incident management resources from the other as necessary to meet management goals.
3. Each party may, at their discretion and upon mutual consent, participate in prescribed fire management; fire prevention; fire preparedness; and emergency incident management operations of another party, to foster knowledge and experience; and to further cooperation between organizations.
4. Personnel and equipment may be provided from one party to another as requested. Request of personnel and equipment shall be at the discretion of the affected Fire or Line Management Officer, Regional Fire Coordinator or Preserve Manager.
5. Each party will provide for salary or wage costs of its own employees and operate and maintain its own equipment.
6. All personnel shall meet the qualification standards of the National Wildfire Coordinating Group for the positions that they will occupy.
7. Each agency may install the others radio frequency in its radios for use in cooperative activities. All federal licensing requirements will be followed.

VI. AGREEMENT TERM:

**This MOU will remain in force for a period of five years form the date of execution.**

VII. SPECIAL PROVISIONS:

A. **This MOU is neither a fiscal nor a funds obligation document. Any endeavor involving reimbursement or contribution of funds between the parties of this MOU will be handled in accordance with applicable laws, regulations and procedures.**

B. This MOU may be modified or amended as necessary upon written consent of all parties or may be terminated by any party with a 60 day written notice to the other parties.

C. Each party will be responsible for its actions, and the actions of its employees performed within the scope of their employment and pursuant to this agreement.

D. Modifications to this MOU will be initiated to the Texas Forest Service by any of the partner agencies. The Texas Forest Service will act on/modify/recommend the change within 90 days after consultation with the partners to this agreement. Changes will not take effect until signed by all approving signatories.

E. The designated contacts for this MOU are:

1. U.S. Fish and Wildlife Service
   Jeff Whitney
   Regional Fire Management Coordinator
   P.O. Box 1306
   Albuquerque, NM 87103
   505-248-6865

2. National Park Service
   Bob Lineback
   Wildland Fire Specialist
   P.O. Box 728
   Santa Fe, NM 87504
   505-988-6018

3. Texas Forest Service
   Mark Stanford
   Chief, Fire Operations
   P.O. Box 310
   Lufkin, TX 75902
   936-639-8130

4. The Nature Conservancy of Texas
   Tom Ledbetter
   Fire Management Coordinator
   11617 FM 2244
   Austin, TX 78738
   512-263-8878

5. U.S. Forest Service
   Ron Haugen
   Fire Management Officer
   701 N. First Street
   Lufkin, TX 75901
   936-639-8501

In Witness Whereof, the parties have caused this Memorandum of Understanding to be executed as of the date of last signature below:

APPROVED:

U.S. FISH AND WILDLIFE SERVICE
REGION 2

BY:______________________________
Regional Director

______________________________
Signature

______________________________
Date

NATIONAL PARK SERVICE
INTERMOUNTAIN REGION

BY:______________________________
IMR Regional Director

______________________________
Signature

______________________________
Date

TEXAS FOREST SERVICE

BY:______________________________
Associate Director

______________________________
Signature

______________________________
Date

THE NATURE CONSERVANCY,
TEXAS CHAPTER

BY:______________________________
State Director

______________________________
Signature

______________________________
Date

U.S. FOREST SERVICE

BY:______________________________
Forest Supervisor

______________________________
Signature

______________________________
Date

Agreement No. CA7140040003

***Cooperative Agreement***
Between the
BIG THICKET NATIONAL PRESERVE
and the
TEXAS FOREST SERVICE

## ARTICLE I - BACKGROUND AND OBJECTIVES

This agreement is made and entered into and between the Texas Forest Service, herein after referred to as the Service, and National Park Service, Big Thicket National Preserve, herein after referred to as the Preserve for cooperative fire management activities. It specifies roles and responsibilities for: training, fire detection, suppression, and mutual aid in the Southeast Texas area; Preserve sharing of the Service's Woodville facilities; and the utilization and staffing of a Service dozer and transporter by Preserve personnel.

## ARTICLE II - AUTHORITY

The primary authority for this Cooperative Agreement is found in 16 U.S.C. § 1g, and:

The Reciprocal Fire Protection Act of May 27, 1955
(69 Stat. 66; 42 U.S.C. 1856a)

Disaster Relief Act of May 22, 1974
(88 Stat. 143; 42 U.S.C. 5121)

Federal Grant and Cooperative Agreement Act of 1977

[P.L. 950224, as amended by P.L. 97-258, September 13, 1982 (96 Stat. 1003; 31 U.S.C. 6301 thru 6308)]

This Cooperative Agreement complies with directives in the National Fire Plan, the National Park Service Strategic Plan, and 10-year Comprehensive Strategy for increasing collaboration and cooperation between state and federal agencies. Activities taking place under this Cooperative Agreement will require substantial involvement by both the Service and Preserve.

## ARTICLE III - STATEMENT OF WORK

Whereas, the **Service** has fire management responsibilities (firefighter training; wildfire prevention, detection, dispatch, and suppression) and conducts fire management operations (prescribed burns) within the Kirby and Siecke State Forests; and

Whereas, the **Preserve** has fire management responsibilities (firefighter training, wildfire prevention, detection, suppression and prescribed fire operations) on Preserve lands within Texas; and

Whereas, the **Service** and the **Preserve** can enter into agreements to cooperate as the most effective and efficient means to achieve our fire management goals and personnel utilization;

Now, therefore, in consideration of the above premises, the parties hereto agree as follows:

***A. BITH agrees to:***

1. Designate a **Preserve** employee as a contact person for the **Service.** The Fire Management Officer shall serve as the primary contact.

2. Provide instructors and students, as available, for interagency training opportunities.

3. Provide assistance for fire dispatching, mutual aid (no cross billing) for fire management operations within the mutual aid zone (see map) as staffing and equipment availability permit, and other professional services. Designate preserve employee(s) as operators of a Service dozer/plow unit/transporter, and purchase consumables (fuel, fluids, belts, hoses, and batteries) to maintain operability.

4. Renovate mutually agreed office space; fund/purchase/construct garage and storage buildings to meet preserve needs that exceed existing capacity; pay fair-share operational costs (excluding cooler) and participate in grounds maintenance of the Service's Woodville facilities.

***B. The Service agrees to:***

1. Designate a **Service** employee as a contact person for the **Preserve.** The Regional Fire Coordinator, or designee, shall serve as the primary contact.

2. Provide instructors and students, as available, for interagency training opportunities.

3. Provide aerial detection, dispatch, professional services, and equipment (i.e. transport vehicle and dozer), when available, to assist the **Preserve** in performing fire management actions (wildfire suppression, prescribed burns, and mutual aid).

4. Provide office, storage, garage, and parking spaces that are excess of their needs for Preserve use.

**C. BITH and the Service, jointly, agree to:**

1. **Reciprocal Fire Protection (Mutual Aid):** The **Preserve** and **Service** will, by mutual agreement, establish reciprocal initial attack zones for lands of intermingled or adjoining protection responsibility.

2. **Reimbursable (Cooperative) Fire Protection:** The **Preserve** or **Service** may request fire resources from the other for its protection work outside of the Mutual Aid Zone, or beyond the initial attack period within the zone.

3. Each party may, at their discretion and mutual consent, participate in fire management operations of the **Service** or the **Preserve** to foster firefighter knowledge and experience; and to further interagency cooperation.

4. Utilization of Dozer and Transporter

   a. The dozer and transporter (**unit**) will be used by either party on an as-needed basis. Scheduling conflicts will be resolved between each primary contact.

   b. The **unit** will be staffed wholly, or in cooperation with, each party. Drivers and equipment operators will hold appropriate operating licenses to meet Agency, State, and Federal regulations. State or Federal employees may operate each others vehicles provided the operator meets the current operating guidelines and training requirements of their own agency.

   c. The **unit** will be dispatched through the **Service's** dispatch center, with notification of the fire response to the Texas Interagency Coordination Center in Hudson, Texas.

## ARTICLE IV - TERMS OF AGREEMENT

*This Agreement shall become effective upon signature of both parties and extend for up to two (2) years from the dates of approval, unless terminated earlier in accordance with Article X.*

## ARTICLE V - KEY OFFICIALS

The key officials specified in this agreement are considered essential to ensure maximum coordination and communication between the parties and the work being performed. Upon written notice, either party may designate an alternate to act in the place of the designated key official.

A. **For the National Park Service:**

NPS official to whom payment requests are sent:
Pollard Mobley
Contracting Officer
Big Thicket National Preserve
3785 Milam
Beaumont, TX 77701
Phone: 409-839-2689 ext. 242
Fax: 409-839-2599

Art Hutchinson
Superintendent
Big Thicket National Preserve, 3785 Milam
Beaumont, Texas 77701
(409) 839-2689 extension 222.

Dave McHugh
Fire Management Officer
Big Thicket National Preserve
507 Pine St., Hwy 287
Woodville, Texas 75979
(409) 283-5824

B. **For Texas Forest Service:**

Branch Fire Coordinator
Ricky Holbrook
2500 US 190 East
Livingston, TX 77351
(936) 327-4832

Facilities Manager
Charles Richards
P.O. Box 146
3882 Hwy 69N
Kountze, TX. 77625
(409) 246-2484

Tyler County Office manager
David Colton
P.O. Box 146
3882 Hwy 69N
Kountze, TX. 77625
(409) 246-2484

## ARTICLE V - AWARD AND PAYMENT/INVOICES

A. Payment: The Preserve will pay the Service 50% of utilities costs, excluding the seedling cooler, with an annual billing by September 1st (based upon a fiscal year of October 1st to September 31st). September costs will be estimated from June's, due to similar weather conditions.

B. Period of Performance: This Cooperative Agreement will be in effect for 2 years, subject to extension. The initial billing period will begin when preserve fire staff have moved in to the end of the fiscal year. Subsequent periods will be on a fiscal year basis.

C. Payment Form: Payment will be transferred electronically to the financial institution designated by the Service. To receive payment, the Service must submit an SF 270 (Request for Advance or Reimbursement) and a Payment Information form (for electronic transfer information) to the NPS Contracting Officer listed in Article XII.

## ARTICLE VII - PRIOR APPROVAL

Both parties mutually agree upon integrated dispatch of resources to wildland fires within the mutual aid zone, based upon the closest resources concept and values at risk. Request for interagency assistance in other fire management activities, routine operations, or grounds maintenance, will require consultation between the FMO and Service representative. Dispatch of the 'shared dozer unit' out of the mutual aid zone will require the concurrence of the FMO and Service representative. Employee participation in interagency training, prescribed burning, or other fire management activities will require that employee's supervisory approval.

## ARTICLE VIII - REPORTS AND DELIVERABLES

The Service will provide the preserve's Fire Program Assistant with a monthly report of prorated costs.

Agency costs for assistance within the MUTUAL ATTACK ZONE incurred during the initial attack period (24 hours) will not be cross-billed.

Agency cost for assistance within the COOPERATIVE FIRE PROTECTION ZONE, or after the initial attack period within the MUTUAL ATTACK ZONE, will be cross-billed. The billing agency shall submit a bill within 60 days of the fire being declared out. Each bill will be identified by fire name, location, ownership, order number, and will be supported by appropriate documentation. Reimbursable assistance resources must be requested or recorded through the dispatch system, or documented by the Incident Commander in the Fire Report. Resources not documented in this manner are not reimbursable. Performance beyond the current fiscal year is subject to available funding.

National Park Service costs will be borne by the appropriate fire account developed for each incident.

Receiving agency shall send to assisting agency:

Fire Report
Fire Map/Location
Investigator's Report (if applicable)
Resource Order
Resource Evaluation (if applicable)

Assisting agency shall sent to receiving agency:

Employee Time Sheets
Equipment Log Sheets/Receipts
Unit Log

ARTICLE IX - PROPERTY UTILIZATION AND DISPOSITION

Improvements to the Service's facilities become the property of the **Service** when this agreement is concluded or terminated.

The Service will provide approximately 420 sq. feet of office space within the dispatch building consisting of the southeast office, reception area, and permit the occasional use of the meeting room. The Preserve will provide office furniture and install computer service lines.

The Service will provide approximately 750 sq feet of space in the Crew Office building. The preserve will remodel this space into four offices and an expanded dispatch / common work area.

The Service will provide one of the equipment repair bays in the shop area, and storage space in the tool room and storage area.

The Service will provide adequate storage space for a 20-person fire cache that will be stocked by the Preserve.

The Service will provide adequate parking area for up to 16 private vehicles.

The Service will provide an area for the construction of an equipment storage building, and parking of government vehicles. Construction will be dependant upon funding availability, and coordinated with the Service's facility management personnel.

Modifications to the **dozer/plow unit** (unit) may occur only with the consent of the Service, will henceforth be considered as an integral part and not be removed, and will be completed at the expense of the party performing the modification unless each agency administrator agrees to cost sharing. Service personnel shall perform routine servicing and repair of the unit at Service facilities. The **Preserve** will provide operational and maintenance materials (fuel, oil, grease, antifreeze, repair parts, etc.). The **unit** shall become the responsibility of the borrower, and shall be returned in the same condition as when received, fair wear and tear excepted. The borrower will repair or reimburse for damages in excess of normal wear and tear and will replace or reimburse items lost or destroyed.

## ARTICLE X – MODIFICATION AND TERMINATION

This Agreement may be modified only by a written instrument executed by the parties. In accordance with 43 CFR Part 12, this agreement may be terminated in accordance with OMB Circular A-110, Subparts 12.930 - 12.937. Either party may terminate this agreement by providing thirty (30) days written notice.

## ARTICLE XI - REQUIRED AND SPECIAL/ADDITIONAL PROVISIONS

REQUIRED PROVISIONS:

A. NON-DISCRIMINATION: All activities pursuant this Agreement and the provisions of Executive Order 11246; shall be in compliance with the requirements of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. 2000d et seq.); Title V, Section 504 of the Rehabilitation Act of 1973 (87 Stat. 394; 29 U.S.C. 794); the Age Discrimination Act of 1975 (89 Stat. 728; 42 U.S.C. 6101 et seq.); and with all other Federal laws and regulations prohibiting discrimination on grounds of race, color, national origin, handicap, religion or sex in providing of facilities and service to the public.

B. CONSISTENCY WITH PUBLIC LAWS: Nothing herein contained shall be deemed to be inconsistent with or contrary to the purpose of or intent of any Act of Congress or the laws of the District establishing, affecting; or relating to the Agreement.

C. APPROPRIATIONS (ANTI-DEFICIENCY ACT, 31 U.S.C. 1341): Nothing contained in this Agreement shall be construed as binding the Service to expend in any one fiscal year any sum in excess of appropriations made by Congress, for the purposes of this Agreement for that fiscal year, or as involving the United States in any contract or other obligation for the further expenditure of money in excess of such appropriations.

D. OFFICIALS NOT TO BENEFIT: No Member of, Delegate to, or Resident Commissioner in, Congress shall be admitted to any share or part of the Agreement or to any benefit to arise therefrom, unless the share or part or benefit is for the general benefit of a corporation or company.

E. LOBBYING PROHIBITION: The parties will abide by the provision of 18 U.S.C. 1913 (Lobbying with Appropriated Moneys), which states: “No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or oppose, by vote or otherwise, any legislation or appropriation by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communicating to Members of Congress on the request of any Member or to Congress, through the proper official channels, requests for legislation or appropriations which they deem necessary for the efficient conduct of the public business."

*F.* *LIABILITY:*

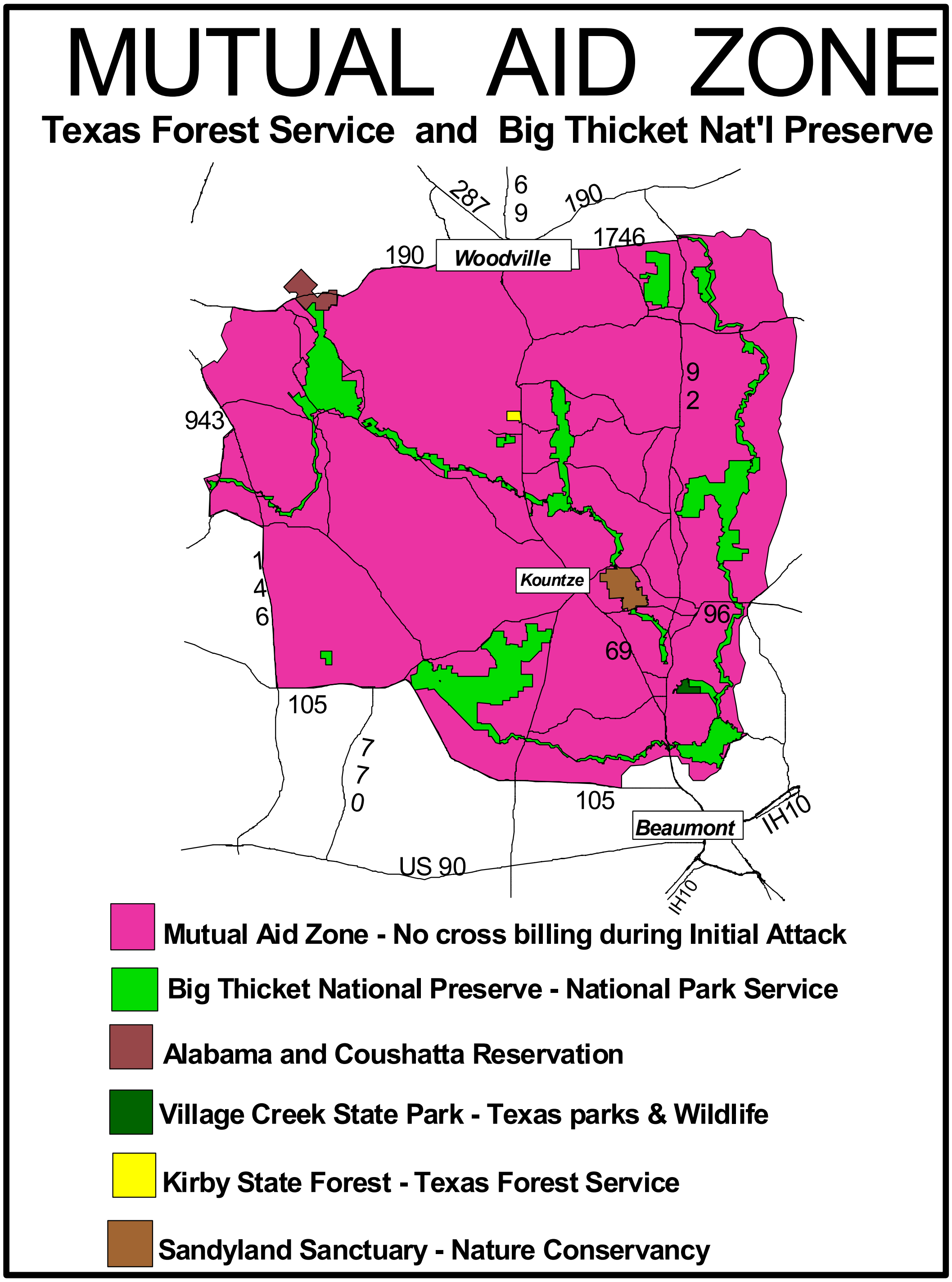
*The National Park Service and Texas Forest Service accept responsibility for any property damage, injury or death caused by the acts or omissions of their respective employees, acting within the scope of their employment, to the fullest extent permitted by law, including laws concerning self-insurance.*

G. DI-2010 CERTIFICATION: The Department of the Interior's certification form, DI-2010, "Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements, and Lobbying" enclosed with this Agreement must be completed and signed by the Cooperator. The signed DI-2010 shall be part of this Agreement.

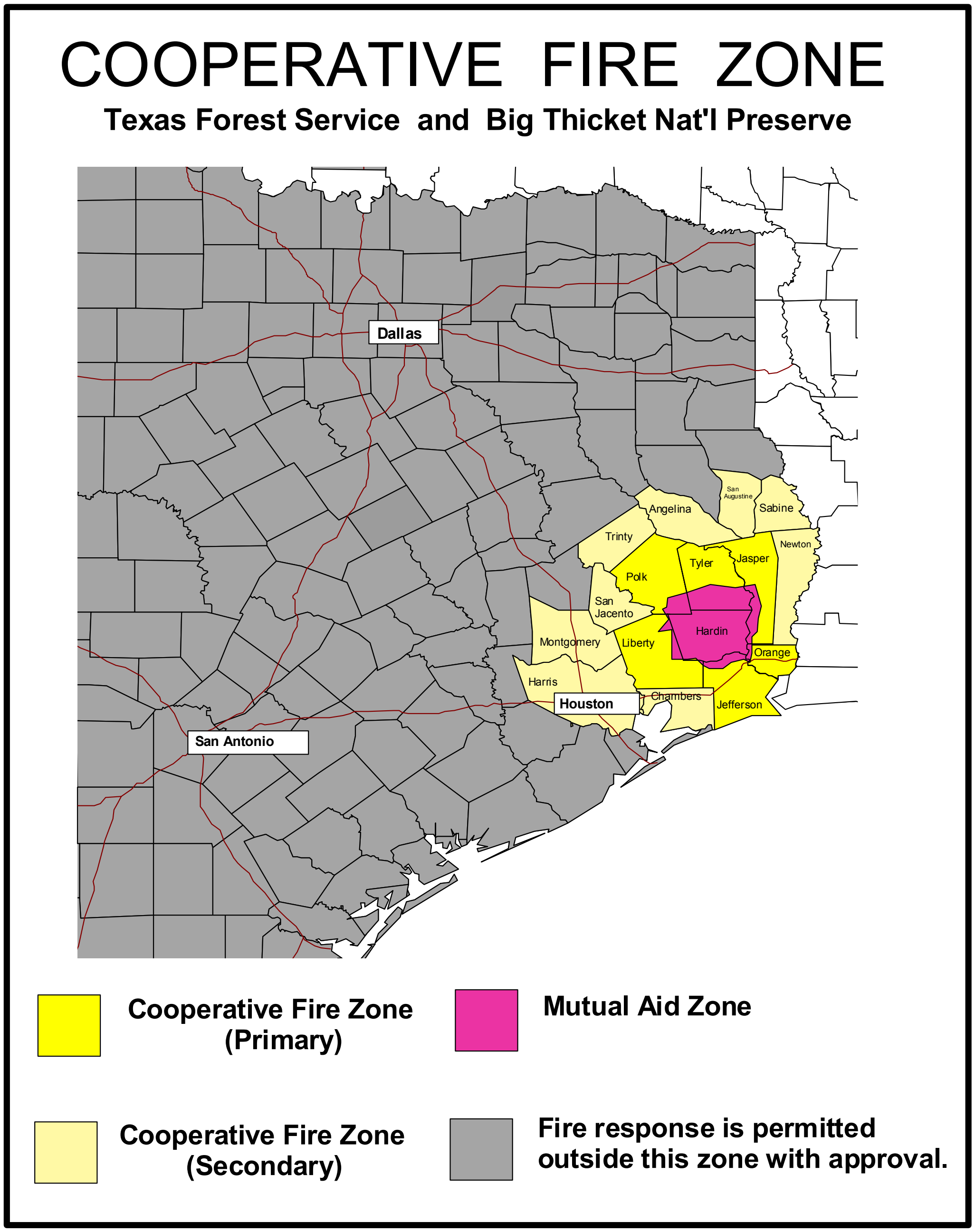
**ARTICLE XI - ATTACHMENTS AND APPENDICES**

***A. DI-2010, "Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements, and Lobbying" is attached for signature.***

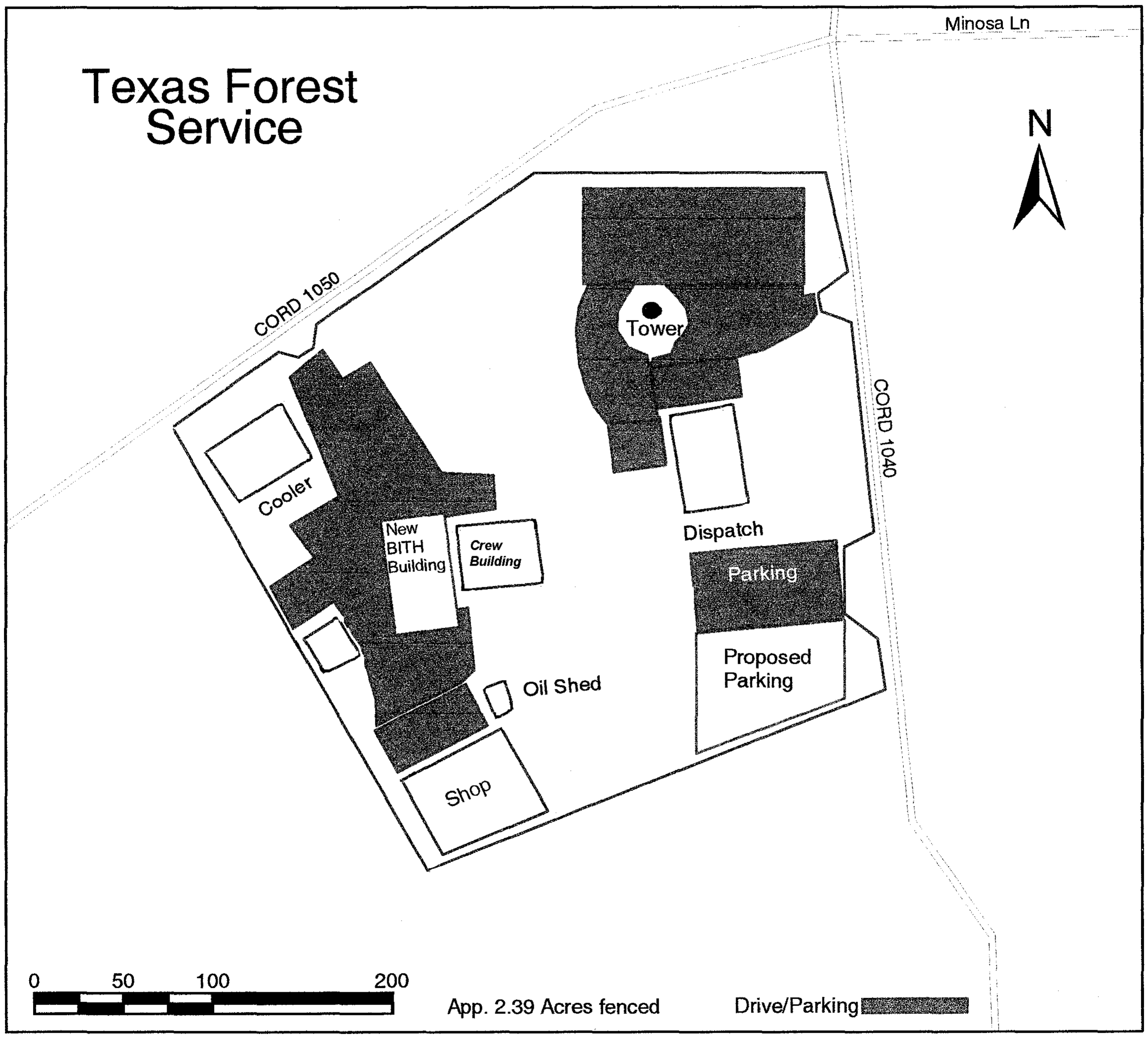
## *Mutual Aid Zone Map*



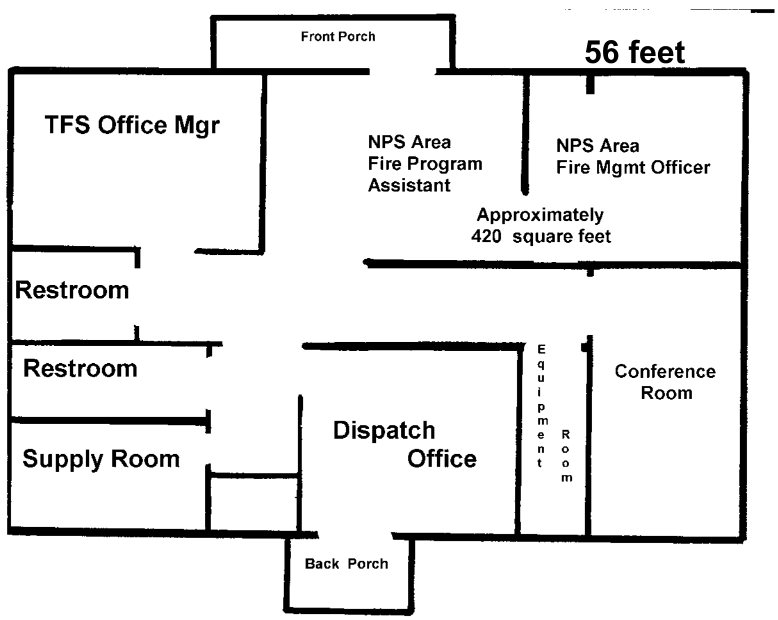
## *B. Cooperative Zone Map*



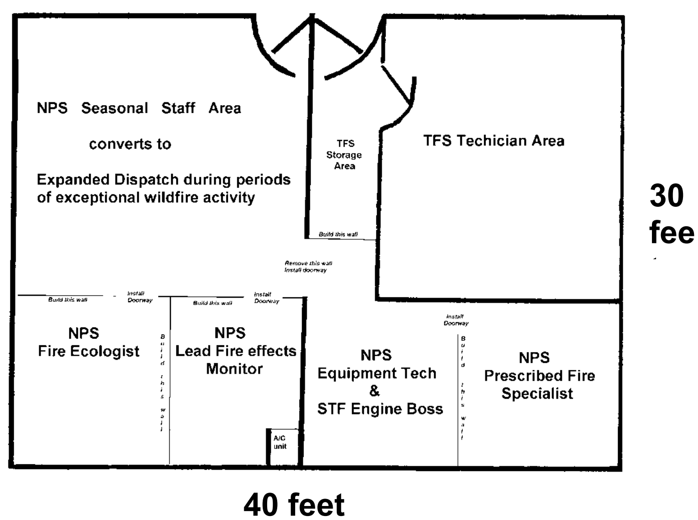
## C. Facilities Map



# Dispatch Office




# Crew Facilities



ARTICLE XII - AUTHORIZING SIGNATURES

**TEXAS FOREST SERVICE**

Signature: ___________________________
Name: ___________________________

Title: _____________________________
Date: _____________________

Signature: ___________________________

Name: ___________________________

Title: _____________________________

Date: _________________

**NATIONAL PARK SERVICE**

Signature: ______________________________

Art Hutchinson
Superintendent

Date: _____________

Signature: ______________________

Pollard Mobley
Contracting Officer

Date: ______________

**Cooperative Agreement**
**between**
**The United States Department of the Interior**
**National Park Service**
**and**
**State of Texas**
**Texas Forest Service**

***IMPORTANT NOTE:*** ***THIS COOPERATIVE AGREEMENT IS NOT INTENDED TO REPLACE THE MEMORANDA OF AGREEMENT CURRENTLY IN PLACE USING THE RECIPROCAL FIRE ASSISTANCE AUTHORITY. THIS IS ONLY TO BE USED FOR PASSING FUNDS TO THE STATE FORESTRY AGENCIES UNDER THE NATIONAL FIRE PLAN.***

*This Cooperative Agreement (hereinafter Agreement) is made and entered into by the Department of the Interior, National Park Service (NPS) and the Texas Forest Service (TFS).*

**ARTICLE I – BACKGROUND AND OBJECTIVES**

The TFS is organized and maintained to conduct a program of fire management and prevention activities designed to benefit all people of the state.

Such activities, whether performed and/or financed by the Service, the Cooperator, or other institutions or persons, will be valuable in achieving the goals outlined in the National Fire Plan in which Congress has directed the Service to "accelerate treatments, planning efforts, and collaborative projects with non-federal partners in the wildland urban interface" with an emphasis on the "removal of hazardous fuels to alleviate immediate emergency threat". The Cooperator and will be valuable and necessary for the management of the areas and resources under their jurisdiction and the jurisdiction of the Service.

The NPS and the TFS mutually desire to cooperate in executing this Cooperative Agreement (hereinafter also known as the Agreement) in order to conduct hazardous fuels treatment, prevention, and interpretive activities related to the reduction of the threat of wildfire to life, property, natural and cultural resources of the national park system and adjoining lands.

Both parties to this Cooperative Agreement desire to cooperate with one another for their mutual benefit and for the general benefit of the people of the United States and future generations.

It is contemplated that there will be substantial involvement, as specified in Article III of this Cooperative Agreement, by the NPS in the work of the TFS.

In the interest of the mutual advantage in attainment of common objectives, the parties hereto desire to cooperate and mutually agree to develop specific working Task

Agreements and workplans for fire management activities relating to the protection of life, property, and natural and cultural resources.

The public will benefit by having reduced fire loss, the development of fire prevention programs, and the reduction of occurrence and intensity of wildland fire within the urban interface.

**ARTICLE II – AUTHORITY**

This Agreement is hereby entered into by authority of:

*Title IV of the Department of the Interior and Related Agencies Appropriations Act, 2001, Act of October 11, 2000,* Pub. L. No. 106-291, 114 Stat. 922, 1006-1010*, which appropriates money for fire suppression operations, burned areas rehabilitation, hazardous fuels reduction, and rural fire assistance and which sets forth provisions governing the money's use.*

**ARTICLE III – STATEMENT OF WORK**

A. **The Texas Forest Service agrees to:**

1. Manage and carry out work, consistent with Ariticle III in subsequent task agreements, including fuel reduction, education, training, and other services on an appropriate reimburnsable basis
2. Encourage cooperation to provide consultation services to the Service on fire management issues, including participation in scoping sessions held periodically in selected parks, and state collabrative group meetings
3. Provide the Service with reports, photographs, and accomplishments on projects conducted under this cooperative agreement

B. **The National Park Service agrees to:**

1. Provide funding for services on a per project basis, as awarded on subsequent Task Agreements.
2. Provide technical fire management advice to the Cooperator without charge to the Cooperator;
3. Allow Service fire personnel to participate in Cooperator conducted training.
4. Periodically provide other staff to give orientations and lectures and to participate in workshops and scoping sessions related to fire management.

## ARTICLE IV – TERM OF AGREEMENT

This Agreement shall become effective on the date of signature of the NPS Contracting Officer and shall remain in effect until five years after the effective date, unless terminated in accordance with the provisions of *43 CFR Subpart C, Section 12.84.*

## ARTICLE V – KEY OFFICIALS

*A* ***A. Key officials are essential to ensure maximum coordination and communication between the parties and the work being performed. They are:***

1. **For the National Park Service:**

**Signatory/Administrative**

Kimberly Washington
Contracting Officer
100 Alabama Street
1924 Building
Atlanta, GA 30303
Email: Kathleen_Batke@nps.gov
Office: 404-562-3162 X598
Fax: 404-562-3256

**Local/Coordinating**

Clint Cross - COTR
SERO, Wildland Urban Interface Specialist
100 Alabama Street
1924 Building
Atlanta, GA 30303
Email: Clint_Cross@nps.gov
Office: 404-562-3108 X672
Fax: 404-562-3200

2. **For the Texas Forest Service:**

**Signatory/Administrative**

Jim Hull
301 Tarrow, Suite 364

College Station, TX 77840
Email: jhull@tfs.tamu.edu
Phone: 979-458-6600
Fax: 979-458-6610

B. **Communications** - The TFS will address any communication regarding this Agreement to the key official with a copy to the Contracting Officer, and to the superintendent of the area. Communications that relate solely to routine operational matters described in the current work plan may be sent only to the superintendent.

C. **Changes in Key Officials** - Neither the NPS nor the TFS may make any permanent change in a key official without written notice to the other party reasonably in advance of the proposed change. The notice will include a justification with sufficient detail to permit evaluation of the impact of such a change on the scope of work specified within this Agreement. Any permanent change in key officials will be made only by modification to this Agreement.

## ARTICLE VI – AWARD AND PAYMENT

***The commitment of funds in furtherance of the Cooperative Agreement will be authorized by individual Task Agreements issued against this Cooperative Agreement identifying each project or group of projects, amount of requested financial assistance, and any other special terms or condition applicable to the project.***

***The cooperator will submit requests for reimbursement on Standards Form 270 (SF-270), Request for Advance or Rembursement, original and two copies, to the Services's Contracting Officer. Nothing in this Agreement shall be construed as binding the National Park Service to expend in any fiscal year any sum in excess of the appropriation made by Congress for purposes of this Agreement in that fiscal year.***

### ARTICLE VII – PRIOR APPROVAL

***Will be specified in each task agreement and in accordance with* OMB Circular *A-110 and* 43 CFR Part 12.**

### ARTICLE VIII - LIABILITY

A. **The Texas Forest Service agrees**:

1. To indemnify, save and hold harmless, and defend the United States against all fines, claims, damages, losses, judgments, and expenses arising out of, or from, any act or omission of the City, its officers, employees, or (members, participants, agents, representatives, agents as appropriate) arising out of or in any way connected to activities authorized

pursuant to this Agreement. This obligation shall survive the termination of this Agreement.

2. To provide workers' compensation protection to the MFC employees, and representatives.

3. To pay the United States the full value for all damage to the lands or other property of the United States caused by the MFC, employees, or representatives.

4. In the event of damage to or destruction of the buildings and facilities assigned for the use of the TFS in whole or in part by any cause whatsoever, nothing herein contained shall be deemed to require the NPS to replace or repair the buildings or facilities. If the NPS determines in writing, after consultation with the MFC that damage to the buildings or portions thereof renders such buildings unsuitable for continued use by the TFS, the NPS shall assume sole control over such buildings or portions thereof. If the buildings or facilities rendered unsuitable for use are essential for conducting operations authorized under this Agreement, then failure to substitute and assign other facilities acceptable to the MFC will constitute termination of this Agreement by the NPS.

B. **The NPS agrees:**

To cooperate to the extent allowed by law, in the submission of claims pursuant to the Federal Tort Claims Act against the United States for personal injuries or property damage resulting from the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his or her employment, arising out of this Agreement.

**ARTICLE IX** – **REPORTS AND/OR DELIVERABLES**

As specified in each task agreement awarded.

**ARTICLE X** – **PROPERTY UTILIZATION**

*Any NPS property used or other property acquired under this Agreement, including intangible property such as copyrights and patents shall be governed by the provisions of* 43 CFR, Subpart C, Sections 12.71 *through* 12.74.

## ARTICLE XI – MODIFICATION AND TERMINATION

A. Modifications to this Agreement may be proposed by either party and shall become effective upon approval by both parties.

B. Termination of this Agreement is only in accordance with *OMB Circular A-110 and 43 CFR Part 12.*

**Article XII – GENERAL AND SPECIAL PROVISIONS**

A. **General Provisions**

1. **OMB Circulars and Other Regulations –** The following OMB Circulars and other regulations are incorporated by reference into this Agreement:

   (a) *OMB Circular* A-87, “Cost Principles for State, Local, and Indian Tribal governments.”

   (b) *OMB Circular A-97*, “Provisions for Specialized and Technical Services to State and Local Governments.”

   (c) *OMB Circular A-102*, as codified by *43 CFR Part 12*, Subpart C, “Uniform Administrative Requirements for Grants-in-Aid to State Governments.”

   (d) 43 *CFR Part 12, Subpart D*, “Government-wide Debarment and Suspension (Non-procurement) and Government-wide Requirements for Drug-Free Workplace (Grants).”

   (e) 43 *CFR Part 12, Subpart E*, “Buy American Requirements for Assistance Programs.”

   (f) *FAR Clause 52.203-12*, Paragraphs (a) and (b), “Limitation on Payments to Influence Certain Federal Transactions.”

2. **Non-Discrimination** - All activities pursuant to this Agreement shall be in compliance with the requirements of Executive Order 11246; Title VI of the *Civil Rights Act of 1964,* as amended, (78 Stat. 252; 42 U.S.C. §§ 2000d et seq.); Title V, Section 504 of the *Rehabilitation Act of 1973,* as amended, (87 Stat. 394; 29 U.S.C. §794); the *Age Discrimination Act of 1975* (89 Stat. 728; 42 U.S.C. §§ 6101 et seq.); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, sexual orientation, national origin, disabilities, religion, age, or sex.

3. **Lobbying Prohibition -** 18 *U.S.C. §1913*, Lobbying with Appropriated Moneys - No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or oppose, by vote or otherwise, any legislation or appropriation

by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or of its departments or agencies from communicating to Members of Congress on the request of any Member or to Congress, through the proper official channels, requests for legislation or appropriations which they deem necessary for the efficient conduct of the public business.

4. **Anti-Deficiency Act** - 31 *U.S.C. §1341* - Nothing contained in this Agreement shall be construed as binding the NPS to expend in any one fiscal year any sum in excess of appropriations made by Congress for the purposes of this Agreement for that fiscal year, or other obligation for the further expenditure of money in excess of such appropriations.

5. **Minority Business Enterprise Development** - *Executive Order 12432* - It is national policy to award a fair share of contracts to small and minority firms. The NPS is strongly committed to the objectives of this policy and encourages all recipients of its Cooperative Agreements to take affirmative steps to ensure such fairness by ensuring procurement procedures are carried out in accordance with *43 CFR §12.944* for Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations, and 43 *CFR §12.76* for State and Local Governments.

B. **Special Provisions**

**Advertising and Endorsements**

The TFS must obtain prior NPS approval before releasing any public information that refers to the Department of the Interior, any bureau or employee (by name or title), or this task agreements awarded. The specific text, layout, photographs, etc. of the proposed release must be submitted to the NPS along with the request for approval.

C. **Certifications** – The following form(s) are incorporated into this Agreement by reference. These certifications are required in accordance with the provisions of this Agreement:

DI-2010, U.S. Department of the Interior Certification Regarding Debarment, Suspension, and Other Responsibility Matters, Drug-Free Workplace Requirement and Lobbying.

**ARTICLE XIII – <u>ATTACHMENTS</u>**

*In addition to the attachments previously specified in this Agreement, the following document is incorporated by reference and made a part of this Agreement:*
Form SF-424, “Application for Federal Assistance.”

**ARTICLE XIV– SIGNATURES**

**IN WITNESS HEREOF**, the parties hereto executed this Agreement on the date(s) set forth below.

| **FOR THE TEXAS FOREST SERVICE** | | **FOR THE NATIONAL PARK SERVICE** | |
|---|---|---|---|
| Signature: | ______________________ | Signature: | ______________________ |
| Name: | ______________________ | Name: | ______________________ |
| Title: | Director | Title: | Contracting Officer |
| Date: | ______________________ | Date: | ______________________ |
| | | Signature: | ______________________ |
| | | Name: | ______________________ |
| | | Title: | Regional FMO |
| | | Date: | ______________________ |
| | | Signature: | ______________________ |
| | | Name: | ______________________ |
| | | Title: | Regional Director |
| | | Date: | ______________________ |

CA7140-5-0001

COOPERATIVE AGREEMENT

BETWEEN

THE ALABAMA-COUSHATTA TRIBE OF TEXAS

AND

BIG THICKET NATIONAL PRESERVE

This agreement is made and entered into by and between the Alabama-Coushatta Tribe of Texas, hereinafter referred to as the **TRIBE**, and the Big Thicket National Preserve, Park Service, U.S. Department of Interior, hereinafter referred to as the **PRESERVE**, under the provisions of the Public Law 101-630 and 25 CFR Part 163.

**Whereas**, the **PRESERVE** has natural resource management responsibilities on preserve lands; and on an occasional basis, needs reinforcements to carry out prescribed bums and other resource management related projects; and

**Whereas**, the **TRIBE** has qualified firefighters, and is interested in cooperating with the **PRESERVE** to provide its members developmental opportunities in the management of natural resources; and

**Whereas**, the **TRIBE** and the **PRESERVE** can enter into agreements to cooperate as the most efficient and effective means to complete fire management objectives including utilization of qualified personnel;

Now, therefore, in consideration of the above premises, the parties hereto agree as follows:

A. The TRIBE shall:

1. Utilize the **TRIBE'S** Tribal Employment Office and Forestry Department to recruit, interview, employ and refer to the appropriate job location, personnel for employment under this program.

2. Designate an individual employed by the **TRIBE** to serve as a contact person for the **PRESERVE**. The Tribal Forest Manager will be the primary contact.

3. Pay the **TRIBE'S** employees that participate under this agreement at a rate commensurate with the federal Administratively Determined (AD) Pay Plan, unless other rates are agreed to, and pay all other costs associated with the use of Tribal employees.

4. Bill the **PRESERVE** for **TRIBAL** overhead and administrative costs related to the individual projects performed under this agreement. Overhead and administrative costs will be charged at the negotiated indirect cost rate approved annually by the Inspector General's office.

5. Bill the **PRESERVE** for hours worked as supported by time slips (signed by the employee and **PRESERVE** project coordinator), on a per project basis.

6. If an employee does not satisfactorily respond to training or perform his/her assigned duties, the **TRIBE** agrees to replace said employee, if possible, with another or make other mutually satisfactory arrangements.

7. Provide orientation to Tribal employees on pay, leave, and other personnel matters, and encourage Tribal employees to orient their Park Service co-workers on their cultural needs and expectations.

8. Insure that Tribal employees working on projects under this agreement are appropriately attired in personal protective gear, including boots and hardhat.

B. The **PRESERVE** shall:

1. Provide training and experience opportunities for Tribal employees utilized under this agreement, as described on the request for workers (Exhibit 1).

2. Provide orientation to all Tribal employees on the expectations of the **PRESERVE**.

3. Provide safety training pertinent to the assigned tasks, and inform the **TRIBE** of safety equipment required as a part of the Request for Workers.

4. Provide essential tools, equipment, and materials to Tribal employees while working on projects under this agreement.

5. Report time and/or work accomplishments of the Tribal employees to the **TRIBE** in accordance with requirements of the agreement.

6. Reimburse the **TRIBE** upon receipt of request for payment for all agreed upon costs.
   - Hours worked will be reimbursed to the extent shown on time slips signed by the Tribal employee and the Park Service contact.
   - Transportation cost will be reimbursed at a rate comparable to the GSA rate for that type of vehicle.

7. Bear the cost of any **TRIBAL** overhead and administrative costs related to the individual projects performed under the agreement.

8. Provide supervision, technical assistance, on-the-job training, and guidance to Tribal employees while working on projects under this agreement.

9. Designate an individual employed by the **PRESERVE** to serve as a contact person for the **TRIBE**. The Fire Management Officer will be the primary contact.

C. It is mutually agreed and understood by and between the said parties that:

1. No member of, or delegate to, Congress or Resident Commissioner, shall be admitted to any share or part of this agreement, or to any benefit that may arise therefrom; but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

2. Nothing in this agreement shall be construed as obligating the **PRESERVE** to expend, or as involving the United States in any obligations for the future payments of money in excess of appropriations authorized by law and administratively made available for this work.

3. The **TRIBE** will be deemed the employer participating in any project under this agreement. The **PRESERVE** will be responsible only for areas specified above.

4. Tribal employees working under this program shall not be deemed to be Federal employees other than for the purposes of section 2671 through 2680 of title 28, United States Code, and section 8101 through 8193 of title 5, United States Code.

5. Any facilities or land resources developed or improved under this agreement shall be and remain the property of the United States.

6. That in the performance of the terms of this agreement, the parties agree that the provisions of Title VI of the Civil Rights Act of 1964 wi1l be complied with.

7. This agreement may be revised as necessary, by the mutual consent of both parties, by the issuance of a written amendment, signed and dated by both parties.

8. The parties will meet annually to agree on rates of pay, other associated costs, and Tribal administrative costs. A written agreement of costs from this meeting will become a part of this agreement.

9. Either party may terminate this agreement by providing thirty (30) days written notice. Unless terminated by written notice, this agreement will remain in force indefinitely.

INTERPARK AGREEMENT
between
BIG THICKET NATIONAL PRESERVE
and
Padre Island National Seashore

ARTICLE I. <u>PURPOSE</u>

Define the mutual fire responsibilities of the Big Thicket National Preserve's fire staff (**Preserve)** and the staff at Padre Island National Seashore (**Padre Island)**.

ARTICLE II. <u>RESPONSIBILITIES</u>

The duties of the **Preserve** will include providing, as requested and required, professional and technical support for the fire management programs of **Padre Island**. The performance of these responsibilities will be based on communications between the area superintendent, the preserve's Fire Management Officer, and other staff as appropriate.

A. Specific responsibilities of the **Preserve** include:

1. Assist in development and implementation of prevention, suppression, rehabilitation, and aviation programs with appropriate staff through site visits, program reviews, inspections, budget formulation, and training.

2. Assist in coordination of reports, correspondence, preparation/review of fire management plans, aviation plans, and participate in fire management planning as requested.

3. Assist in coordination and implementation of planned ignitions, fire effects monitoring, smoke management, fire ecology, and research programs in accordance with park fire management plans.

4. Coordinate mobilization of Padre Island personnel to interagency fire assignments through appropriate coordination centers.

5. Develops, coordinates, issues performance task books, and conduct fire-related training as necessary to meet wildland fire needs of **Padre Island** and interagency needs according to approved fire management plans, zone, region, cluster, and national guidelines. Assist Intermountain Regional Fire management staff in the identification and certification of individuals for development of overhead positions.

6. Manage fire qualification/training records in the National Park Service Wildland Fire Computer System, including: initial record input; updating fitness scores, training, record transfer, experience, and instructor records, and issue incident qualification cards

7. Communicates with **Padre Island** units on issues and concerns prior to representing Padre Island Park at meetings, conferences, seminars, and other functions as requested and required.

8. Coordinate **Padre Island's** role in the 'zone' interagency fire community; developing interagency agreements, cooperative agreements, and other agreements necessary for carrying out wildland fire management.

9. Provide **Padre Island** with daily situation and fire weather reports as requested during the identified fire season; or, in support of management ignited burn projects.

B: Responsibilities of **Padre Island** include:

1. The superintendent will designate a collateral duty Fire Management Officer who requests program assistance, budget, supplies, and training needs through the **Preserve** FMO with sufficient-lead time to meet due dates, set-up meetings, etc..

2. Submit personnel updates, physical fitness scores, individual fire reports (DI-1202), situation reports, physical exam records, and information following established times and due dates. **Padre Island** FMO will be responsible for maintaining fire readiness to the level identified in the park's fire management plan.

3. Notify the **Preserve** FMO as soon as practical of any fire restrictions, closures, fire occurrences, or support actions.

4. Participate in the overall fire management of the **Preserve** and of the National Park Service by shared training and available personnel upon request.

ARTICLE IV. FUNDING

Program costs (travel/per diem, communications, supplies & materials, etc.) incurred by the **Preserve** will be charged to appropriate FIREPRO accounts. If personnel are working on a project that has been individually funded, the personnel may be paid from appropriate project funds.

The **Preserve's** annual budget request will identify supplemental support for **Padre Island -** i.e.: physical exams, PPE, training, cache items, travel, hazard fuel reduction projects, etc.

ARTICLE V. REPORTS

The **Preserve** will supply trip reports, situation reports and weather reports, personnel file information, or other pertinent reports **Padre Island** as requested.

ARTICLE VI. TERM OF AGREEMENT

The term of this Agreement will be five (5) years, beginning in CY2001. It is renewable at the end of each five-year period by written letter of agreement signed by each of the superintendents.

Amendments to this Agreement can be made at any time subject to the written concurrence and approval of both superintendents.

____________________________________ ______________
Superintendent, Padre Island National Seashore Date

____________________________________ ______________
Superintendent, Big Thicket National Preserve Date

INTERPARK AGREEMENT
between
BIG THICKET NATIONAL PRESERVE
and
Lyndon B. Johnson National Historical Park

ARTICLE I. PURPOSE

Define the mutual fire responsibilities of the Big Thicket National Preserve's fire staff (**Preserve)** and the staff at Lyndon B. Johnson National Historical Park (**LYJO**).

ARTICLE II. RESPONSIBILITIES

The duties of the **Preserve** will include providing, as requested and required, professional and technical support for the fire management programs of **LYJO**. The performance of these responsibilities will be based on communications between the area superintendent, the preserve's Fire Management Officer, and other staff as appropriate.

A. Specific responsibilities of the **Preserve** include:

1. Assist in development and implementation of prevention, suppression, rehabilitation, and aviation programs with appropriate staff through site visits, program reviews, inspections, budget formulation, and training.

2. Assist in coordination of reports, correspondence, preparation/review of fire management plans, aviation plans, and participate in fire management planning as requested.

3. Assist in coordination and implementation of planned ignitions, fire effects monitoring, smoke management, fire ecology, and research programs in accordance with park fire management plans.

4. Coordinate mobilization of **LYJO** personnel to interagency fire assignments through appropriate coordination centers.

5. Develops, coordinates, issues performance task books, and conduct fire-related training as necessary to meet wildland fire needs of **LYJO** and interagency needs according to approved fire management plans, zone, region, cluster, and national guidelines. Assist Intermountain Regional Fire management staff in the identification and certification of individuals for development of overhead positions.

6. Manage fire qualification/training records in the National Park Service Wildland Fire Computer System, including: initial record input; updating fitness scores, training, record transfer, experience, and instructor records, and issue incident qualification cards

7. Communicates with **LYJO** units on issues and concerns prior to representing Padre Island Park at meetings, conferences, seminars, and other functions as requested and required.

8. Coordinate **LYJO's** role in the 'zone' interagency fire community; developing interagency agreements, cooperative agreements, and other agreements necessary for carrying out wildland fire management.

9. Provide **LYJO** with daily situation and fire weather reports as requested during the identified fire season; or, in support of management ignited burn projects.

B: Responsibilities of **LYJO** include:

1. The superintendent will designate a collateral duty Fire Management Officer who requests program assistance, budget, supplies, and training needs through the **Preserve** FMO with sufficient-lead time to meet due dates, set-up meetings, etc..

2. Submit personnel updates, physical fitness scores, individual fire reports (DI-1202), situation reports, physical exam records, and information following established times and due dates. **LYJO** FMO will be responsible for maintaining fire readiness to the level identified in the park's fire management plan.

3. Notify the **Preserve** FMO as soon as practical of any fire restrictions, closures, fire occurrences, or support actions.

4. Participate in the overall fire management of the **Preserve** and of the National Park Service by shared training and available personnel upon request.

ARTICLE IV. FUNDING

Program costs (travel/per diem, communications, supplies & materials, etc.) incurred by the **Preserve** will be charged to appropriate FIREPRO accounts. If personnel are working on a project that has been individually funded, the personnel may be paid from appropriate project funds.

The **Preserve's** annual budget request will identify supplemental support for **LYJO** - i.e.: physical exams, PPE, training, cache items, travel, hazard fuel reduction projects, etc.

ARTICLE V. REPORTS

The **Preserve** will supply trip reports, situation reports and weather reports, personnel file information, or other pertinent reports **LYJO** as requested.

ARTICLE VI. TERM OF AGREEMENT

The term of this Agreement will be five (5) years, beginning in CY2001. It is renewable at the end of each five-year period by written letter of agreement signed by each of the superintendents.

Amendments to this Agreement can be made at any time subject to the written concurrence and approval of both superintendents.

____________________________________ _______________
Superintendent, Padre Island National Seashore Date

____________________________________ _______________
Superintendent, Big Thicket National Preserve Date

INTERPARK AGREEMENT
between
BIG THICKET NATIONAL PRESERVE
and
San Antonio Missions National Historical Park

ARTICLE I. PURPOSE

Define the mutual fire responsibilities of the Big Thicket National Preserve's fire staff (**Preserve)** and the staff at San Antonio Missions National Historical Park (**SAAN**).

ARTICLE II. RESPONSIBILITIES

The duties of the **Preserve** will include providing, as requested and required, professional and technical support for the fire management programs of **SAAN**. The performance of these responsibilities will be based on communications between the area superintendent, the preserve's Fire Management Officer, and other staff as appropriate.

A. Specific responsibilities of the **Preserve** include:

1. Assist in development and implementation of prevention, suppression, rehabilitation, and aviation programs with appropriate staff through site visits, program reviews, inspections, budget formulation, and training.

2. Assist in coordination of reports, correspondence, preparation/review of fire management plans, aviation plans, and participate in fire management planning as requested.

3. Assist in coordination and implementation of planned ignitions, fire effects monitoring, smoke management, fire ecology, and research programs in accordance with park fire management plans.

4. Coordinate mobilization of **SAAN** personnel to interagency fire assignments through appropriate coordination centers.

5. Develops, coordinates, issues performance task books, and conduct fire-related training as necessary to meet wildland fire needs of **SAAN** and interagency needs according to approved fire management plans, zone, region, cluster, and national guidelines. Assist Intermountain Regional Fire management staff in the identification and certification of individuals for development of overhead positions.

6. Manage fire qualification/training records in the National Park Service Wildland Fire Computer System, including: initial record input; updating fitness scores, training, record transfer, experience, and instructor records, and issue incident qualification cards

7. Communicates with **SAAN** units on issues and concerns prior to representing Padre Island Park at meetings, conferences, seminars, and other functions as requested and required.

8. Coordinate **SAAN's** role in the 'zone' interagency fire community; developing interagency agreements, cooperative agreements, and other agreements necessary for carrying out wildland fire management.

9. Provide **SAAN** with daily situation and fire weather reports as requested during the identified fire season; or, in support of management ignited burn projects.

B: Responsibilities of **SAAN** include:

1. The superintendent will designate a collateral duty Fire Management Officer who requests program assistance, budget, supplies, and training needs through the **Preserve** FMO with sufficient-lead time to meet due dates, set-up meetings, etc..

2. Submit personnel updates, physical fitness scores, individual fire reports (DI-1202), situation reports, physical exam records, and information following established times and due dates. **SAAN** FMO will be responsible for maintaining fire readiness to the level identified in the park's fire management plan.

3. Notify the **Preserve** FMO as soon as practical of any fire restrictions, closures, fire occurrences, or support actions.

4. Participate in the overall fire management of the **Preserve** and of the National Park Service by shared training and available personnel upon request.

ARTICLE IV. FUNDING

Program costs (travel/per diem, communications, supplies & materials, etc.) incurred by the **Preserve** will be charged to appropriate FIREPRO accounts. If personnel are working on a project that has been individually funded, the personnel may be paid from appropriate project funds.

The **Preserve's** annual budget request will identify supplemental support for **SAAN** - i.e.: physical exams, PPE, training, cache items, travel, hazard fuel reduction projects, etc.

ARTICLE V. REPORTS

The **Preserve** will supply trip reports, situation reports and weather reports, personnel file information, or other pertinent reports **SAAN** as requested.

ARTICLE VI. TERM OF AGREEMENT

The term of this Agreement will be five (5) years, beginning in CY2001. It is renewable at the end of each five-year period by written letter of agreement signed by each of the superintendents.

Amendments to this Agreement can be made at any time subject to the written concurrence and approval of both superintendents.

____________________________________ _______________
Superintendent, Padre Island National Seashore Date

____________________________________ _______________
Superintendent, Big Thicket National Preserve Date

## Appendix F

# FIRE MONITORING PLAN

## BIG THICKET NATIONAL PRESERVE

**June 2001**

| | |
|---|---|
| **PREPARED BY:** | R. Fulton Jeansonne ____________________________<br>Fire Ecologist, NP-BITH |
| **REVIEWED:** | David F. McHugh ______________________________<br>Fire Management Officer, NP-BITH |
| **REVIEWED:** | Susan L. Grace_________________________________<br>Ecologist, National Wetlands Research Center, USGS |
| **RECOMMENDED:** | Linda Kerr____________________________________<br>Regional Fire Ecologist, NP-DENVER |
| **APPROVED:** | Richard Peterson _______________________________<br>Superintendent, NP-BITH |

## FIRE MONITORING PLAN – BIG THICKET NATIONAL PRESERVE

### I. INTRODUCTION

Vegetation of Big Thicket National Preserve (BITH) creates special circumstances in the implementation of a fire-effects monitoring program. "Compared to the whole of the eastern deciduous forest, probably the most distinctive feature of vegetation of both Big Thicket National Preserve and the coastal plain generally is the large number of community types per unit area (~ a few $km^2$), with extreme compositional variation among them" (Harcombe, P. A. and P. L. Marks, 1979 p. 2). Geraldine Watson (1982) describes herbaceous vegetation communities changing within elevation differences of inches in some areas of the Preserve.

In addition to an extremely variable landscape, much of BITH land has been recently impacted (prior to its Preserve designation in 1974). Fire exclusion and logging may have been the major reasons for significant loss of longleaf pine (*Pinus palustris*) habitat - a fire-adapted type - in east Texas from 1931 to 1975 (Marks and Harcombe 1981). A report by Rice University researchers, A Study of Fire Effects on Vegetation in the Big Thicket, adds that these practices also "resulted in changes of vegetation in both species composition and extent of different community types in the whole area" (Liu, Changxiang, Harcombe, P. A. and Knox, R. G., August 1, 1995 p. 8). These conditions complicate vegetation type designation and the related determination of prescribed fire goals.

It is widely accepted that the fire-prone types in this area underwent regular, natural fires. Physical evidence of past fire activity is limited. The lack of old-growth trees for tree ring analysis (limited tree-ring analysis studies suggest a fire interval of 1 – 7 years in most fire-prone types) and lake charcoal sedimentation evidence (Ware et al. 1993), requires that educated hypotheses be made on natural fire regimes, and the vegetation communities relationship to fire.

#### Vegetation Communities and Fire

The Fire Monitoring Program utilizes the vegetation classification described by Harcombe and Marks (1979):

Uplands
Upland Pine Forest
Sandhill Pine Forest
Wetland Pine Savannah

<u>Slopes</u>
Upper-Slope Pine-Oak Forest
Mid-Slope Oak-Pine Forest
Lower-Slope Hardwood-Pine Forest

<u>Floodplains</u>
Floodplain Hardwood-Pine Forest
Floodplain Hardwood Forest
Wetland Baygall Shrub Thicket
Swamp Cypress Tupelo Forest

<u>Flatlands</u>
Flatland Hardwood Forest

In the Big Thicket, soils have important effects on vegetation patterns. Marks and Harcombe (1981) feel that vegetation patterns in the Big Thicket are largely determined by soil texture, including those in the fire-prone habitats (p. 11). Liu et al. offer that "vegetation change in the absence of fire may not be as dramatic and profound as is sometimes suggested", summarizing long-term studies where changes were mostly structural and lacked species replacement (p. 15).

Slopes and Uplands comprise 47,873 acres, or 55% of the Big Thicket. Approximately 28% of this, or 13,400 acres, is upland and upperslope forests - the most fire-prone habitats of the Preserve. It should be noted that nearly all types within the "Thicket" have the potential to carry fire during drought (personal comm. Dave McHugh). For example, if soil dries well enough, the deep organic peat layer of the Wetland Baygall type (in which there is standing water most of the year) has the potential to carry a fire (Liu et al. 1995, p. 13).

Much of the following information on community relationships to fire is taken from The BITH Fire Management Plan, 1998 (FMP), and the Liu et al. study. Citations are reproduced as well, and many were not re-checked by this author.

**Upland Pine Forest**

Chapman (1932) notes that lightning-caused fires probably occurred in Southeastern forests and savannas as frequently as three to four years apart. He goes on to state that five to six years of fire protection may so alter the ecological conditions that seedlings (including longleaf pine) if established, cannot compete with the herbaceous vegetation. With fire exclusion, the slower growing longleaf pine is often shaded out by the faster growing, less fire-tolerant loblolly pine (*Pinus taeda*) and shortleaf pine (*Pinus echinata*), as well as some hardwood species. Wright and Bailey (1982) predict that in the absence of fire, longleaf pine forests gradually succeed to a southern mixed hardwood community dominated by fire-intolerant species. Christensen (1981) suggests a 2 - 8 year fire frequency for this vegetation type.

The overstory in the Upland Pine Type is still dominated by the fire-tolerant longleaf pine. However, Sweetgum (*Liquidambar styraciflua*) and loblolly pine, as well as other fire-intolerant species, are now present in the overstory. It is plausible that in longleaf stands not under fire management (and in Sandhills and Wetland Pine Savannas), longleaf continues to retain dominance because of seasonal soil waterlogging or very deep, sandy soils. In less extreme sandy loam sites, however, longleaf-dominated Uplands have graded into Upperslope Pine Oak type over the last 60 years (Harcombe and Marks 1979, p. 43). This appears to be due to 60 years of fire absence.

With suppression has come an explosion of yaupon (*Ilex vomitoria*), which forms a dense shrub layer of volatile fuel. Subsequently, fires may become more intense and reach the canopy. Where woody species are absent from the understory due to fire influence, the herb layer is rich and consists of many species of grasses and forbs. A description of pyric herbaceous species typically associated with Upland Pine Forest is located below in section **II. Ecological Model**.

A 2 - 8 year fire frequency will allow longleaf pine to dominate the overstory canopy, reduce colonization and regeneration of fire-intolerant species, and maintain a species-rich herb layer (FMP 1998, p. 24). These effects will restore Upland Pine to a more natural, fire-influenced condition. With frequent burns, longleaf forest will be open, and parkland-like [as many historical accounts describe these areas] with a diverse herb layer (Komarek 1974).

**Wetland Pine Savanna**

Wetland Pine Savanna is the most diverse vegetation type in Southeast Texas. In the BITH Hickory Creek Unit, low tree density in Savannas appears to be due to fire and periodic droughts (Streng and Harcombe 1982). The overstory is dominated by scattered longleaf pine with many shade-intolerant, fire-adapted forbs in the understory. Dendrochronology studies suggest that natural fire occurs on a 3.9-year return frequency (Glitzenstein and Harcombe 1988). Liu et al. 1995 summarized findings from studies on similar types in South Carolina, that found repeated burning over a long period of time is needed to maintain pine grassland (p. 15). Without fire, tree density may increase and the community could become less flammable and succeed to pine-hardwood types (Streng and Harcombe 1982).

The presence of numerous pyric herbaceous species (listed in **II. Ecological Model**) in Wetland Pine Savanna suggests that this community type has long been influenced by frequent fire (FMP 1998, p 24). Most of the several hundred members of the species-rich graminoid/forb layer are shade-intolerant, and many disappear within a few years of fire exclusion because of increased canopy shading and litter accumulation (Komarek 1974). Fire keeps the woody understory component low and clears dead grasses to keep the herbaceous layer open. Liu et al. found that fire can significantly reduce shrub density in this type (though this may just represent the slower recovery in Wetland Pine Savanna, when compared to other types).

Declining fire frequency in the Hickory Creek Savanna Unit is accompanied by an increase in hardwood species and loblolly pine (Streng and Harcombe 1982). Loblolly pine and sweet gum (fire-intolerant invaders), and sweet bay and wax myrtle (original members of the community) are beginning to dominate the savannas in the absence of fire (Watson 1979). It is widely suspected that fire suppression in pine savanna ecosystems leads to virtually irrevocable conversion from fire communities to non-pyrophytic shrubland or forest (FMP 1998 p. 25).

**Sandhill Pine Forest**

The presence of remnant longleaf pine and xeric oaks suggests that historically low-intensity fires occurred frequently enough to maintain longleaf populations while enabling bluejack oak (*Quercus incana*) and post oak (*Quercus stellata*) to exist in the understory (FMP 1998 p. 25). Rare pyric herbaceous species (described in section **II. Ecological Model**) inhabit Sandhill Pine Forest. Fire supports longleaf recovery, while keeping hardwoods and other intolerant species at lower levels.

Since fire frequency is dependent on the accumulation of ground fuels, it is reasonable to conclude that the logging of pines and the reduction of grasses through grazing activity directly resulted in decreased fire frequency. This reduced fire frequency may explain the present dominance by xeric oaks, the highly unusual presence of loblolly pine (which currently dominates all other pine species), the occurrence of sweetgum (FMP 1998 p. 25), and the decreased presence of longleaf pine. Loblolly pine and sweet gum are river and creek bottom species that often invade fire-excluded, disturbed areas through good seed dispersal and wide tolerances of habitats (Harcombe and Marks 1979), while the xeric oaks (naturally occurring) out-compete longleaf in the absence of fire.

Some xeric sandhill forests in the Coastal Plain accumulate sufficient pine litter and ground fuel within a three to five year period to carry low-intensity fires (Christensen 1981). This forest type may have experienced natural fire every four to seven years. In its present condition (less longleaf pine in the canopy) it may not burn this frequently due to the rather slow accumulation of flammable fuels (FMP 1998, p 25).

**Upperslope Pine Oak Forest**

This vegetation type shows characteristics that indicate a strong fire influence occurred in the past (Schafle and Harcombe 1983). The importance of shortleaf and longleaf pines in this type points to historical periodic fire. In fact, shortleaf pine reaches its peak importance in this type (Harcombe and Marks 1979). It is reasonable to assume that fire keeps Lower-Slope, fire-intolerant species from encroaching upslope. Fire suppression has resulted in an upslope migration of Lower-Slope species such as loblolly pine, sweet gum and black gum, and has allowed the development of a rather dense hardwood understory and shrub stratum (FMP p. 26).

Shortleaf pine is thought to have been important in the canopy historically. It remains an important diagnostic species for this type, though it is less frequent as more hardwoods and loblolly pine now reach the canopy. Longleaf pine, blackjack oak, and post oak are associated canopy species under natural conditions. In order for shortleaf pine to have maintained its dominant position in this type, fire must have occurred less frequently than in upland longleaf pine forests and savannas, but frequently enough to preclude establishment of loblolly pine and other less fire-tolerant species (FMP p. 26).

Shortleaf pine has been shown to become established and grow best on sites where fire intervals are less than 10 years (Chapman 1944). Once fire frequencies approach a 10-year interval, loblolly pine often overtakes shortleaf pine (Wright and Bailey 1982).

Thus, the evidence suggests that a fire interval ranging from six to eight years maintains the desired forest structure and species composition in Upper-Slope Pine-Oak Forest (a shorter fire return interval may be needed to restore some areas to a maintenance level). This fire frequency favors shortleaf pine while providing for regeneration of longleaf pine and fire-tolerant hardwoods, and maintains a relatively open understory and shrub stratum (FMP 1998, p. 26). Liu et al. showed that large sapling density in this type declined significantly after fire (p. 49).

### Need for study

Big Thicket National Preserve has had a prescription burning program since 1981. Short-term fire effects study began when Geraldine Watson established permanent plots in some of the fire-managed areas of the Preserve in 1983. The goal of the current monitoring program is to characterize short-term and long-term effects of fire on the four pyric vegetation types. The protocol will provide for the analysis of effects of current fire regimes on vegetation, as well as address specific questions concerning the efficacy of varied burn frequencies and canopy densities in attaining desired conditions.

The study by Rice University researchers Liu, Harcombe and Knox conducted from 1989 to 1995 presents preliminary results of fire effects analysis. The decision to follow Rice University protocols, rather than the FMH Western Region protocol, was made in consultation with NPS National Fire Ecologist Tim Sexton, Dr. Paul Harcombe (Rice University), and Dave McHugh (BITH FMO). The fire monitors will utilize the initial findings of the Rice study, as well as its sampling methods and established plots. The existing data (from the Rice fire effects study and other vegetation monitoring studies conducted since 1976) are a valuable resource; and the Rice protocols provide an appropriate design for answering many questions in this landscape. Due to the highly variable character of the Big Thicket vegetation, and the uncertainty surrounding past fire activity and vegetation relationships with fire, there must be a long-term monitoring program to characterize fire's role in these ecosystems.

Because the burning program has been active since 1981, initial startup issues have been resolved. Preserve neighbors are generally supportive of burning activities, and community meetings are occasionally held to address neighbor concerns. Monitoring will provide the hard figures required to support the Preserve's fire management activities when future conflict arises. The monitoring program will also provide the information for making improvements to the burn program.

## II. DESCRIPTION OF ECOLOGICAL MODEL

The following ecological descriptions are summarized from information in the BITH Fire Management Plan (FMP 1998). Some citations are reproduced from the FMP, and many of these were not re-checked by this author.

**Upland Pine Forest**

This forest type occurs on level-to-gently-rolling hilltops with sandy surface soils (Harcombe and Marks 1979, p. 9), and consists of open stands of longleaf pine which vary considerably in height and density. Loblolly pine and shortleaf pine are common overstory associates. Additional overstory species that may be present include bluejack oak, blackjack oak (*Q. marilandica*), southern red oak (*Q. falcata*), post oak, and sweet gum. The understory is highly variable, depending upon fire history, and is dominated by saplings of the above species, roughly in the order indicated. Flowering dogwood (*Cornus florida*), American beautyberry (*Callicarpa americana*), wax myrtle (*Myrica cerifera*), and winged sumac (*Rhus copallina*) are additional common understory species. Where woody species are absent from the understory due to fire, the herb layer is dense and consists of many species of grasses and forbs. Bluestem grasses (*Andropogon spp.*) are usually dominant in such areas. Upland Pine Forest is distinguished from Sandhill Pine on the basis of greater density and height of longleaf pine, lower importance of scrub oaks, and greater vigor and diversity of forbs and/or low shrubs (FMP 1998, p. 7).

Rare, fire-adapted, herbaceous species typically associated with Upland Pine Forest include puccoon (*Lithospermum caroliniense*), wine-cup (*Callirhoe papaver*), bird-foot violet (*Viola pedata*), bristly sensitive brier (*Schrankia hystricina*), prairie phlox (*Phlox pilosa*), butterfly-weed (*Asclepias tuberosa*), and slender gay-feather (*Liatris tenuis*) (Ajilvsgi 1979, Watson 1982). The endangered Texas trailing phlox (*Phlox nivalis var. texensis*) appeared in an Upland site in the Big Sandy Unit following a prescribed burn in 1998 (FMP 1998, p. 24).

**Sandhill Pine Forest**

The Sandhill Pine type occurs on deep and level sandy terraces (the surface soil is > 90% sand) that are presumed remnant sand bars of old stream terraces (Harcombe and Marks 1979 p. 9). It is short, open woodland with low tree density and basal area, low shrub density, and a relatively sparse herb layer. Bluejack oak and post oak are dominant, and there is an emergent overstory of widely scattered loblolly pine, shortleaf pine, and longleaf pine. Bluejack oak and post oak reach their maximum importance in this type and are relatively unimportant in any of the other types. Dr. Paul Harcombe notes farkleberry (*Vaccinium arboreum*) and woollybucket bumelia (*Bumelia lanuginosa*) are distinctive shrubs in this type (personal comm.). Red bay (*Persea borbonia*), flowering dogwood (*Cornus florida*), sweet gum, and yaupon also occur (FMP 1998, p. 7).

Rare pyric herbaceous species occurring in Sandhill Pine Forest include wahlenbergia (*Wahlenbergia marginata*), rose vervain (*Verbena canadensis*), Oklahoma prairie clover (*Petalostemum griseum*), reverchon palafoxia (*Palafoxia reverchonii*), clammy-weed (*Polanisia erosa*), whitlow-wort (*Paronychia drummondii*), catchfly (*Silene subciliata*), Winkler gaillardia (*Gaillardia aestivalis*), and Texas trailing phlox (Ajilvsgi 1979, Watson 1982).

**Wetland Pine Savanna**

Wetland Pine Savanna occurs in areas with poor drainage, ranging from small depressions or swales in Upland Pine Forest to broad, swampy, interdistributary flats. It normally contains widely scattered longleaf pine or loblolly pine with little else in the overstory. Stunted individuals of black gum (*Nyssa sylvatica*), sweet gum, and southern red oak often occur. Common understory shrubs include sweet bay (*Magnolia virginiana*), wax-myrtle, and titi (*Cyrilla racemiflora*), which may occur in dense patches interspersed with grassy meadows that include sedges, insectivorous plants such as the pitcher plant (*Sarracenia alata*), and orchids. Wetland Pine Savanna is distinguished from Upland Pine Forest by the open tree layer and presence of wetland herbs and shrubs (FMP p. 7).

According to Watson (1979) the only trees which should occur in Wetland Pine Savanna are stunted black gum and widely spaced longleaf pine. Loblolly pine and sweet gum (fire-intolerant invaders) and sweet bay and wax myrtle (original members of the community) are beginning to dominate the savannas, crowding out the herbaceous species and forming dense thickets (FMP 1998, p. 7).

Rare plant species occurring in this vegetation type consist of the snowy orchid (*Habenaria nivea*), yellow fringed orchid (*H. ciliaris*), grass-pink (*Calopogon pulchellus*) bearded grass-pink (*C. barbatus*), rose pogonia (*Pogonia ophioglossoides*), bottle-gentian (*Gentiana saponaria*), bartonia (*Bartonia texana*), spring bartonia (*B. verna*), prairie rose-gentian (*Sabatia campanulata*), and blue-star (*Amsonia glaberrima*) (Ajilvsgi 1979, Watson 1982).

**Upper-Slope Pine-Oak Forest**

Upper-Slope Pine-Oak type is distributed on gentle, mantled slopes of fine sands or fine, sandy loams (Harcombe and Marks 1979, p. 10), and is closed canopy forest with a moderately well developed shrub layer. It is distinguished from the mid and Lower-Slope types by the lower relative abundance of hardwoods (and those hardwood species that are present tend to be more fire tolerant) (Harcombe and Marks 1979, p. 19). Shortleaf pine is sometimes dominant, and southern red oak, longleaf pine, loblolly pine, and blackjack oak are often codominant in various combinations. The pines are often more important than the hardwoods. Associated species include post oak, sweet gum, white oak, and black gum, all of which reach maximum importance in other types. The most important understory species are yaupon, flowering dogwood, and American beautyberry (FMP 1998, p. 8).

Upper-Slope Pine-Oak Forest is distinguished from Upland Pine Forest by the abundance of shortleaf pine, which reaches its peak importance in this type, and by the importance of oaks in the canopy. Several species, including mockernut hickory (*Carya alba)*, yaupon, blackjack oak, American beautyberry, and sassafras (*Sassafras albidum*) reach their maximum importance in this type (FMP 1998, p. 8).

**Species characteristics**

Geraldine Watson (1982) notes species well adapted to frequent fire include longleaf pine, many grasses, forbs, legumes, and pitcher plants. She further identifies species that can survive occasional fire (every 5 - 10 years) because of inherent reproductive, survival, or recovery characteristics. These include shortleaf pine, black gum, flowering dogwood, bluejack oak, post oak, red bay, sweet bay, sassafras, titi, wax-myrtle, yaupon, and American beautyberry. The majority of species normally associated with mesic environments are basically fire-intolerant. These include loblolly pine, American beech, southern magnolia, ironwood, red maple, and many of the oaks (FMP 1998, p. 28). Geraldine Watson (1979) notes that species that may be eliminated by fire occur abundantly in climax communities spread over the preserve, thus precluding concerns about their significant reduction.

Included here are detailed descriptions of the fire ecology of the three major canopy species in the Preserve's fire-managed types - longleaf pine, shortleaf pine, and loblolly pine, - and the shrub species of greatest concern, yaupon.

**Longleaf pine** (*Pinus palustris*)

The Preserve is on the western edge of longleaf habitat that stretches southwest from North Carolina. As previously shown, longleaf pine is a major component of Big Thicket National Preserve vegetation types. Longleaf is drought tolerant, preferring sandy sites with good to excessive drainage (Wright and Bailey 1982, p. 367). Harcombe and Marks (1979) note that longleaf is most important in the Upland Pine and Wetland Pine Savanna types, with Upland Pine Forest containing most of the area classified as longleaf pine habitat in the Preserve (p. 18). They find that, with fire exclusion, some of the original longleaf-dominated area has converted to loblolly-shortleaf type (and will probably succeed to oak-hickory type), while the remaining original longleaf habitat is already in the oak-hickory stage (p. 43).

Longleaf seeds can germinate in less than a week after hitting the ground. Fires help clear the ground of litter and grass so seeds can reach mineral soil, and burning within a year of seedfall normally provides an adequate seedbed. When the seedling reaches a root collar diameter of .8 cm, it is highly resistant to fire. At a height of about 0.6 - 0.9 meter, they are once again sensitive to fire. After this stage, they are again resistant to fire damage. Seedlings can also sprout from the root collar if top-killed, with sprouting ability decreasing with height growth .

Longleaf is susceptible to brown-spot needle blight (*Scirrhia acicola*) during its immature "grass" stage (Boyer 1983). Burning will remove infected leaves, and consume innoculum while the plant survives on its large root mass (Wright and Baily 1982). Fire releases longleaf from its grass stage by clearing fire-intolerant competitors. During the grass stage, the bud is protected by a sheaf of long needles and fire resistant scales. In some studies, seedlings burned during the winter at intervals of three years have shown twice as much growth as those not exposed to fire (Wright and Bailey 1982, p.370). Following release, the seedling rapidly puts on apical growth so that in three to four years the sensitive apical bud is high enough to avoid damage from low-intensity surface fires (Christensen 1981).

Prescribed burning can favor longleaf over less-tolerant species. Longleaf is quite susceptible to resource competition and shading, and without fire, hardwoods and other pines like loblolly and slash invade. As stated previously, five to six years of fire protection in open longleaf stands may so alter the ecological conditions that longleaf seedlings, if established, cannot compete with the herbaceous vegetation, or faster growing trees.

In addition to being an important timber species, longleaf provides valuable wildlife habitat. The red-cockaded woodpecker favors longleaf for cavity nest building, while burning maintains the open understory the bird prefers. Wildlife also affects longleaf recovery to some degree. Longleaf produces seed irregularly, and wildlife such as birds, mice and squirrels feed on seeds.

**Shortleaf pine** (*Pinus echinata*)

Loblolly and shortleaf thrive where fires occur about every ten years, though shortleaf can resprout, tolerate more frequent burns, and is better adapted to drier, coarser soil sites (Wright and Bailey 1982 p. 377). Young individuals are moderately tolerant of shade, and intolerance increases with age. On good sites, shortleaf may be out-competed by hardwood species (e.g. sweetgum and red maple). Seeds do not require exposed mineral soil for germination and seedling establishment in large seed crop years (Baker 1992 p. 104). Fire, though, can prepare the seedbed fully by reducing litter and ground vegetation while controlling some of the smaller hardwoods. Attaining a height of 12 - 15 feet will protect shortleaf pines from fire damage as hardwood competition is again controlled by burning (Baker 1992 p. 105). Shortleaf pine sprouts when young trees are top-killed.

**Loblolly pine** (*Pinus taeda*)

Loblolly is the predominant pine in much of the South. It will invade on drier sites where longleaf is better suited and its faster growing seedlings will out-compete and shade out longleaf seedlings unless fire frequency is every 3 years or so. Loblolly becomes established and grows best on sites that escape fire for intervals of at least 10 years. It is susceptible to fire until it reaches a height of 4.6 meters, compared to 1.8 to 2.4 meters for longleaf. The understory of loblolly pine forests consist of less combustible fuels than longleaf dominated stands (Wright and Bailey 1982 p. 374).

**Yaupon** (*Ilex vomitoria*)

The formation of dense thickets of this species occurs with the exclusion of fire that would kill ground level saplings, thus providing a volatile and abundant fuel that produces up to 80 foot flame lengths (FMP 1998). It also sprouts vigorously after fire. A major prescribed fire objective in BITH is the reduction of dense shrub layers (yaupon is the most prevalent thicket-former) to favor herbaceous species and desired tree sapling establishment, and reduce hazardous live fuel accumulation.

## Effects of Other Resource Uses on Vegetation

Oil and gas exploration have centralized, small-scale effects on vegetation. A study by Fountain, 1987, looked at vegetation recovery on abandoned oil well sites. It was concluded that vegetation recovery on production sites required an average of 109 years. Current oil and gas sites are protected from fire management areas.

Impacts to vegetation from most hunting and trapping activities are likely insignificant, i.e., controlled, sustainable deer and squirrel populations will not affect forest regeneration substantially. It is quite possible, however, that the current removal rate for the feral hog is too low, and feral hog populations may be causing significant reductions in longleaf pine seedling success.

### Ecological Evidence: Preliminary Findings of the Rice University Fire-Effects Study

The following information is summarized from "A Study of Fire Effects on Vegetation in the Big Thicket, Final Report to the National Park Service and The Nature Conservancy", August 1, 1995 pp. 36-62. This summary describes the most current analysis of the short-term effects of fire on Big Thicket vegetation that can provide a basis for determining possible long-term ecological changes.

Phytolith studies were completed by Liu et al. 1995. This analysis of soil silicates determines the past relative abundance of grasses for a site. It can be postulated that current shrub or dense overstory canopies have displaced grasses and other herbs and forbs because of fire exclusion. These analyses suggest a shift from Upland Pine to Upperslope Pine Oak, and from Wetland Pine Savanna to a midslope pine-hardwood mix in some areas of the preserve.

Fine fuel load showed significant reduction in all types except in Wetland Pine Savanna (these sites recovered well after fire, replacing consumed fuel). Fine fuel depth decreased significantly in all types, varying in magnitude among types. Only in Wetland Pine Savanna was the shrub (< 1.4 m tall) cover reduced significantly, with other types showing insignificant declines (possibly representing regrowth after fire), while shrub cover increased (fast resprouting) in the Sandhill type. In some types, shrubs increased greatly in the second and third years after an initial post-burn decline. Seedlings and small saplings showed no significant differences between pre and post-fire densities (though appearing to increase in some areas), with post-fire individuals resulting from seed or sprouting.

There were significant declines (with subsequent steady increases) of large saplings in Upland Pine and Upperslope Pine Oak types only. This category is affected by growth of pre-fire small saplings and shrubs into the large sapling class. Small tree populations were reduced in all types except Savanna. "The change of small tree density can be solely considered as [a] direct [result] of fire" (p. 49) as it would take several years or decades for saplings or seedlings to grow into this class. Declines were prolonged in hot-burned areas (Sandhill and Upland Pine). Basal area decreases were largely insignificant.

High intensity fires in heavy fuels resulted in tree death. Fire temperature varies from type to type under the same burn conditions therefore affecting tree kill and tree density differently among types (Sandhill and Upland Pine sites burned hottest). Comparisons between these two types and the others show that they respond in changes to small tree density more profoundly. "Gradients in environment, and factors associated with vegetation types at a particular site, cause the differential effects of fire on the vegetation" (p. 56), with fire affecting drier types (Sandhill and Upland Pine) more strongly than wetter types.

Time of year affects fire results: "summer fires tend to result in higher mortality in hardwoods than in pines, and controlled growth of shrubs and hardwoods better than fires in other seasons" (p. 14). Current fire management practices emphasize growing season burns to control understory brush and promote grass/forb ground cover (FMP 1998 p. 48). A connection between fire interval and herbaceous cover was also found. hardwood and shrub species are more susceptible to low intensity fire injury than are pine species. The duration of fire effects depends upon the reduction in the small tree class, the rate of regrowth of small size classes, and the species composition of the newly regenerated populations. Compositional changes in the understory did not follow a pattern, however, Savanna and Sandhill communities tended to return to their preburn composition after several years.

This study documents that prescribed fire will bring structural change to some of the plant communities - particularly Upland Pine, Upperslope Pine Oak, and Sandhill Pine. While it had limited effect on the overstory, it can open up the understory, reduce shrub cover, and even introduce a herbaceous component. As the five-year study tracked change after only one prescribed burn (two burns in the Sandhill), longer-term research into changes resulting from repetitive burning over several decades is necessary to make informed management decisions.

**Ordination Analysis Results**

The study by Liu et al. 1995 is a multivariate analysis that looked for general trends and movements of vegetation types to other vegetation types.

In the tree layer, burned stands exhibited more changes than controls, but no consistent patterns of convergence or divergence emerged. Although in longleaf dominated stands, there was greater movement on the ordination diagram, with one Upperslope stand definitely moving towards dry upland types - suggesting this stand was once Upland type. After decades of fire exclusion, heavy fuel loading and a shrub understory contributed to high intensity fires that changed overstory composition at this site. There are doubts that Upperslope Pine Oak Forest will change to mixed longleaf on a large scale due to the lack of longleaf in the canopy, and the fact that regeneration of longleaf requires an open canopy and is slow.

Small trees showed dramatic changes in Upland Pine stands and some of the Sandhill and Upperslope stands - moving away from pre-fire positions. Sandhill showed substantial movement away from other types in this category. No patterns of overall change were noticed in the large saplings, seedlings and small sapling strata. Grass cover was reappearing in Upland Pine type, while fire probably plays a role in maintaining the diverse herbaceous layer and arresting succession in the Savanna type.

Reintroduction of fire changed the vegetation structure and relative abundance of the species in the two dry types (Sandhill and Upland pine) and some of the upperslope stands, particularly in the small tree stratum. Size classes affected by fire became smaller going from dry to wetter types. Vegetation structure changes are attributed mainly to the decline of understory density of hardwoods and shrubs.

As noted previously, shrub cover increased in 2 - 3 years post-burn at some sites after an initial decline, as did seedlings and small saplings. Comprehensive monitoring will look more closely at the long-term effects of vigorous post-fire sprouting and germination, and the action of 2-3 year interval burning on survival. Seedbed characterization and subsequent release by fire in all types are also important areas to be monitored. The monitoring program will determine how much hardwood is coming back in comparison to desirable pines, and if pines are growing fast enough to outcompete fire-intolerant hardwoods and shrubs.

## III. MANAGEMENT OBJECTIVES

### Resource Management Goal for Prescribed Fire

The Big Thicket Resources Management Plan (RMP) 1996, states that a resources management objective of the Preserve is "to perpetuate, protect, interpret and, where appropriate, restore the Preserve's unique mixture of temperate and subtropical botanical and biological communities (p. 3)." The RMP project statement for continuing the prescribed fire program states that "restoring fire's role as dynamic force shaping the vegetative structure will restore the conditions that occurred in the natural forests of the Big Thicket" (p. 136), reversing 50 to 75 years of fire suppression and restoring natural community structure and balance (p. 138). Prescribed fire will also continue to maintain and enhance wildlife habitat characteristics. Particularly, the threatened and endangered red-cockaded woodpecker requires open, park-like old-growth pine forests (RMP 1996 p. 187)

The RMP calls for the initiation and continuation of an aggressive monitoring program that provides baseline data necessary to facilitate future planning and the management decision process, and evaluate the environmental impacts of human use on Big Thicket National Preserve (p. 3). Also noted is the lack of information on the effects of fire on the plant communities, or on what burn conditions and rotations will "perpetuate biological diversity" (p.23). The RMP states: "Feedback from vegetation monitoring in pyric vegetation types is critical to optimize burning prescriptions and fire return intervals in these communities" (p. 134).

The RMP states that a prescribed burning program should also minimize the risk of wildland fires escaping Big Thicket National Preserve by conducting hazard fuel reduction burns along specific boundaries. Fire management should prevent human-caused wildland fires; minimize detrimental impacts on resources and property from such wildfires; and properly and judiciously manage wildland fire use and prescribed fire in a manner consistent with the safety of persons, property, and other resources (RMP 1996). Wright and Bailey (1982) note that "fire hazard reduction is one of the principle reasons for using fire in the Southeast because prescribed burns reduce the frequency of wildfires manytimes" (p. 381).

## Prescribed fire goals

Successful fire management will take into account the biology of the species in the four fire-adapted vegetation types, in order to attain - as closely as possible - natural conditions. This can be accomplished by reducing fire-intolerant species competition (while maintaining or increasing more tolerant species presence), and reducing brush density to allow for greater herbaceous presence and/or desired seedling success. Data analysis will attempt to identify the interactions of the physical effects of fire and the ecological responses of vegetation communities.

There are specific objectives for prescribed fire in the Big Thicket. They are listed under the burn objectives of the FMH-4's for the four fire-adapted vegetation types (Appendix A). The best available data, historical accounts, and informed hypotheses of pre-suppression/fire-influenced conditions have guided objective formulation. Changes in the populations of interest (defined in the objectives) will be determined as statistically significant differences between pre and post-burn populations and/or differences with control area development.

The **Upland Pine Forest**, **Wetland Pine Savanna**, and **Sandhill Pine Forest** types share the following objectives:

-Re-establish or maintain longleaf pine dominance in the canopy and sapling/seedling layers
-Decrease canopy presence of fire-intolerant hardwoods and pines
-Reduce/eliminate invasion of subcanopy strata by typically low-dwelling species less tolerant of fire
-Reduce dense shrub layer cover
-Maintain or increase herbaceous cover and diversity
-Stabilize or increase the presence of pyric herbaceous species
-Reduce hazardous fuel buildup in high risk areas

In **Wetland Pine Savanna**, an additional objectives is:

-Reduce canopy density by removing less tolerant species or weakened individuals to encourage
herbaceous ground cover

The objectives of fire management in the **Upperslope Pine Oak Forest** type are:

-Retain importance of longleaf and shortleaf pines in the canopy
-Reduce invasion by lower-slope species
-Reduce the hardwood and shrub density in the subcanopy layers
-Reduce hazardous fuel buildup in high risk areas

These objectives define desired changes in appropriate indicators of area conditions/type. In addition to the structural characteristics analyzed by Rice University, BITH monitoring will be researching compositional changes and fire responses, to ensure we are attaining desired long term change. The monitoring program will also study the effectiveness of various fire regimes and canopy densities in promoting the herbaceous ground cover.

## IV. <u>MONITORING DESIGN</u>

### Monitoring Objectives

Monitoring in the Big Thicket will characterize the effects of prescribed burning/fire use on forest structure, development, succession, species replacement, etc. Because of vegetative species abundance and diversity, the Western Region Fire Monitoring Handbook (1992) design will not be followed. This was done in consultation with Tim Sexton, National Fire Ecologist. The Liu, Harcombe, and Marks research protocols provide an appropriate level of precision. In addition to their original measurements, BITH will implement an intensive herbaceous layer aspect.

The monitoring program will track development in the fire-managed types of the Preserve. Changes will be analyzed for statistical significance while determining fire's role (and its varying conditions and behavior) in causing the observed changes.

Control plots are an important aspect of monitoring change in the Big Thicket. They provide a basis for comparisons of fire-treated areas to similar sites protected from fire. Control plots and burn plots will be installed utilizing the same criteria and methods as outlined below.

### Sampling design and Field measurement

The monitoring program will initially consist of the 33 plots established by Liu, with early data analysis providing more information on sample size needs. Liu et al. (1995), obtained some statistically valid results on structural changes with the existing sample sizes. Each plot consists of 5 sub-plots. Each sub-plots is treated as an individual statistical unit. New concerns with species - level effects, and effects of different burn frequencies on a vegetation type may alter sample size requirements.

The following chart displays acreage amounts of the four vegetation types as well as existing numbers of plots per vegetation type:

| Vegetation Type | Acreage | Existing #Plots | |
|---|---|---|---|
| | | Burn | Control |
| Sandhill Pine | 132 | 2 | 2 |
| Upland Pine | 1137 | 3 | 3 |
| Upperslope Pine Oak | 10342 | 8 | 8 |
| Wetland Pine Savanna | 1813 | 4 | 3 |

The existing plots, by vegetation type, are:

**Upland Pine:** 3 burn (BS06UPB, BS15UPB, TC36UPB); 3 control (BS06UPC, BS15UPC, TC36UPC)

**Wetland Pine Savannah:** 4 burn (LR51WSB, LR53WSB, LR54WSB, LR54SLB); 3 control (LR51WSC, LR54WSC, LR54SLC)

**Sandhill Pine:** 2 burn (TCISS1B, TCISS2B); 2 control (TCISS1C, TCISS2C)

**Upperslope Pine Oak:** 8 burn (BSRCUSB, BS06UUB, BS06LUB, BS15USB, BS15U2B, TCISUSB, TC36UUB, TC36LUB); 8 control (BSRCUSC, BS06UUC, BS06LUC, BS15USC, BS15U2C, TCISUSC, TC36UUC, TC36LUC)

See Appendix B for maps of plot locations.

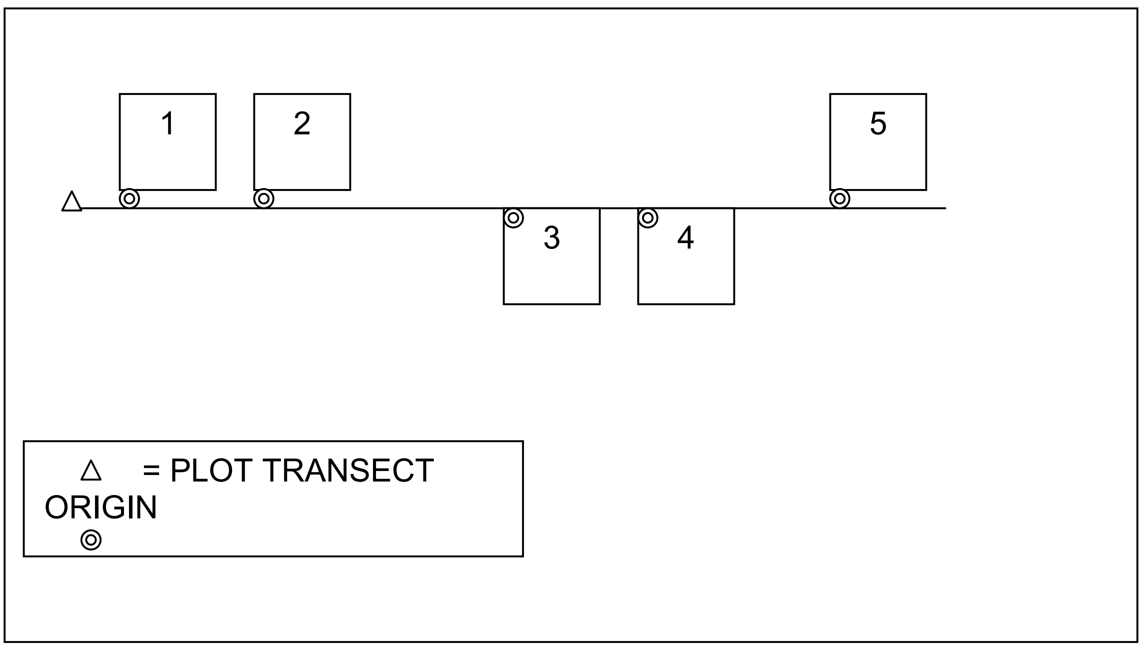
**Site Selection**

Selection of plot location points will be random - utilizing the grid method or GIS random point selection. The large variations in vegetation on relatively small scales in the Preserve often make it necessary to use these methods as initial guides and then search until a suitable site is found. It is not necessary to have equal numbers of burn and control plots. Control plots will be placed in similar, adjacent areas that can be safely and cost-effectively defended.

Harcombe and Marks (1979), defined and named units of vegetation on the basis of physiographic position (upland, slope, floodplain, flatland) and community physiognomy (forest, savanna, or shrub thicket), usually combined with important trees (pine, oak, hardwood). Vegetation Type will be determined through combined analysis of current species present and/or the potential vegetation type (expected natural vegetation type based on analysis of topography, species presence, and fire history). Preserve FMO David McHugh and Dr. Paul Harcombe will provide initial guidance in type designation. Some already-established plots may have to be reassigned by type. Appendix A contains Monitoring Type Description Sheets (FMH 4) for the four vegetation types. The information on these forms will guide future decisions on plot installation.

**Plot setup**

This plot design allows for flexibility in plot placement, permitting the coverage of small and odd-shaped areas. All plot location information will be recorded on FMFS-1 ( Appendix C ). Plots consist of 10m X 10m square subplots arranged along transects. Transects are of varying lengths based on area size and shape, along which a number (usually 5) of the 10m X 10m sub-plots are aligned. Plot transect length will be determined on a site to site basis, and this design allows for the placement of several short transects in a small or odd-shaped area. A large number of vegetation types are small and odd shaped and this variable transect length allows for the transect to be tailored to the site. There is no maximum transect length, but the minimum length should be no shorter than 75 meters with 16 meters between sub-plot origins to accommodate the fuels transect. Plot placement is tailored to site, with subplots placed at various distances from one another, and on either the right or left side of the plot transect. For example:




The transect origin is marked with a galvanized metal pole. All four corners are marked with a galvanized metal pole, and the subplot centerline (parallel to transect) endpoints are marked with rebar. Transect origins, and all subplot origin positions are captured with a GPS unit, and physical coordinates are obtained.

**Field Measurement Procedures**

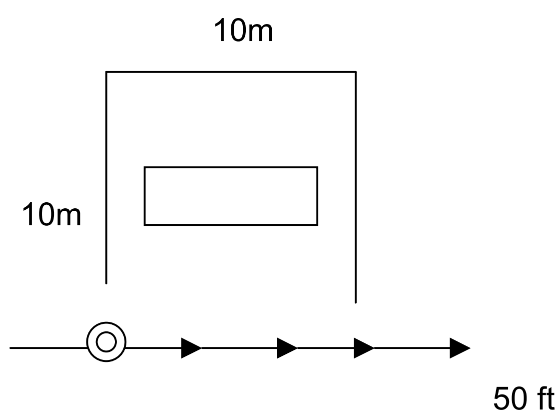
Data sheets are grouped according to plot, with each 10m X 10m subplot having its own set of data sheets to facilitate specific data search and collections.

**Fuels**

Brown's transects will be installed to monitor downed woody fuels. The measurements will follow the "Handbook For Inventorying Downed Woody Material" by James K. Brown 1974. There is one 50 foot transect per subplot that originates at the subplot origin and extends 50 feet along the plot transect in the same direction. Overlap to adjacent subplots is avoided by establishing subplot origins are at least 16m apart. This gives enough room to prevent the overlapping of fuels transect.

BITH will follow FMH recommendations by utilizing the "6-6-12-50" measurement system for Brown's
data collection. This means that sticks are measured up to certain distances from the fuels transect origin based on size. The distances are:

| Fuel Size | Distance From Origin |
|---|---|
| 0" – 0.25" | 6ft. |
| 0.26"- 1" | 6ft |
| 1.1" – 3" | 12ft. |
| 3.1" and up | 50ft. |




This method differs from procedures followed by Liu et al 1995, as they measured all fuel size classes along the entire length of a 20-meter transect. Data for the Brown's transects is entered on FMFS-2 (Appendix C).

Live fuels are integral to determining fire behavior in the Big Thicket. Live stem counts and cover analysis of species like yaupon give us measures of available fuel as well (see Woody Understory Vegetation Methods below).

**Fire Weather and Behavior**

Western Region Fire Monitoring Handbook (1992) data collection protocol will be followed, and form FMFS-10 ( Appendix C), Fire Behavior/Weather Data Sheet, will be utilized for data recording.

**Photographic Record**

There will be a total of four photos per 10m X 10m subplot. Photos are taken starting at the subplot origin, from the four subplot corners in the direction of the next corner of the subplot. All locations, directions, photo numbers, dates and times will be recorded on FMFS - 3 (Appendix C). A compass will be used to align photos when the end point is not visible.

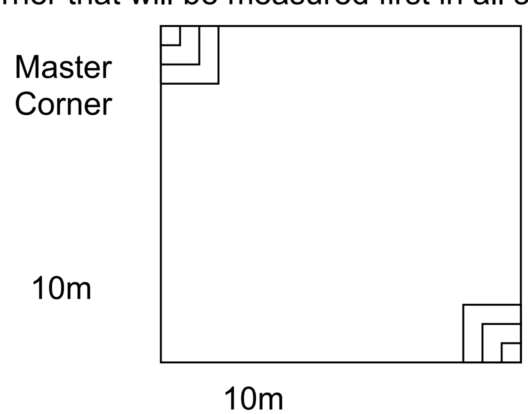
**Overstory Trees**

Trees (tree and shrub species) 5 cm dbh and over are tagged in each subplot and mapped using custom form FMFS-3 (Appendix C). Trees are tagged with brass tags. New individuals entering the tree stratum will be tagged in numerical order. FMH protocol for tree damage and canopy position estimation will be added to original measurement set. Data on trees is recorded on of FMH-8 (Appendix C).

**Herbaceous Vegetation**

In Liu's study, herbaceous cover was visually estimated over the entire subplot, and broken down into two categories, grass and forb, with no species identification. This monitoring project will include fire effects on herbaceous populations in terms of species presence, replacement, migration, richness, abundance, and community make-up (e.g. non-native presence). To do this the BITH Fire Monitoring program will implement the methods of the North Carolina Vegetation Survey instead of the Liu et al. (1995) protocol.

A draft report, "A Flexible, Multipurpose Method for Measuring Vegetation" (R. K. Peet, Wentworth, T. R., and White, P.S. 15 July 1990), outlines the North Carolina Vegetation Survey (NCVS) methods. The herbaceous methods ("intensive" as opposed to "releve") described are applicable to the vegetation of The Big Thicket, and to the goals of the BITH Fire Monitoring program. This is a summary of the protocol:
Two nested subplots will be installed in three of the five 10m X 10m subplots in an plot. The first subplot in a plot (closest to plot origin) will be nested, then every other subplot, for a total of three. A frame will be constructed containing three subplot sizes - .01m$^2$, .1m$^2$, and 1m$^2$ - while the 10m X 10m plot serves as the fourth subplot. The frame will be placed in two permanently designated corners of the plot, with one randomly chosen as the "master" corner that will be measured first in all succeeding visits:



Presence and cover will be recorded for all herbaceous species in the subplots. Presence values are assigned according to the subplot(s) in which a species appears (values assigned from 5 - 2 as increase in subplot size). After completing presence surveys in both corners, cover is estimated for the "master" corner nested set only (because all species present in the 10m X 10m plot are included in this nested subplot set). The remaining two 10m X 10m plots in an plot will be inspected for species presence and cover, though only over their entire area - no nested subplots are used. New species encountered in these subplots are assigned a presence value of 1, and cover is estimated over the 10 $m^2$ area. Cover classes and related percentage cover ranges are:

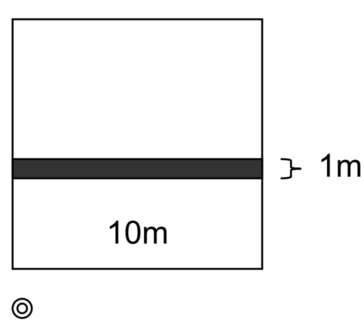
| | |
|---|---|
| 1) trace | 6) 10.1-25.0% |
| 2) 0-1.0% | 7) 25.1-50.0% |
| 3) 1.1-2.0% | 8) 50.1-75.0% |
| 4) 2.1-5.0% | 9) 75.1-95.0% |
| 5) 5.1-10.0% | 0) 95.1-One-hundred percent |

Data will be recorded on FMFS-5 (Appendix C).

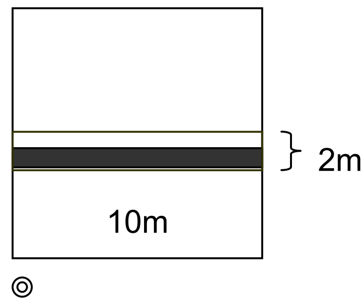
This protocol will provide managers with a good representation of herbaceous species richness and diversity, and will supply the data to determine changes to composition of communities under fire management.

**Woody Understory Vegetation**

**1.** Tree Seedlings (SDL) (tree species only) 0 - 50 cm in height and Small Saplings (SS) (tree and shrub species) .5 - 1.4m in height. Data recorded are species, and number of stems. These individuals are measured in a 1m x 10m band straddling the centerline of the subplot:



**2.** Large Saplings (LS) are woody stems 0 - 2cm dbh (> 1.4m in height). Data recorded are species, approximate dbh, and number of stems. Sizes are recorded as Category 1 (0 - 1cm) or Category 2 (1 - 2cm). These are measured in a 2m x 10m band straddling the subplot center:




A measuring tape is run connecting the opposite center posts. A graduated tent pole or meter stick along the measuring tape will be used to determine if an individual is in or out of measurement bands 1 and 2. This is preferable to running two additional parallel tapes in the sometimes thick vegetation.

**3.** Woody stems 2 - 5cm dbh and >1.4m in height are recorded in size classes of: Category 1 (2 - 3cm), Category 2 (3 - 4cm), and Category 3 (4 - 5cm dbh). Data recorded are species, and approximate dbh. These are inventoried in the entire 10m x 10m subplot.

Living stems only are measured. Data sets 1 - 3 are recorded on FMFS-4 (Appendix E).

**Shrub and Tree Cover Monitoring**

Liu et al. (1995) performed intercept measurement of shrub coverage along a 20-meter line. The BITH monitoring program will use digital photo analysis for cover monitoring. Similar in theory to densiometer measurements, this method will reduce observer variation in cover estimates and will enhance reproducibility. It will also produce a more objective estimation of change in cover over time than traditional cover estimates. The hardware that will be used is the Nikon Coolpix950 digital camera with fisheye lens with a self-leveling camera mount. The software will be HemiView 2.1 by Delta-T Devices. Consultation with agency and national experts on the subject matter is taking place to design this monitoring aspect.

## Data Analysis

In Liu et al. (1995), each 10m X 10m sub-plot was a statistical unit. Plots were organized according to burn unit and statistically grouped according to vegetation type. In addition to within-type comparisons, plots in different vegetation types were placed as close as possible in an attempt to make cross-type comparisons under the same burn conditions. BITH monitoring analysis will not involve cross-type comparisons; it will be concerned with fire effects upon the four vegetation types, with the goal of providing input for general management decisions. Plot placement will be more flexible without this design constraint, and will produce more type-representative data (original plots involved some degree of grading in vegetation type).

The BITH monitoring program will analyze the data for statistically significant changes in the four vegetation types. The categories that are important indicators of change, and that will be tested for pre-burn and post-burn differences, are the "Monitoring Type Variables" listed on the Monitoring Type Description Sheet (FMH-4, Appendix A) for each vegetation type. We want to be 80% sure of detecting the changes described on the FMH-4. We are willing to accept a 20% chance of saying that a change took place when it did not. This level of precision was determined to be acceptable by fire management and resource management officials for practical and economic reasons.

Liu et al. (1995) employed a nested-factorial analysis because of an unbalanced sample size at some sites; they state that a repeated measure analysis produces the same results in a balanced sample. BITH monitors will use the appropriate analysis for the samples that are present. SAS/STAT version 6, 4th edition, 1992 was used for analysis. The latest version of SAS/STAT will continue to be utilized for analysis purposes. Microsoft Excel will be utilized for database management and summary statistical analysis.

Liu et al. (1995) also performed ordination analysis of general trends in vegetation types. It was a multivariate analysis looking at the movement of vegetation types towards other types under the influence of fire (e.g. an Upperslope Pine Oak stand shifts to Upland Pine type). Initial results provided no statistically valid information. BITH monitoring will continue to include ordination analysis of results as this provides a comprehensive view of fire-induced change and, if statistically significant, a useful management guide. Subsequent analyses will determine the usefulness of this tool for the long term.

The original study utilized fire-excluded control plots for comparison to burned plots. Control plots provide useful comparative statistics and will be maintained for meaningful analysis of change due to fire. They also facilitate the comparison of different treatments (different burn frequencies) on a vegetation type.

## V. MONITORING IMPLEMENTATION SCHEDULE

### Burn Unit Schedule

Big Thicket Burn Units are generally on a 3 - 5 year burn rotation. A general guide by vegetation type, based on estimations of natural fire regimes and restoration needs, is:

**Upland Pine:** 3-4 years

**Wetland Pine Savanna:** 2-8 years

**Sandhill Pine:** 4-7 years

**Upperslope Pine Oak:** 6-8 years

Resource managers will use observations of the site, and data analysis (when available), into consideration when determining site-specific burn rotations.

### Plot Measurement Schedule

Plot re-measurement will be dictated by the burn schedule, and by the data set needs of particular vegetation types. Any new plots that are determined to be necessary will be established at the beginning of the Fire Monitor's season (though they can be installed at any point in the season) and read according to burn unit schedule.

Analysis will provide some statistically significant results (as was shown by the Liu et al. study that utilized only the existing numbers of plots). Future data analysis will determine if the sample sizes are adequate to address most of management's questions with statistical significance.

See Appendix B for maps with existing plots. See Appendix D for the Fire Management Unit Maps.

### Pre-Burn Sampling

Because of the high growth rate in the area, not more than one growing season should elapse between reading a plot and its being burned. If more than one growing season passes before burning, a plot will have to be read again. Plots will be read for all variables in the spring to mid-summer, and at the same time of season in all succeeding years.

### Post-burn Sampling

Plots will be read for all variables within 2 months after burning. All plots will then be read during the spring to mid-summer 1, 2, 5 years (or pre-burn, if before five years) after burning, and pre-burn again.

## *VI. FUNDING*

The monitoring program is funded through Big Thicket's Fire management program using FIREPRO funds.

## VII. MA NAGEMENT IMPLICATIONS OF POTENTIAL RESULTS

An ongoing fire effects monitoring program will enhance fire management decision-making. Management questions concerning best burn frequencies, vegetative species and community effects, optimal burn conditions, etc. will be addressed through interpretation of monitoring results - refining fire management in the four pyric vegetation types of Big Thicket National Preserve.

# *VIII. CONSULTATION AND COORDINATION*

This document was completed through consultation with Dr. Paul Harcombe and Changxiang Liu, Rice University, Houston, TX. Dr. Harcombe's continuing input is invaluable to the successful implementation of the Big Thicket Fire Monitoring Plan. Tim Sexton, NPS National Fire Ecologist provided direction and suggestions on monitoring protocol design.

# *IX. APPENDICES*

A. Monitoring Type Descriptions (FMH-4)
B. Plot Location Maps
C. Data Collection Forms
D. Fire Management Unit Maps
E. Big Thicket Woody Species List

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## Appendix G: Preattack Plan.

The preserve currently has 43 permanent positions (2 long-term vacant), which includes 5 Term positions for the Gulf Coast Exotic Plant Management Team. The fire management staff includes 6 full-time and 1 subject-to-furlough permanent positions, plus 6 seasonal positions (all arduous duty qualified). The Visitor Services Division strongly supports the fire management program, assisting on virtually every prescribed burn or wildfire suppression. The Chief Ranger and all Field Rangers (4) are line qualified (up to Engine Boss), and the Program Assistant is qualified as Expanded Dispatch/Time Recorder. The Contracting Specialist is on an Interagency Purchasing Team. The Maintenance Technician is qualified as Equipment Manager, and provides ground support during local wildfires. The preserve has a Mutual Aid Zone with the Texas Forest Service, which typically provides call-when-needed dozers. Additional interagency staff is coordinated through the Texas Interagency Fire Center, and is typically supplied from the Anahuac National Wildlife Refuge (2-4 hours), Padre Island National Seashore and Lyndon B. Johnson National Historical Park (6-8 hours), and Balcones Canyonlands National Wildlife Refuge (6-8 hours). Local emergency firefighters may also be available, if fitness scores are current.

The following NPS equipment is available:

Engine Type VI (Working Capital Fund) with 200 gallons of water (foam capable). This engine was manufactured in 2004 and is the primary engine for local or interagency assignments.

Engine Type V (Working Capital Fund) with 500 gallons of water (foam capable). This engine was manufactured in 1990, and is considered a ‘local response only’ resource.

Engine Type VI (GSA) with 200 gallons of water (no foam). It is a 6 passenger vehicle and is used by the fire crew for daily assignments.

One - ¾ Ton Pick-Up 4x4 extended cab (Monitor’s Rig), set up with a shell for gear

Two - ¾ Ton Pick-up 4x4 extended cab for gear and trailer towing

Two All-Terrain-Vehicles 6x6 with Slip-in pump units

One All-Terrain-Vehicle 4x4 with rake/plow/mower

Two ATV trailers with 6000’ of 1 ½” hose, 3000’ of 1” hose and a portable pump

Five ATVs (ranger equipment) with three 25-gallon water tanks

The fire cache is typically stock at the 20-person level.

The preserve has a Cooperative Agreement that allows operation of a Texas Forest Service dozer/transporter (see agreement).

**Fire call-up list**

FIRE EMPLOYEES

| Name | Quals | Home Phone | Cell Phone |
|---|---|---|---|
| David McHugh | ICT3, RXM2, RXB1 | 409-837-2079 | 409-429-0963 |
| Fulton Jeansonne | ENGB, FFT1, ICT4, RXB2, RXI2, FEMO, ATVO | 409-283-3044 | 409-429-0888 |
| Krystal Tolar | PTRC, ATVO | 409-283-7462 | 409-429-6599 |
| Deanna Fusco | FFT2, FEMO, ATVO | 409-385-4733 | |
| DW Ivans | CRWB, FFT1, ENOP, ATVO | 409-429-5300 | 409-283-0122 |
| Rodney Monk | DOZB, ENGB, FFT1, ICT5, RXI2, DZIA, TPOP, ATVO | 409-837-2172 | 409-283-0775 |
| Gus Schaefer | FFT2 | 409-753-1857 | 409-651-5992 |
| | | | |
| | | | |

RANGERS

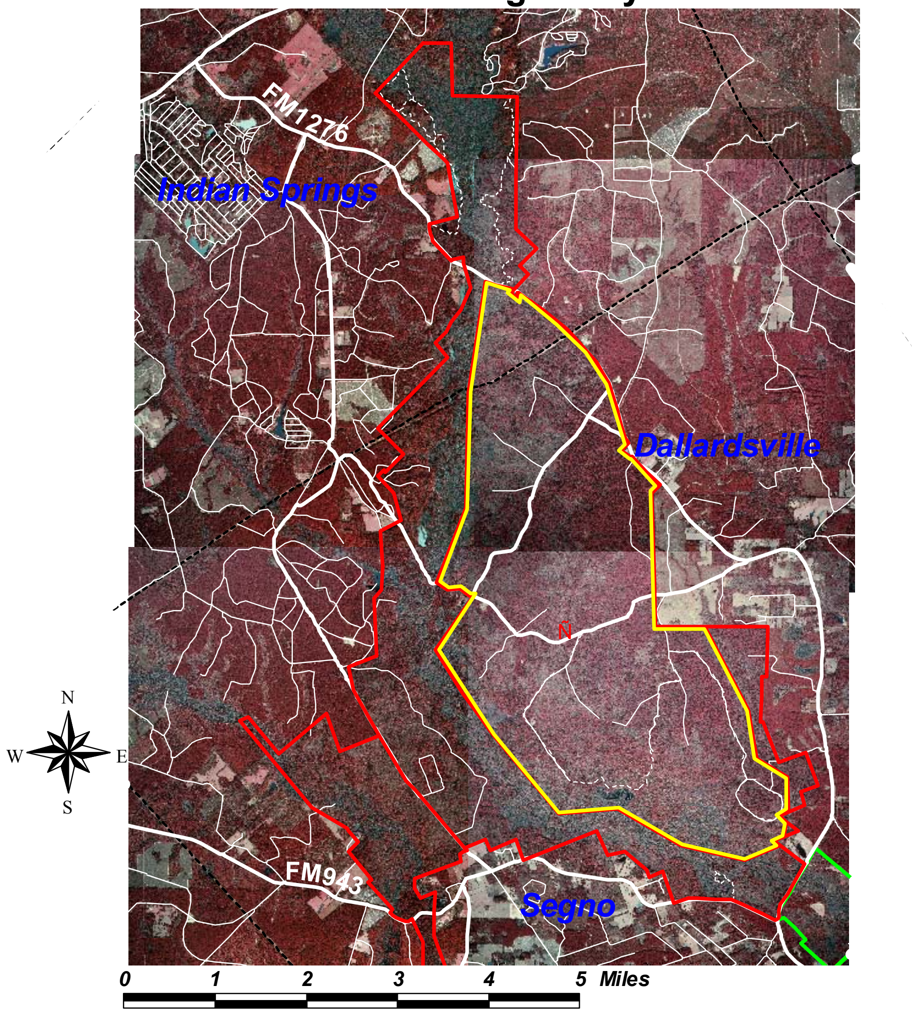
| | | | |
|---|---|---|---|
| Mark Peapenburg | SEC1, FFT1, EMTB | 409-751-6447 | 409-673-3306 |
| Johnny Stafford | CRWB, ENGB, FFT1, ICT4, SEC1, LSCT, ATVO | 409-429-3635 | 409-673-3304 |
| Mike Smith | FFT2, SEC1, ATVO | 409-283-7426 | 409-673-3301 |
| Mike Hughes | FFT2, SEC1, ATVO | 409-837-9233 | 409-673-3303 |
| Brian Gourgues | FFT2, SEC1 | | |

OTHER PARK STAFF

| | | | |
|---|---|---|---|
| Paula Carrington | FFT2 | | |
| Lamar Funderburk | EQPM | | |
| | | | |
| Curtis Hoagland | FFT2 | | |
| Leta Parker | PTRC | 409-755-2493 | 409-893-7421 |
| | | | |

# Big Thicket National Preserve

## Run Card - Big Sandy FMU




**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

**Active Treatment Unit**

Indirect Attack using existing control features and burn out when possible.

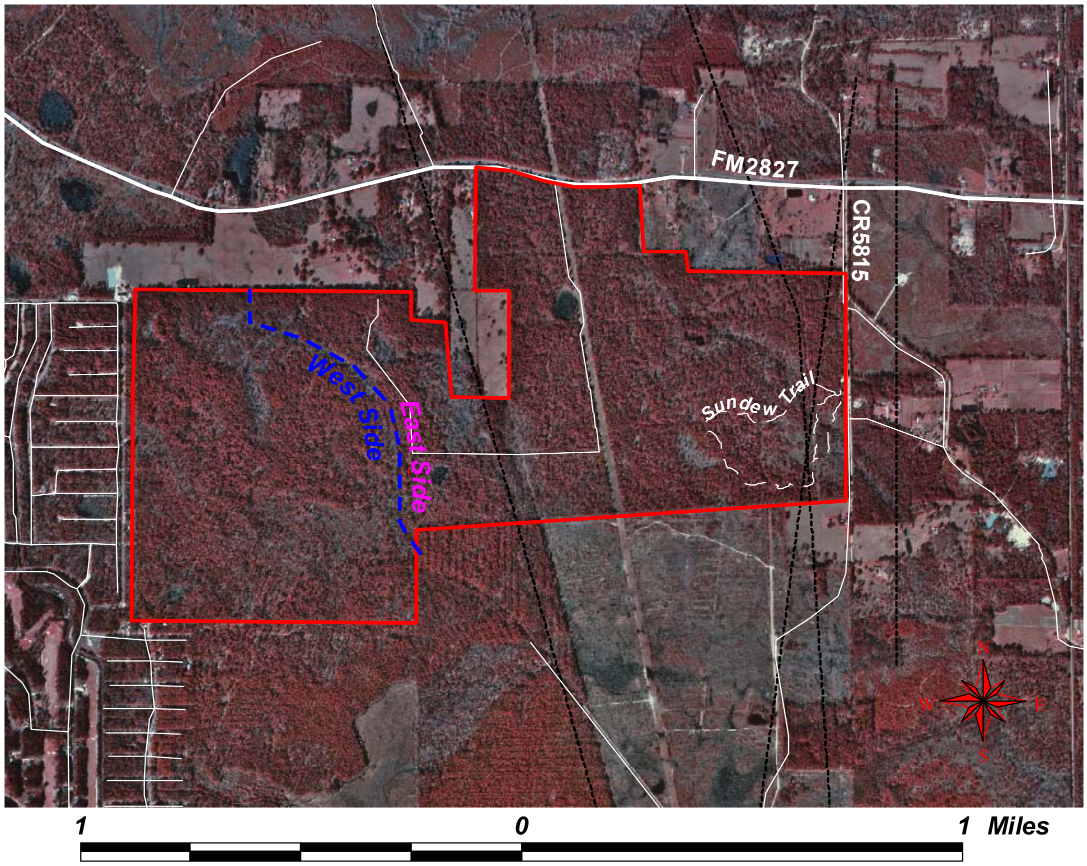
**Floodplain or Flatland Hardwood**

Minimize unnatural disturbance and reduce rehabilitation costs

| | I to III | IV | V |
|---|---|---|---|
| Incident Commander-T3 | | 1 | 1 |
| Incident Commander T-4/5 | 1 | | |
| Strike Team/Task Force Ldr | | | 1 |
| Dozer/plow | NPS Unit | NPS & TFS Unit | NPS & TFS Unit |
| Engine Boss | 1-Type 6 | 2 - Type 5 & 6 | 2 - Type 5&6 |
| Firefighter-T1 Squad Boss | | 1 | 1 |
| Firefighter T2 | 3 | 3 | 5 |
| Logistical Support | | | |
| Other Equipment | 2 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit | 2 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit | 2 - 4x4 ATV pump unit<br>2 - 6x6 ATV pump unit<br>3000' Hose Lay |
| Fire Department<br>Call closest dept. indicated | Call if U/I threat | Call if U/I threat | Call if U/I threat |

# Big Thicket National Preserve

## Run Card - Hickory Creek FMU




**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

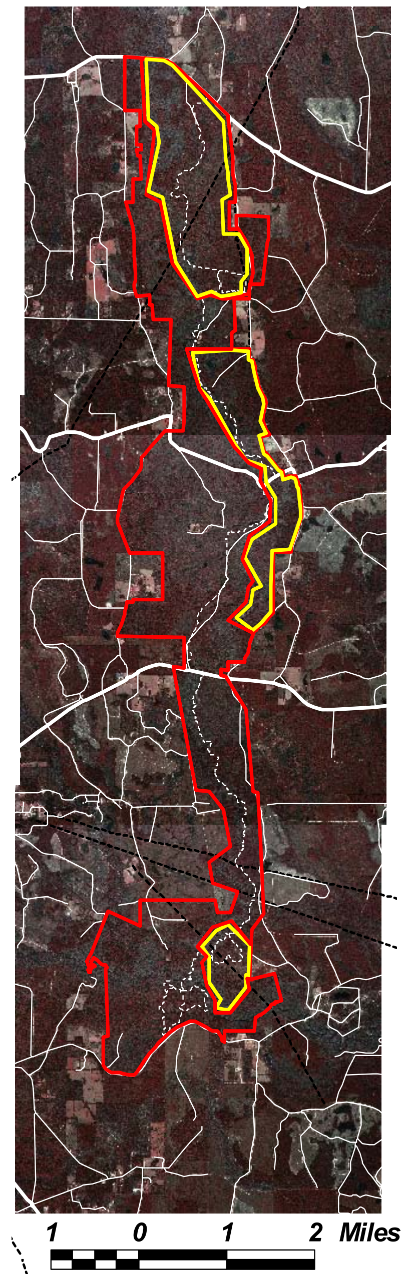
**Active Treatment Unit**

*While most of the unit is actively treated, the surrounding U/I risk requires an agressive response.*

| | I to III | IV | |
|---|---|---|---|
| Incident Commander-T3 | | *1* | *1* |
| Incident Commander T-4/5 | *1* | | |
| Strike Team/Task Force Ldr | | | *1* |
| Dozer/plow | *NPS Unit* | *NPS & TFS Unit* | *NPS & TFS Unit* |
| Engine Boss | *1-Type 6* | *2 - Type 5 & 6* | *2 - Type 5&6* |
| Firefighter-T1 Squad Boss | | *1* | *1* |
| Firefighter T2 | *3* | *3* | *5* |
| Logistical Support | | | |
| Other Equipment | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* | *2 - 4x4 ATV pump unit*<br>*2 - 6x6 ATV pump unit*<br>*3000' Hose Lay* |
| Fire Department *West Side* | *Call if U/I threat* | *Wildwood VFD* | *Wildwood VFD*<br>*Kountze VFD* |
| *East Side* | *Call if U/I threat* | *Warren VFD* | *Warren VFD*<br>*Kountze VFD* |

# Big Thicket National Preserve

## Run Card - Turkey Creek FMU

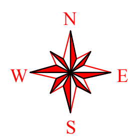



**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

**Active Treatment Unit**

Indirect Attack using existing control features and burn out when possible.

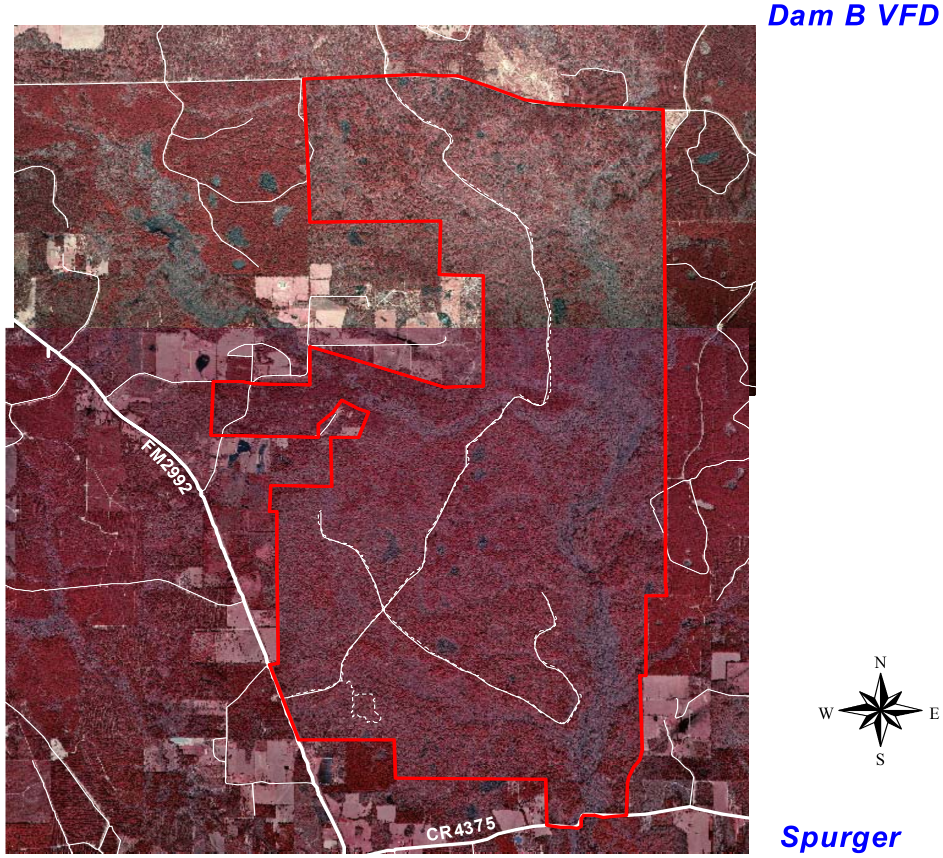



| | I to III | IV | V |
|---|---|---|---|
| IC-T3 | | *1* | *1* |
| ICT-4/5 | *1* | | |
| ST/TF Ldr | | | *1* |
| Dozer/plow | *NPS Unit* | *NPS Unit* | *NPS Unit* |
| Engine Boss | *1-Type 6* | *2 - Type 5 & 6* | *2 - Type 5&6* |
| Firefighter-T1 | | *1* | *1* |
| Firefighter T2 | *3* | *3* | *5* |
| Logistical Support | | | *1* |
| Other Equipment | *2 - 4x4 ATV pump unit* | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* | *3 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* |
| Fire Department | | | |
| *North Side* | *Call if U/I threat* | *Warren VFD* | *Warren VFD* |
| *South Side* | *Call if U/I threat* | *Call if U/I threat* | *Call if U/I threat* |

# Big Thicket National Preserve

## Run Card - Beech Creek FMU

**Dam B VFD**




**Spurger**

0 1 2 3 4 Miles

**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

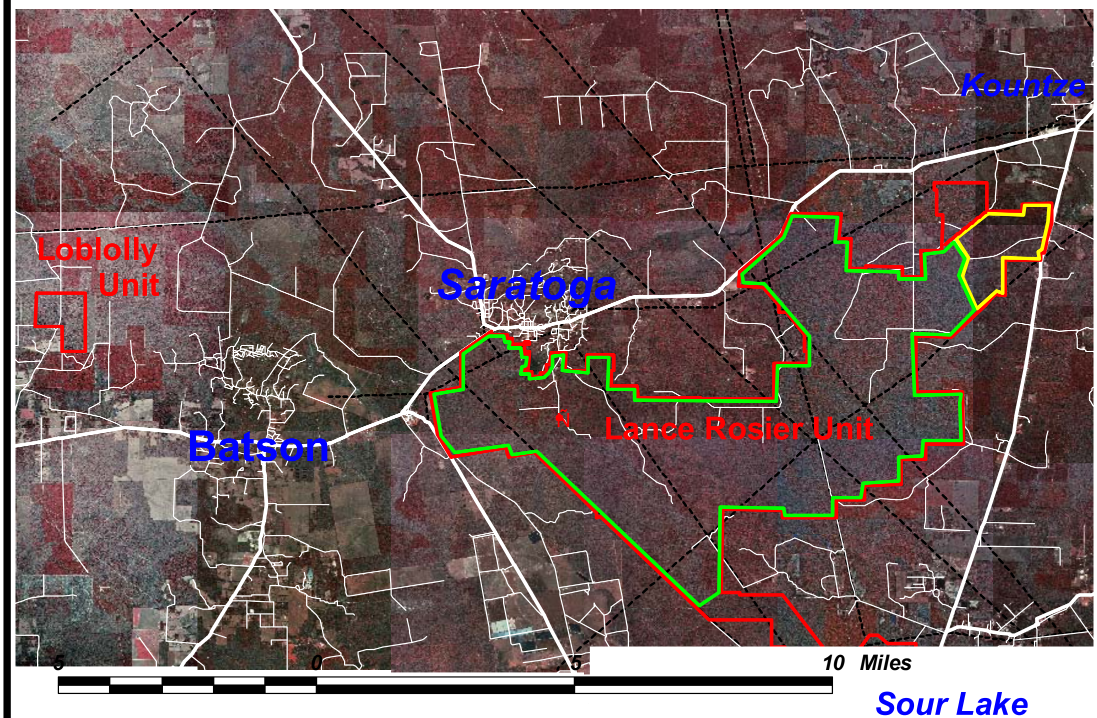
**Floodplain or Flatland Hardwood**

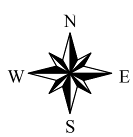
Minimize unnatural disturbance and reduce rehabilitation costs

| | I to III | IV | V |
|---|---|---|---|
| Incident Commander-T3 | | *1* | *1* |
| Incident Commander T-4/5 | *1* | | |
| Strike Team/Task Force Ldr | | | *1* |
| Dozer/plow | *NPS Unit* | *NPS Unit* | *NPS Unit* |
| Engine Boss | *1-Type 6* | *2 - Type 6* | *2 - Type 6* |
| Firefighter-T1 Squad Boss | | *1* | *1* |
| Firefighter T2 | *3* | *3* | *5* |
| Logistical Support | | | |
| Other Equipment | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit* | *2 - 4x4 ATV pump unit*<br>*2 - 6x6 ATV pump unit* |
| Fire Department<br>*Call if U/I threat* | *Spurger* | *Spurger* | *Spurger VFD*<br>*Dam B VFD* |

# Big Thicket National Preserve

## Run Card - West Hardin FMU




**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

**Active Treatment Unit**

Indirect Attack using existing control features and burn out when possible.

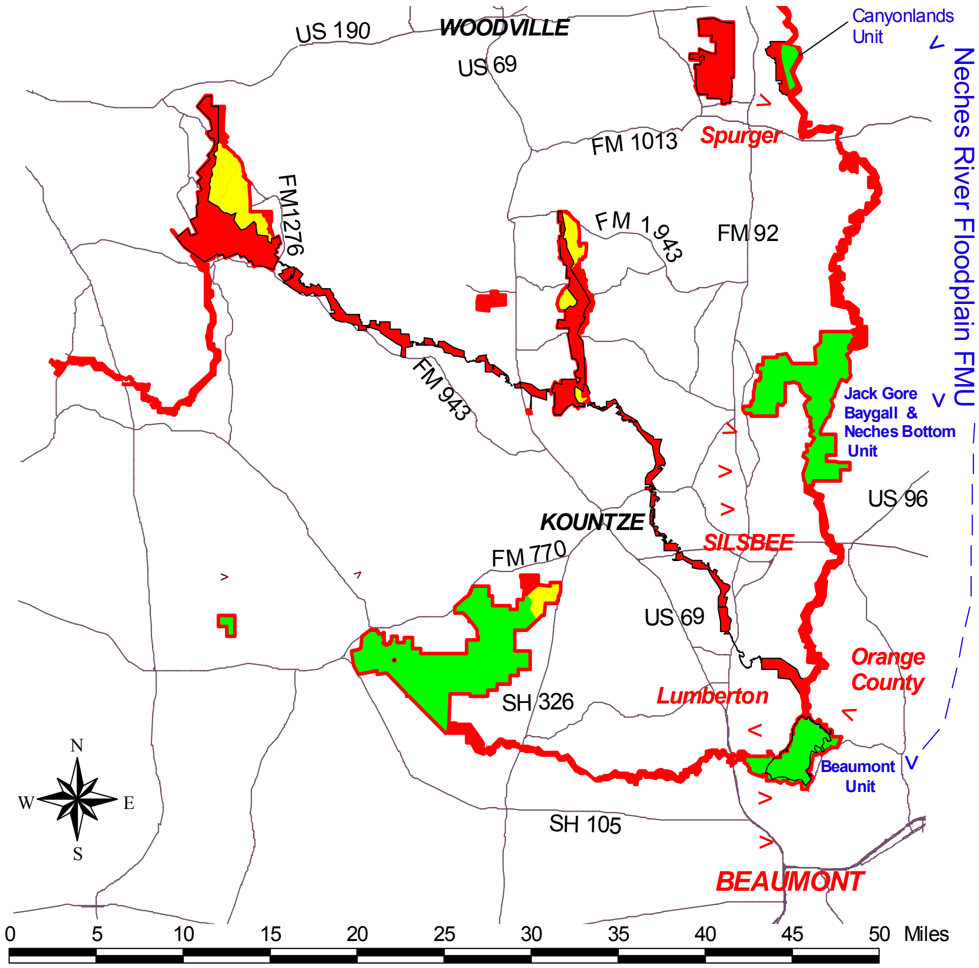
**Floodplain or Flatland Hardwood**

Minimize unnatural disturbance and reduce rehabilitation costs

| | I to III | IV | V |
|---|---|---|---|
| Incident Commander-T3 | | 1 | 1 |
| Incident Commander T-4/5 | 1 | | |
| Strike Team/Task Force Ldr | | | 1 |
| Dozer/plow | NPS Unit | NPS & TFS Unit | NPS & TFS Unit |
| Engine Boss | 1-Type 6 | 2 - Type 5 & 6 | 2 - Type 5&6 |
| Firefighter-T1 Squad Boss | | 1 | 1 |
| Firefighter T2 | 3 | 3 | 5 |
| Logistical Support | | 1 | 1 |
| Other Equipment | 2 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit | 2 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit | 2 - 4x4 ATV pump unit<br>2 - 6x6 ATV pump unit<br>3000' Hose Lay |
| Fire Department<br>Call if U/I threat | Saratoga VFD | Saratoga VFD | Saratoga VFD<br>Kountze VFD |

# Big Thicket National Preserve

## Run Card - Neches Floodplain FMU




**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

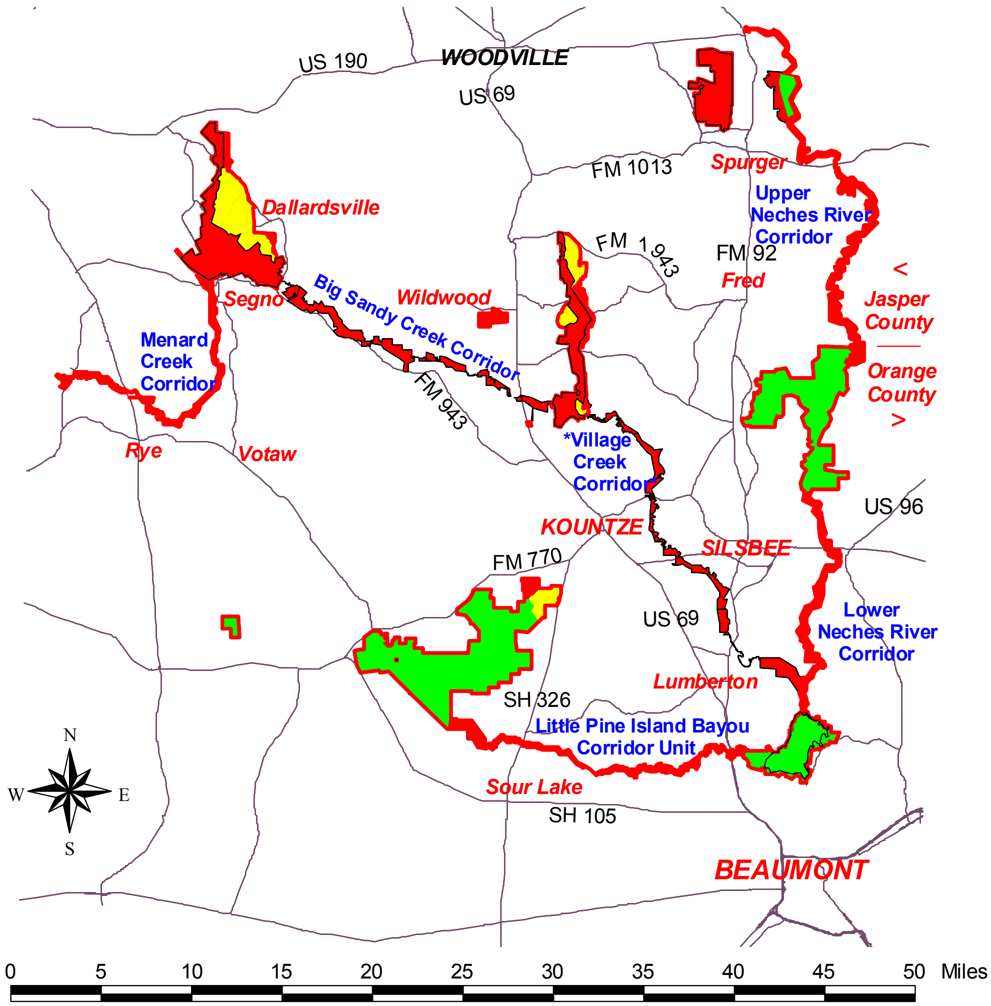
**Floodplain or Flatland Hardwood**

Minimize unnatural disturbance and reduce rehabilitation costs

| | I to III | IV | V |
|---|---|---|---|
| Incident Commander-T3 | | 1 | 1 |
| Incident Commander T-4/5 | 1 | | |
| Strike Team/Task Force Ldr | | | 1 |
| Dozer/plow | NPS Unit | NPS Unit | NPS Unit |
| Engine Boss | 1-Type 6 | 1-Type 6 | 1-Type 6 |
| Firefighter-T1 Squad Boss | | 1 | 1 |
| Firefighter T2 | 3 | 3 | 5 |
| Logistical Support | | | |
| Other Equipment | 1 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit<br>1 - leaf blower<br>1 - ranger boat | 2 - 4x4 ATV pump unit<br>1 - 6x6 ATV pump unit<br>1 - leaf blower<br>1 - ranger boat | 2 - 4x4 ATV pump unit<br>2 - 6x6 ATV pump unit<br>1 - leaf blower<br>1 - ranger boat<br>2000' hoselay |
| Volunteer Fire Department<br>Call Dept. indicated | Call if U/I threat | Call if U/I threat | Call if U/I threat |

# Big Thicket National Preserve

## Run Card - Stream Corridor FMU




**Inactive Treatment Units and Corridor Units**

Protect adjacent values-at-risk by direct or indirect attack. Use Minimum Impact Suppression Tactics when possible.

| | I to III | IV | V |
|---|---|---|---|
| Incident Commander-T3 | | *1* | *1* |
| Incident Commander T-4/5 | *1* | | |
| Strike Team/Task Force Ldr | | | *1* |
| Dozer/plow | *NPS Unit* | *NPS & TFS Units* | *NPS & TFS Units* |
| Engine Boss | *1-Type 6* | *1-Type 6* | *2-Type 5 & 6* |
| Firefighter-T1 Squad Boss | | *1* | *1* |
| Firefighter T2 | *3* | *3* | *5* |
| Logistical Support | | | |
| Other Equipment<br>Neches River | *1 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit*<br>*1 - leaf blower*<br>1 - ranger boat | *2 - 4x4 ATV pump unit*<br>*1 - 6x6 ATV pump unit*<br>*1 - leaf blower*<br>1 - ranger boat | *2 - 4x4 ATV pump unit*<br>*2 - 6x6 ATV pump unit*<br>*1 - leaf blower*<br>*1000' Hose Lay*<br>1 - ranger boat |
| Fire Department<br>*Call Dept indicated* | *Call if U/I threat* | *Call if U/I threat* | *Call if U/I threat* |

**Fire Size-Up**

**Initial fire Size-up** **Date/Time**________________________

**Fire Name** **Ownership**
**I.C.** ________________________ **Agency** ______________________________
**Lat:**__________ **Long:**_________ **Jurisdiction:**__________________________

Initiate all actions based upon current and expected fire Behavior

FUEL TYPE(s): Grass Brush Hardwood Pine Mixed Plantation (ht_________)
SPREAD POTENTIAL: Low Moderate High Extreme
CHARACTER: Smoldering Creeping Running Spotting Torching Crowning Erratic

| WEATHER | Now____ | Peak____ | TONIGHT | TOMORROW |
|---|---|---|---|---|
| Temperature | | | | |
| Relative Humidity | | | | |
| Wind Direction/Speed | | | | |

Comments:

**Map Sketch (include north arrow and scale; ANCHOR POINT)**

***RISK MANAGEMENT***

**Situation Awareness**

**Objective:** ____________________________________________
____________________________________________

**Current Actions:** ____________________________________________
____________________________________________

| Type | ID | Agency | Leader | Comm | Assignment |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

**Hazard Assessment/Control Look Up/Down/Around Indicators**

| |
|---|
| **Fuel Moisture** |
| **Fuel Temp** |
| **Wind** |
| **Stability** |
| **Current Behavior** |

**Identify Tactical Hazards (10 Standard Orders – 18 Situations)**

| Hazard | Location | Mitigation |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

Selected Tactics____________________________________________
____________________________________________
____________________________________________
____________________________________________

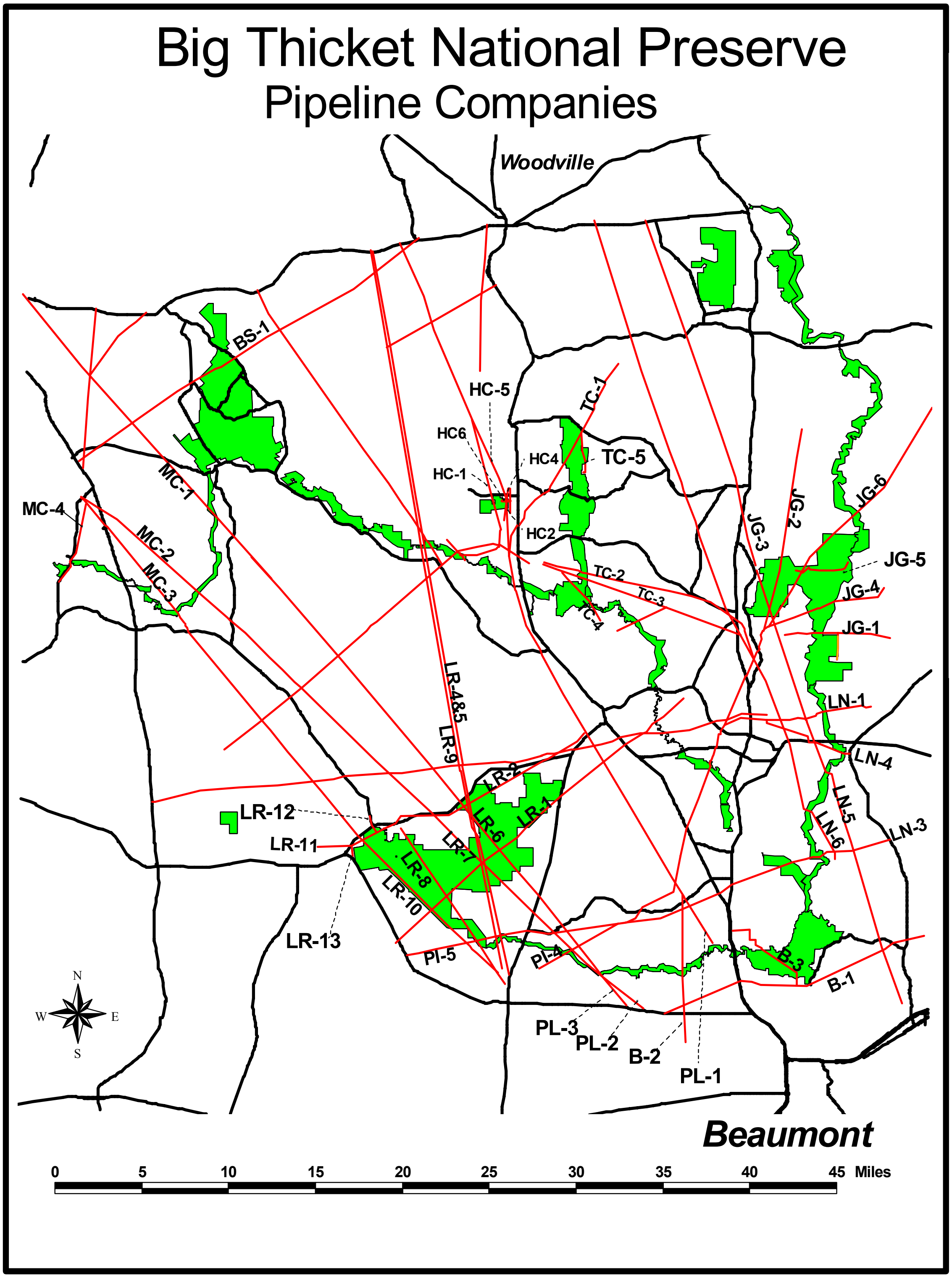
Decision Point
Are controls in place? NO – reassess YES – next question
Are Selected Tactics based on expected fire behavior? NO –reassess YES – next question
Have Instructions been given and understood? NO – reassess YES – initiate action

Evaluate Personnel - experienced with local factors?
- distracted from Primary tasks?
- fatigue or stress reaction?
- hazardous Attitude?

Situation – WHAT IS CHANGING?
- Are Strategy and tactics working?

Additional Resource Needs

| Needed/Ordered | Resource ID | ETA | Assignment | Released |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |




| Operator | Product | Radian No. | No. of Lines By Size | For Information Call |
|---|---|---|---|---|
| **Big Sandy Creek** | | | | |
| **Tennessee Gas** | **Natural Gas** | **BS-1** | **1 - 24"**<br>**1 - 31"** | **281/622-2022** |

| | | | | |
|---|---|---|---|---|
| | | | 1 - 30" | |
| **Menard Creek Corridor** | | | | |
| Mobil | Crude Oil | MC-1 | 1 - 20" | 409/757-3854 |
| Kinder Morgan | Natural Gas | MC-2 | 1 - 18"<br>1 - 20" | 409/842-4223 |
| Chevron | Crude Oil | MC-3 | 1 - 26" | 281/596-3588 |
| Chevron Pipe Line Company | LPG | MC-4 | 2 - 14"<br>1 - 10" | 281/596-3588 |
| Mobil Pipe Line Company | LPG | MC-5 | 1- Main Line | 409/757-3854 |
| **Hickory Creek Savannah** | | | | |
| Unocal Midstream and Trade | Natural Gas | HC-1 | 1 - 18" | 409/724-3311 |
| BP Pipelines (North America)[1] | Natural Gas | HC-2 | 1 - 10" | 281/986-5090 |
| Gulf States Utilities | Power Line | HC-3 | Power Line | 800/368-3749 |
| Houston Pipe Line Company | Natural Gas | HC-4 | 1 - 6" | 281/652-2559 |
| Pure Transmission Company | Crude Oil | HC-5 | 1 - 10" | No phone no. |
| Tennessee Gas | Not in Service | HC-6 | N/A | 281/622-2022 |
| | | | | |
| **Turkey Creek** | | | | |
| Houston Pipe Line Company | Natural Gas | TC-1 | 1 - 4" | 281/652-2559 |
| Houston Pipe Line Company | Natural Gas | TC-2 | 1 - 10" | 281/652-2559 |
| El Paso Field Services | Natural Gas<br>Not in Service | TC-3 | 1 - 6"<br>1 - 6" | 936/563-2938 |
| BP Pipelines (North America) | Not in Service | TC-4 | 1 - 3" | 281/986-5090 |
| Swelco Inc. | Natural Gas | TC-5 | 1 - 2" | No phone no. |
| El Paso Field Services | Natural Gas | TC-6 | 1 - 3" | 936/563-2938 |
| **Beaumont** | | | | |
| El Paso Field Services[2] | Natural Gas | B-1 | 1 - 30" | 936/563-2938 |
| Houston Pipe Line Company | Not in Service | B-3 | 1 - 6" | 281/652-2559 |
| **Pine Island Bayou Corridor** | | | | |
| Unocal Midstream and Trade | Crude Oil | PI-1 | 1 - 10" | 409/724-3311 |
| Kinder Morgan | Natural Gas | PI-2 | 1 - 18"<br>1 - 20" | 409/842-4223 |
| Mobil Pipe Line Company | Crude Oil | PI-3 | 1 - 20" | 281/591-3766 |
| BP Pipelines (North America) | Crude Oil | PI-4 | 1 - 6" | 281/986-5090 |
| Williams Gas Pipeline - Transco | Natural Gas | PI-5 | 1 - 30" | 409/287-2715 |
| Houston Pipe Line Company | Natural Gas | B-2 | 1 - 12" | 281/652-2559 |

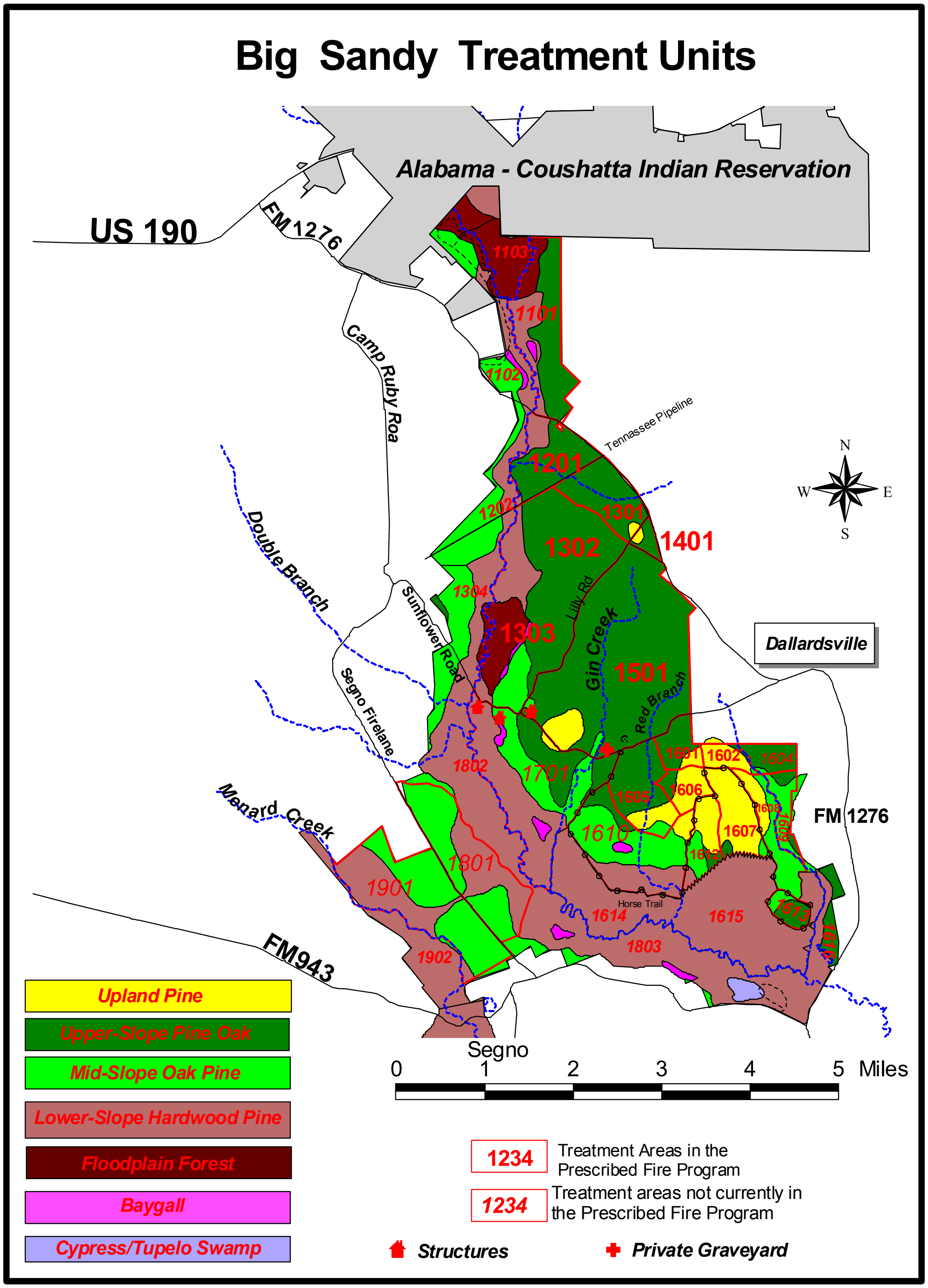
[1] Pipeline outside and adjacent to eastern boundary of Unit
[2] Pipeline outside and adjacent to southeast corner of Unit

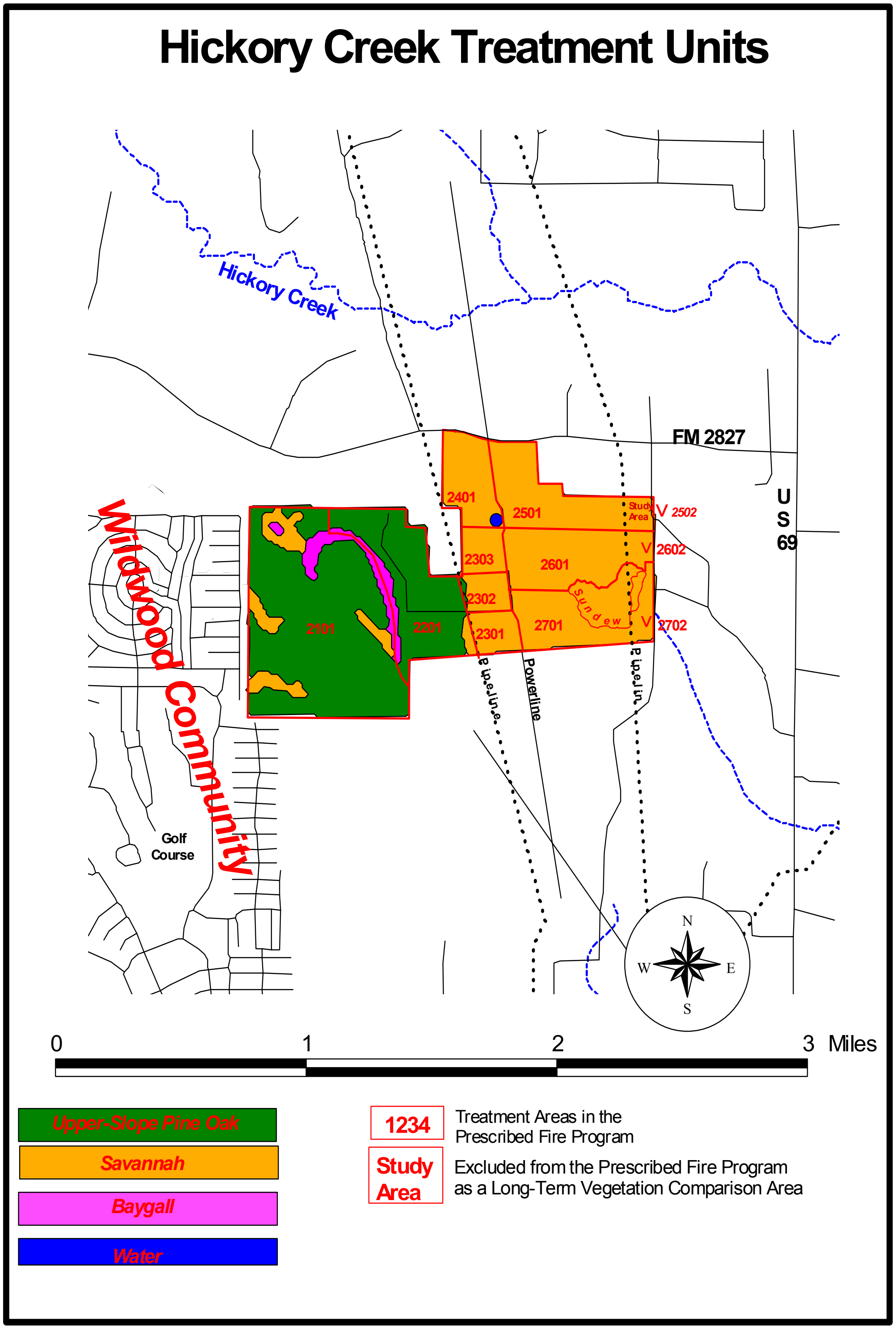
| Operator | Product | Radian No. | No. of Lines By Size | For Information Call |
|---|---|---|---|---|
| Lance Rosier | | | | |
| Black Lake Pipe Line Company | NGL | LR-1 | 1 - 8" | 281/986-5090 |
| Sunoco Pipeline L.P. | Crude Oil | LR-2 | 1 - 6" | 409/287-3528 |
| Black Hills Operating Co., LLC | Crude Oil | LR-4 | 1- 12" | 903/759-0901 |
| Sunoco Pipeline L.P. | Crude Oil | LR-5 | 1- 10" | 409/287-3528 |
| Mobil Pipe Line Company | Crude Oil | LR-6 | 1- 20" | 281/591-3766 |
| Kinder Morgan Texas Pipeline, L.P. | Natural Gas | LR-7 | 1-18", 1-20" | 409/842-4223 |
| Sunoco Pipeline L.P. | Crude Oil | LR-8 | 1 - 6" | 409/287-3528 |
| Chevron Pipe Line Company | Not in Service | LR-9 | 1 - 12" | 281/596-3588 |
| Chevron Pipe Line Company | Crude Oil | LR-10 | 1 - 26" | 281/596-3588 |
| Sunoco Pipeline L.P. | Crude Oil | LR-11 | 1 - 6" | 409/287-3528 |
| Sunoco Pipeline L.P. | Abandoned | LR-12 | 1 - 4" | 409/287-3528 |
| Sunoco Pipeline L.P. | Abandoned | LR-13 | 1 - 8" | 409/287-3528 |
| | | | | |
| Jack Gore Baygall/Neches Bottom | | | | |
| El Paso Field Services | Natural Gas | *JG-1* | 1-10" | 936/563-2938 |
| El Paso Field Services | Natural Gas | JG-2 | 1 - 4"<br>1 - 6" | 936/563-2938 |
| Lion Oil Company – Paline Pipeline | Crude Oil | JG-3 | 1 - 10" | 807/864-1372 |
| El Paso Field Services | Natural Gas | JG-4 | 1 - 8" | 936/563-2938 |
| Oxy Petroleum, Inc. | Crude Oil | JG-5 | 1 - 2-1/2" | No phone no. |
| Black Lake Pipe Line Company | NGL | JG-6 | 1 - 8" | 281/986-5090 |
| | | | | |
| Lower Neches River Corridor | | | | |
| CMS Trunkline Gas Company | Natural Gas | LN-1 | 2 - 24" | 318/725-4922 |
| No Assigned Radian Number | | *LN-2* | | |
| Williams Gas Pipeline - Transco | Natural Gas | LN-3 | 1 - 30" | 409/287-2715 |
| Houston Pipe Line Company | Natural Gas | LN-4 | 1 - 8" | 281/652-2559 |
| Lion Oil Company – Paline Pipeline | Crude Oil | LN-5 | 1 - 10" | 807/864-1372 |
| Houston Pipe Line Company | Natural Gas | LN-6 | 1 - 30" | 281/652-2559 |
| | | | | |
| Upper Neches River Corridor | | | | |
| Black Lake Pipe Line Company | NGL | JG-6 | 1 - 8" | 281/986-5090 |

**Updated 6/16/04**

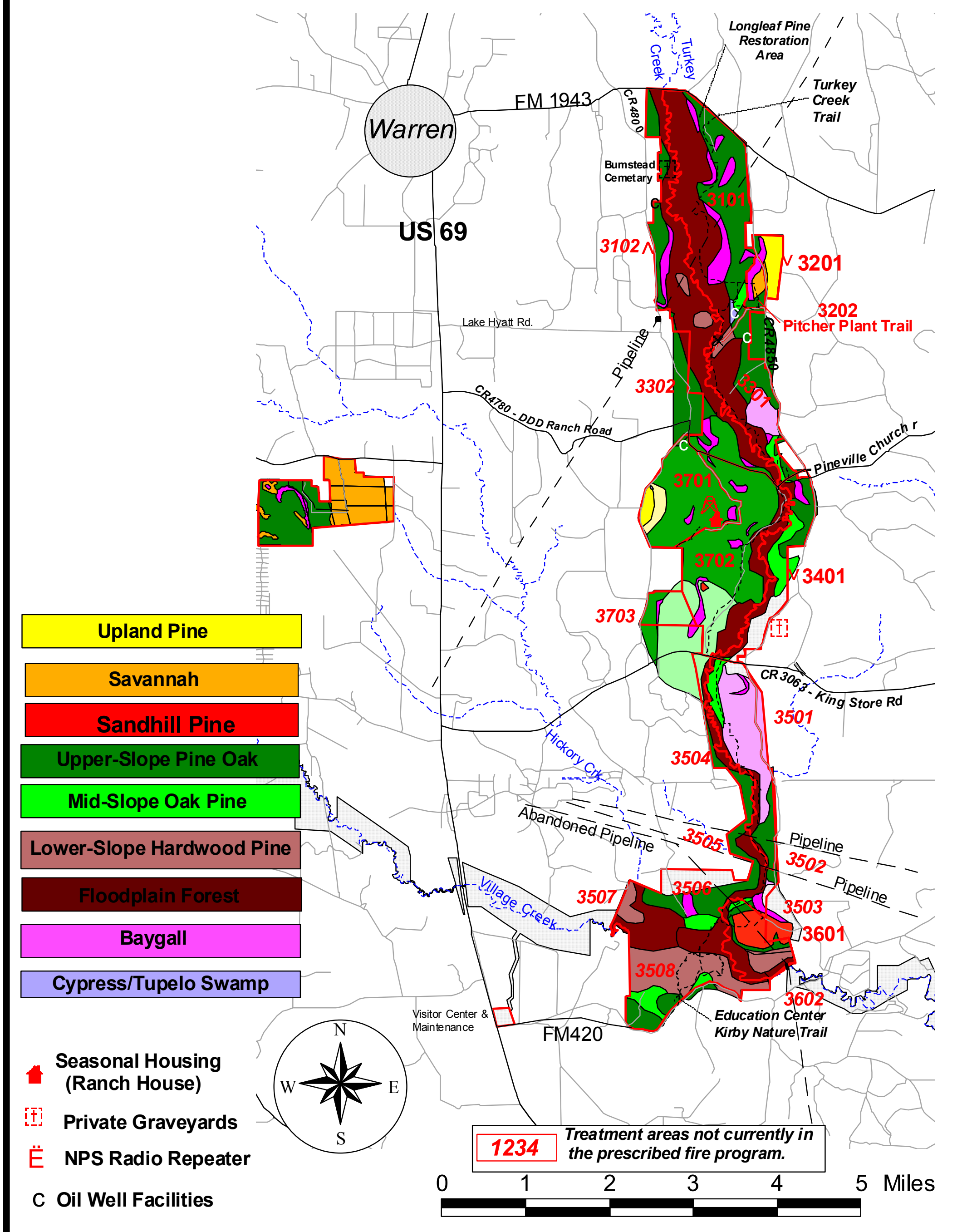
There are no pipelines within the Loblolly or Beech Creek Units.
NOTE: There are five major categories of products carried in pipelines: Natural Gas; Crude Oil; Liquid Petroleum Gas (LPG); Natural Gas Liquids (NGL), and Refined Products (gasolines, diesels, heating oil, and jet fuels). Natural Gas is non-toxic, non-poisonous and non-corrosive; however, it does have certain characteristics that affect its behavior and detection in emergency situations. It is composed mostly of methane, with lesser portions of other hydrocarbons, nitrogen and atmosphere. Crude Oil is a black or dark brown mixture of hydrocarbons, with relatively small quantities of oxygen, nitrogen, sulfur, salt, and water – plus trace amounts of certain metals. LPG and NGL's are

referred to as liquefied hydrocarbons and considered highly volatile liquids. They are gases under atmospheric conditions and liquids under pressure (The Pipeline Group, 1995).

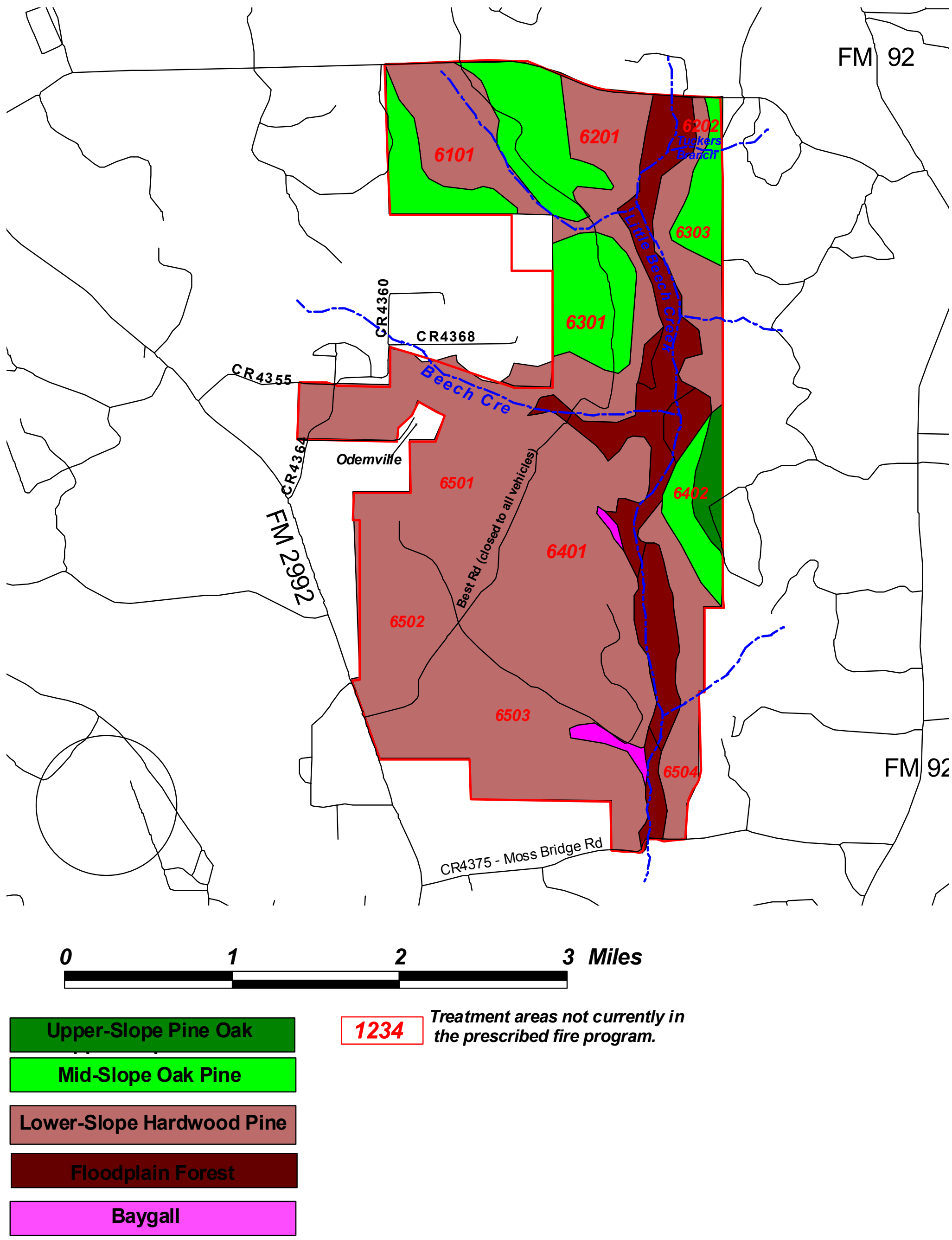

Big Sandy Treatment Units
Alabama - Coushatta Indian Reservation
US 190
FM 1276
Camp Ruby Roa
Tennassee Pipeline
Double Branch
Sunflower Road
Segno Firelane
Menard Creek
FM943
Lilly Rd
Gin Creek
Red Branch
Horse Trail
Dallardsville
FM 1276
Segno
N
S
E
W
1103
1101
1102
1201
1202
1301
1302
1401
1304
1303
1501
1701
1802
1801
1901
1902
1601
1602
1604
1605
1606
1607
1610
1614
1615
1803
0 1 2 3 4 5 Miles
Upland Pine
Upper-Slope Pine Oak
Mid-Slope Oak Pine
Lower-Slope Hardwood Pine
Floodplain Forest
Baygall
Cypress/Tupelo Swamp
1234 Treatment Areas in the Prescribed Fire Program
1234 Treatment areas not currently in the Prescribed Fire Program
Structures
Private Graveyard


Hickory Creek Treatment Units
Hickory Creek
FM 2827
US 69
Wildwood Community
Golf Course
2401
2501
Study Area
2502
2602
2303
2601
2302
2101
2201
2301
2701
2702
Sundew
Pipeline
Powerline
N
W
E
S
0
1
2
3 Miles
Upper-Slope Pine Oak
Savannah
Baygall
Water
1234
Treatment Areas in the Prescribed Fire Program
Study Area
Excluded from the Prescribed Fire Program as a Long-Term Vegetation Comparison Area

# Turkey Creek Treatment Units

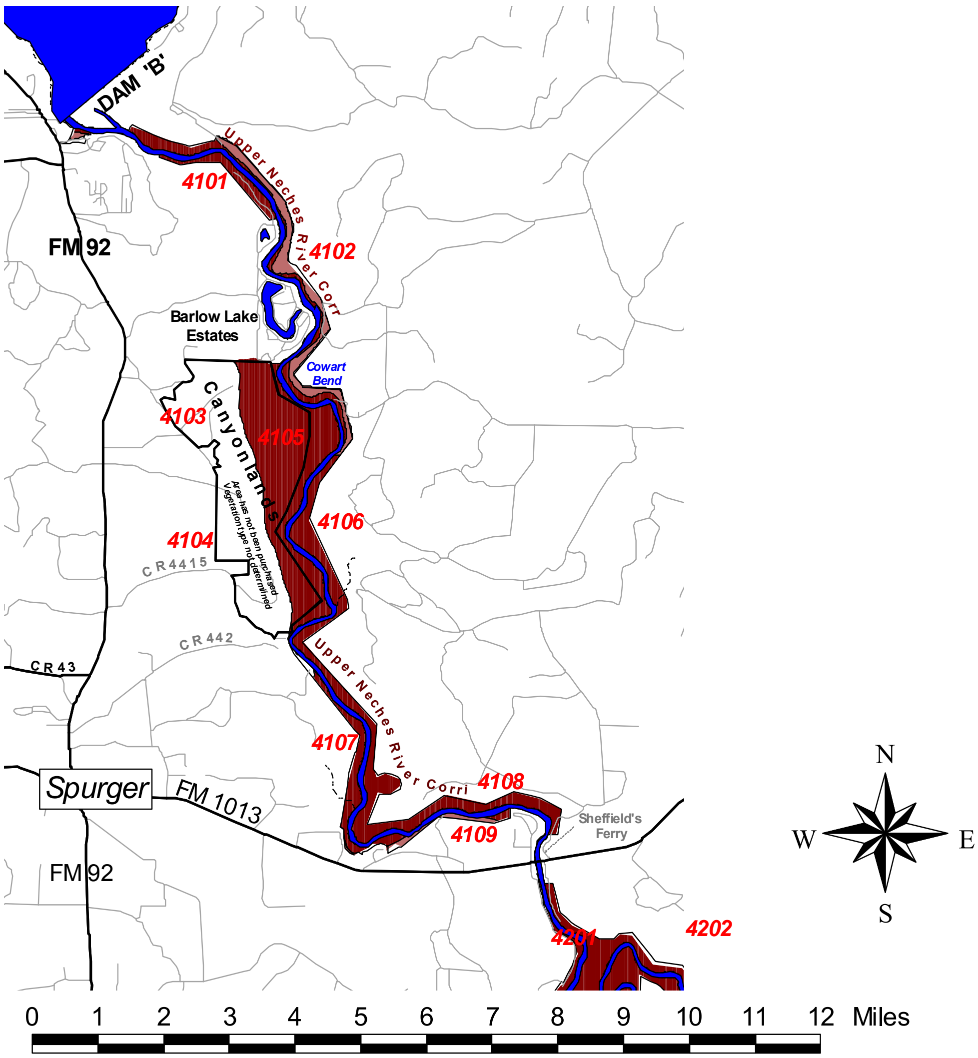


# Beech Creek Treatment Units



# NECHES FLOODPLAIN - TREATMENT UNITS

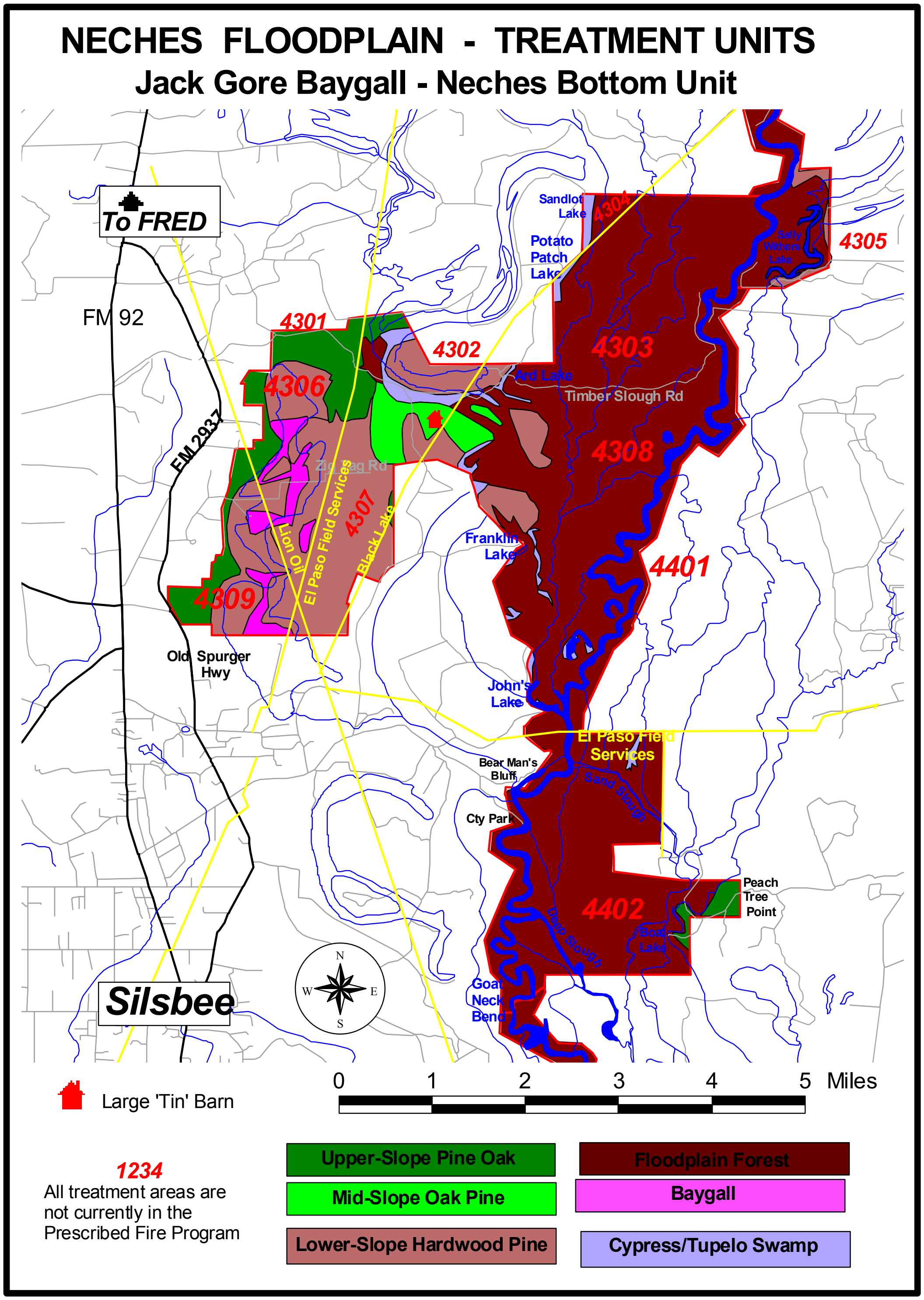
## Canyonlands Unit

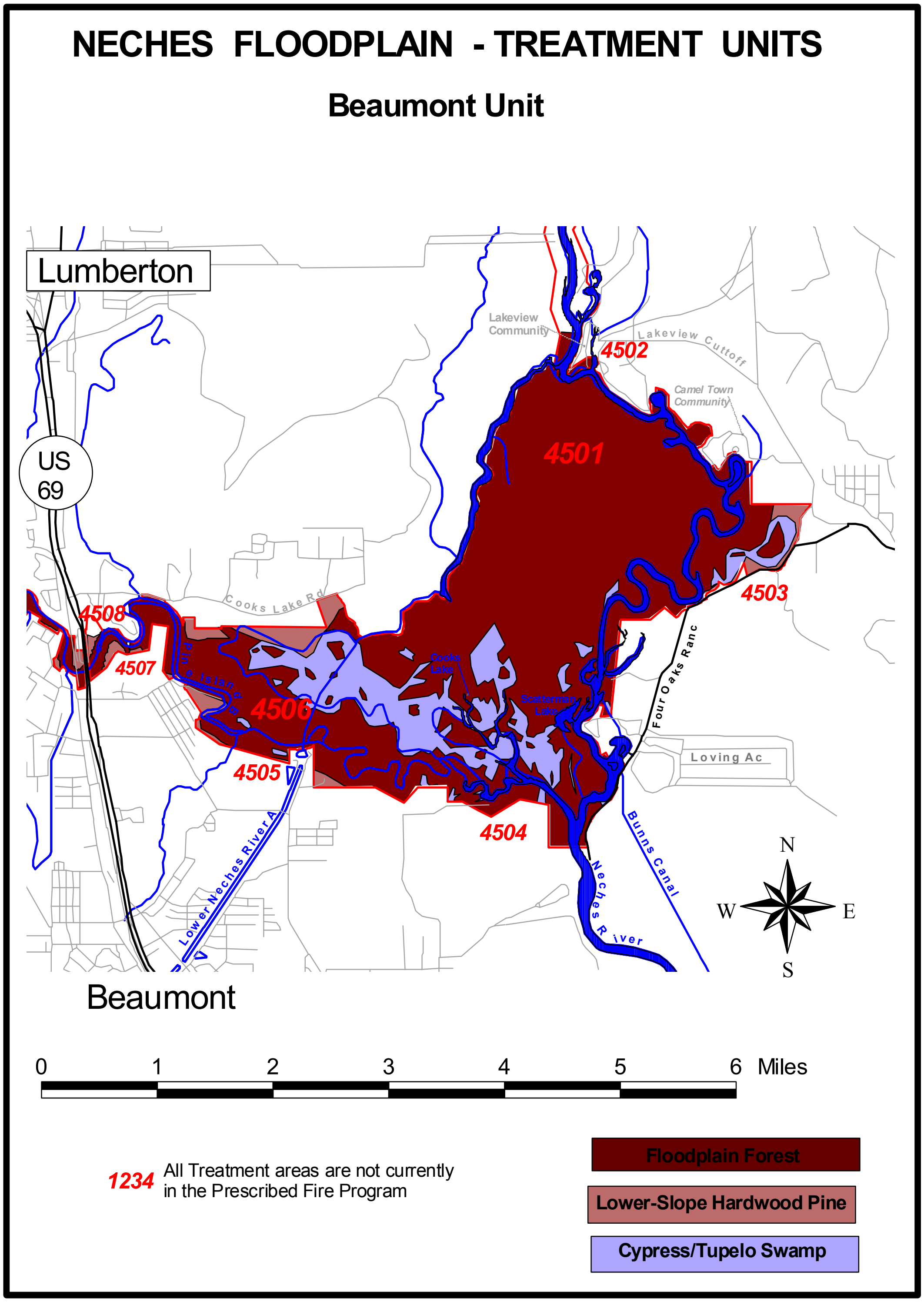



**1234** All treatment areas are not currently in the Prescribed Fire Program

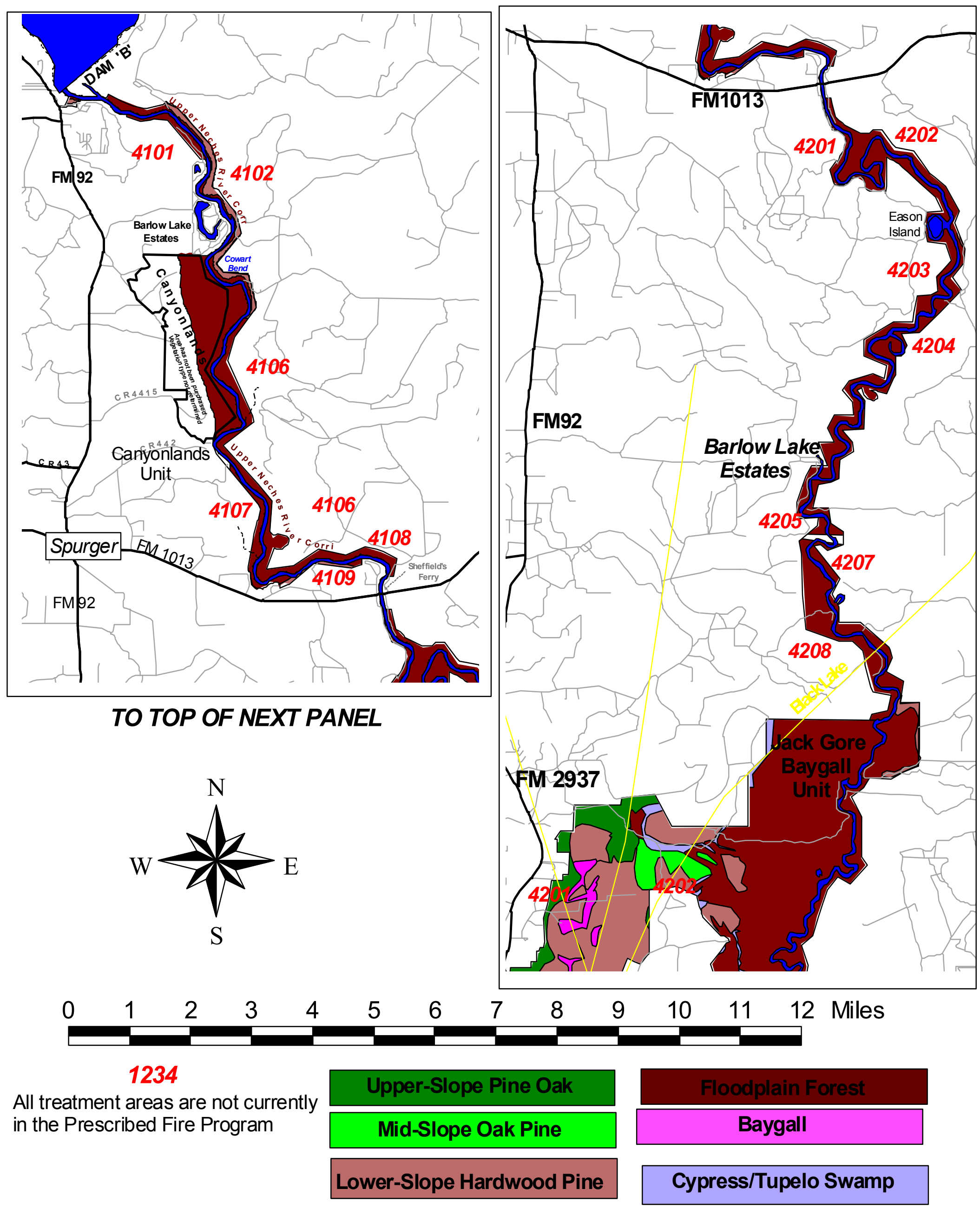
Floodplain Forest

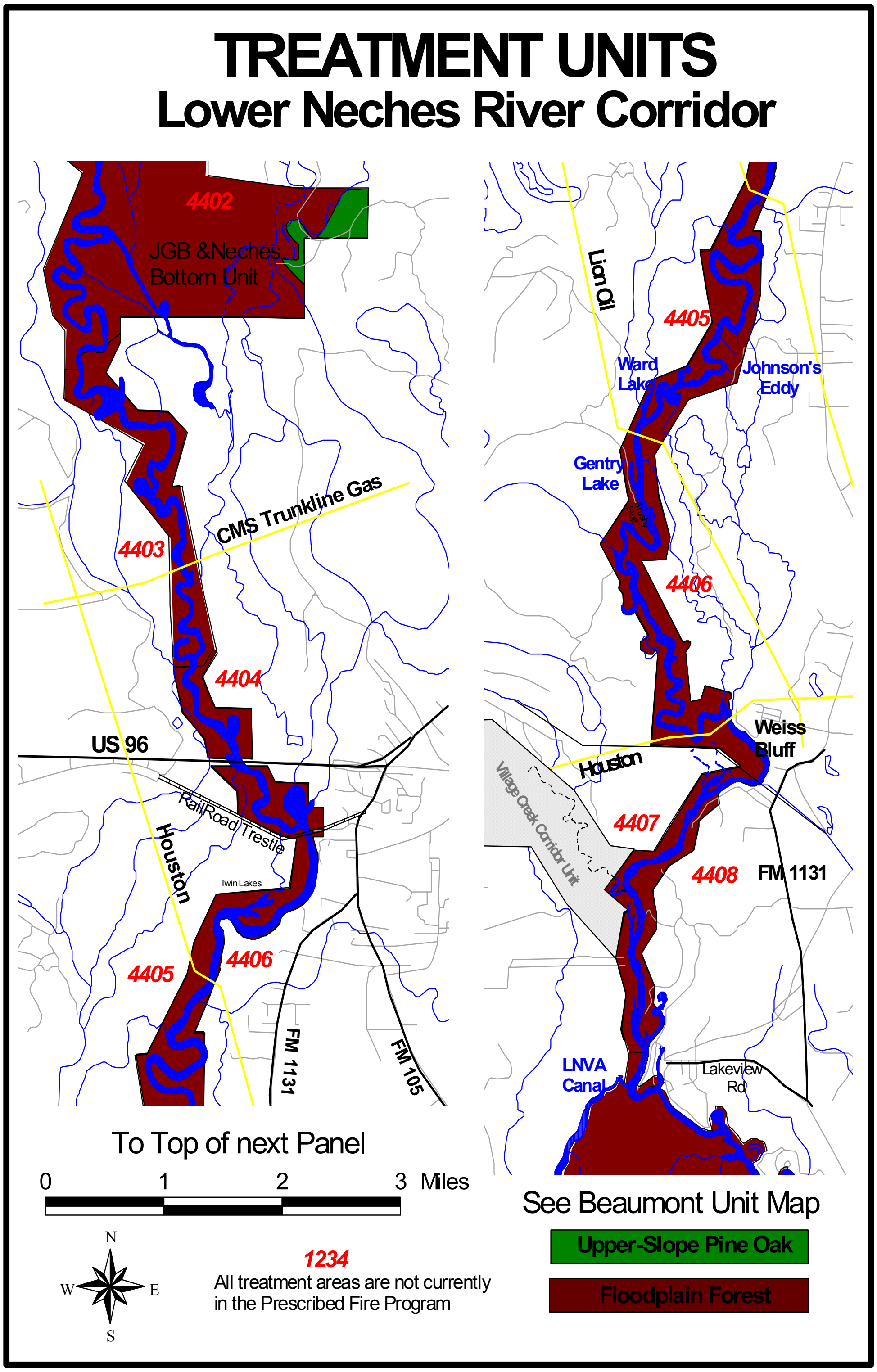
Lower-Slope Hardwood Pine

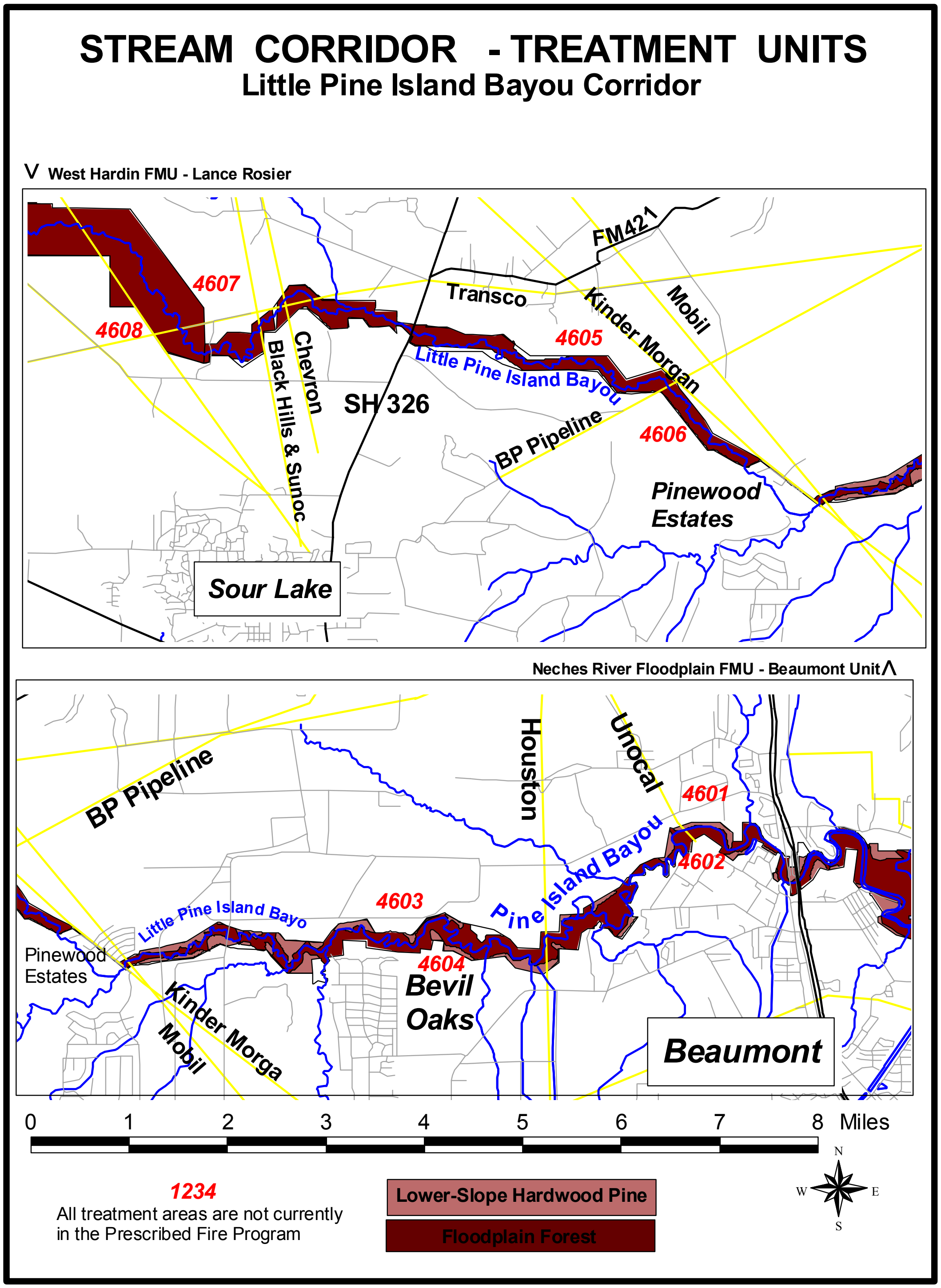

NECHES FLOODPLAIN - TREATMENT UNITS
Jack Gore Baygall - Neches Bottom Unit
To FRED
FM 92
FM 2937
Old Spurger Hwy
Silsbee
4301
4302
4303
4304
4305
4306
4307
4308
4309
4401
4402
Sandlot Lake
Potato Patch Lake
Ard Lake
Timber Slough Rd
Zigzag Rd
El Paso Field Services
Lion Oil
Black Lake
Franklin Lake
John's Lake
Bear Man's Bluff
Cty Park
Sand Slough
Peach Tree Point
Bear Slough
Goat Neck Bend
N
S
E
W
0 1 2 3 4 5 Miles
Large 'Tin' Barn
1234
All treatment areas are not currently in the Prescribed Fire Program
Upper-Slope Pine Oak
Mid-Slope Oak Pine
Lower-Slope Hardwood Pine
Floodplain Forest
Baygall
Cypress/Tupelo Swamp

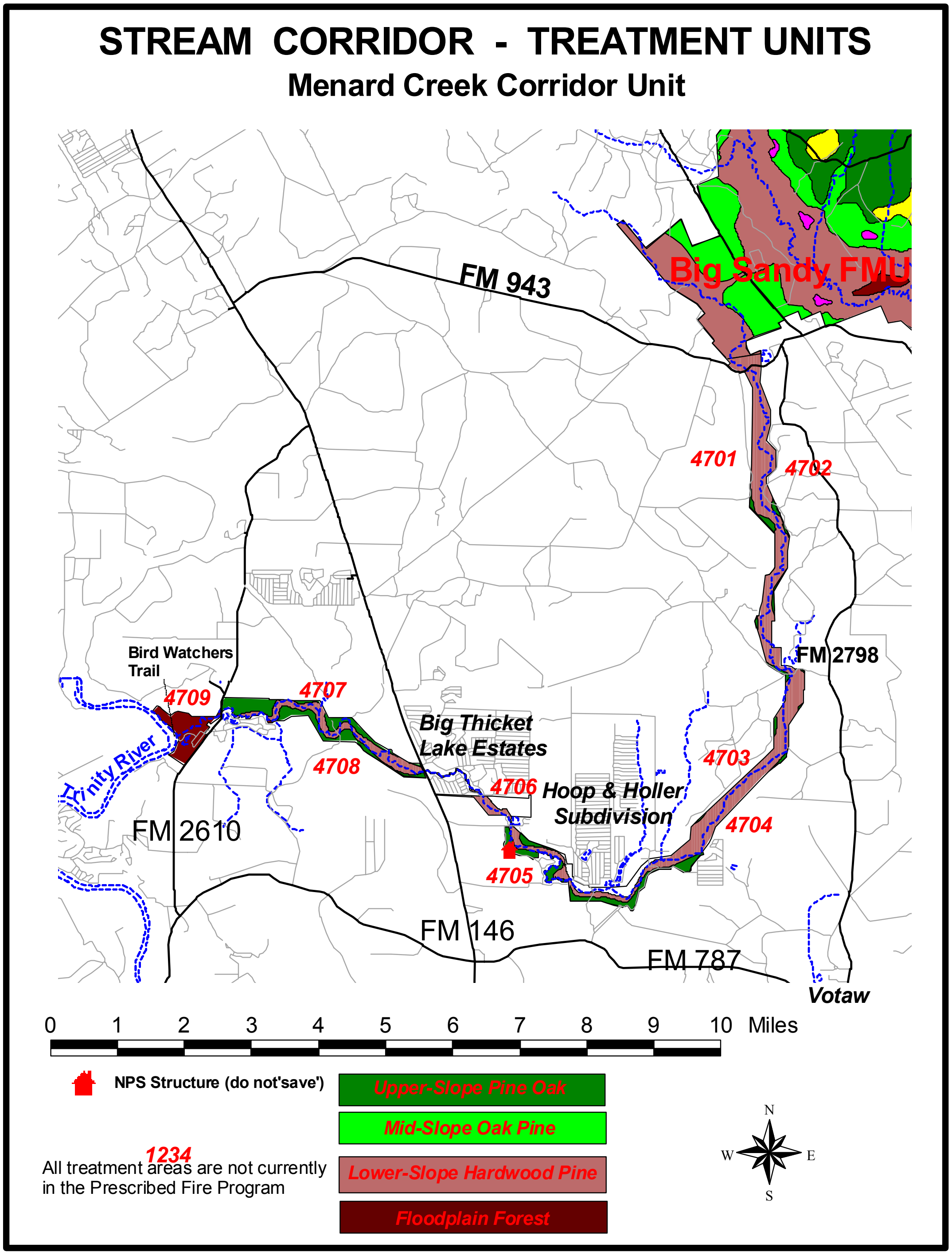

NECHES FLOODPLAIN - TREATMENT UNITS
Beaumont Unit
Lumberton
US 69
Lakeview Community
Lakeview Cuttoff
Camel Town Community
4502
4501
4503
4508
4507
4506
4505
4504
Cooks Lake Rd
Four Oaks Ranc
Loving Ac
Bunns Canal
Neches River
Lower Neches River A
N
W
E
S
Beaumont
0 1 2 3 4 5 6 Miles
1234 All Treatment areas are not currently in the Prescribed Fire Program
Floodplain Forest
Lower-Slope Hardwood Pine
Cypress/Tupelo Swamp

# STREAM CORRIDOR - TREATMENT UNITS
# Upper Neches River Corridor Unit

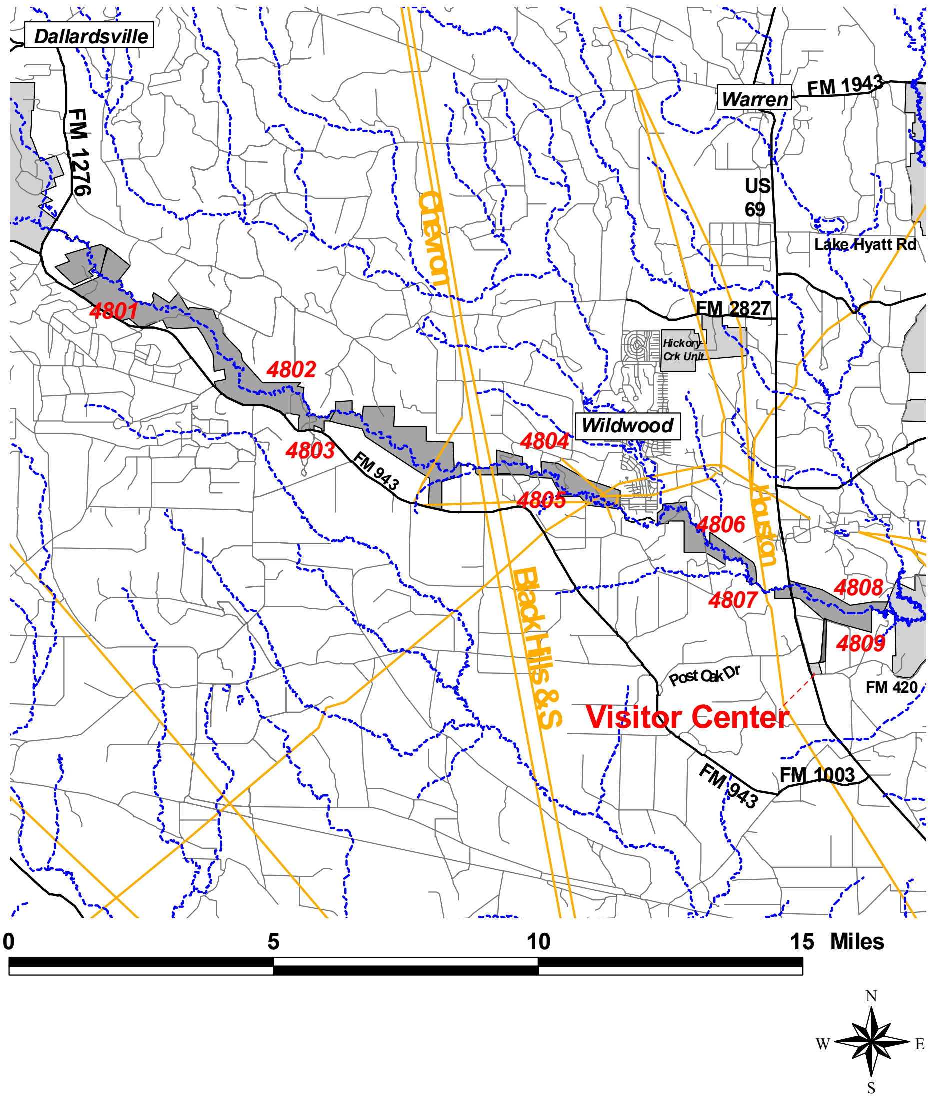



TREATMENT UNITS
Lower Neches River Corridor
4402
JGB &Neches Bottom Unit
CMS Trunkline Gas
4403
4404
US 96
RailRoad Trestle
Houston
Twin Lakes
4405
4406
FM 1131
FM 105
To Top of next Panel
0 1 2 3 Miles
N
W E
S
1234
All treatment areas are not currently in the Prescribed Fire Program
Lion Oil
4405
Ward Lake
Johnson's Eddy
Gentry Lake
4406
Weiss Bluff
Houston
Village Creek Corridor Unit
4407
4408
FM 1131
LNVA Canal
Lakeview Rd
See Beaumont Unit Map
Upper-Slope Pine Oak
Floodplain Forest


STREAM CORRIDOR - TREATMENT UNITS
Little Pine Island Bayou Corridor
V West Hardin FMU - Lance Rosier
4607
4608
4605
4606
FM421
Transco
Kinder Morgan
Mobil
Chevron
Black Hills & Sunoc
SH 326
Little Pine Island Bayou
BP Pipeline
Pinewood Estates
Sour Lake
Neches River Floodplain FMU - Beaumont Unit Λ
BP Pipeline
Houston
Unocal
4601
4602
4603
4604
Little Pine Island Bayo
Pine Island Bayou
Pinewood Estates
Kinder Morga
Mobil
Bevil Oaks
Beaumont
0 1 2 3 4 5 6 7 8 Miles
N
W
E
S
1234
All treatment areas are not currently in the Prescribed Fire Program
Lower-Slope Hardwood Pine
Floodplain Forest


STREAM CORRIDOR - TREATMENT UNITS
Menard Creek Corridor Unit
FM 943
Big Sandy FMU
4701
4702
FM 2798
Bird Watchers Trail
4709
4707
4708
Trinity River
Big Thicket Lake Estates
4706
Hoop & Holler Subdivision
4703
4704
4705
FM 2610
FM 146
FM 787
Votaw
0 1 2 3 4 5 6 7 8 9 10 Miles
NPS Structure (do not'save')
Upper-Slope Pine Oak
Mid-Slope Oak Pine
Lower-Slope Hardwood Pine
Floodplain Forest
1234
All treatment areas are not currently in the Prescribed Fire Program
N
W
E
S

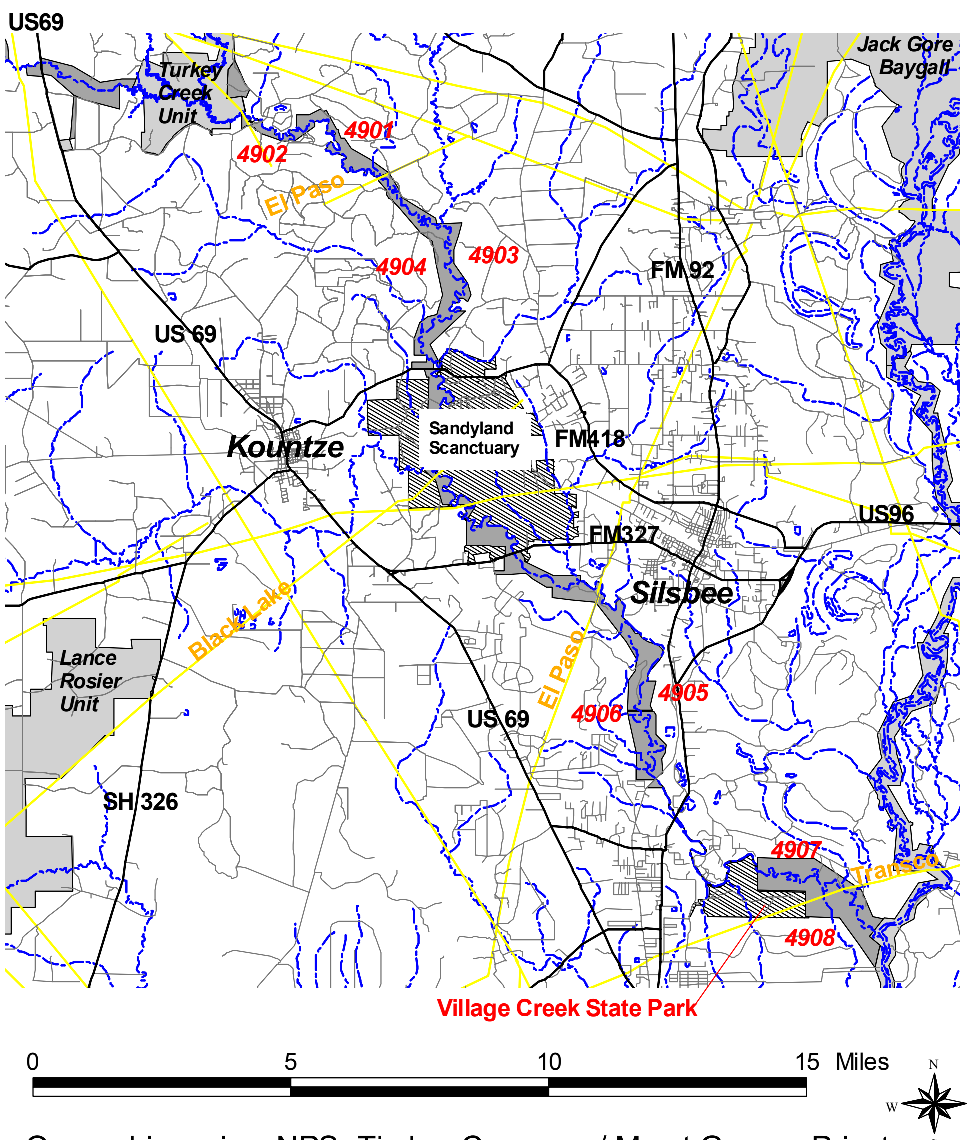
STREAM CORRIDOR - TREATMENT UNITS
Big Sandy Creek Corridor




Ownership varies: NPS -Timber Company / Mgmt Group - Private
Vegetation Mapping will occur after acquision.

## STREAM CORRIDOR - TREATMENT UNITS

Village Creek Corridor




Ownership varies: NPS -Timber Company / Mgmt Group - Private
Vegetation Mapping will occur after acquision.

**Incident Complexity Analysis – Type 1 and 2**

1) Analyze each element and check the response, Yes or No.
2) If positive responses exceed, or are equal to, negative responses within any primary factor (A through G), the primary factor should be considered as a positive response.
3) If any three of the primary factors (A through G) are positive responses, this indicates the fire situation is, or is predicted to be, of Type 1 complexity.
4) Factor H should be considered after numbers 1-3 are completed. If more than two of the items in factor H are answered yes, and three or more of the other primary factors are positive responses, a Type 1 team should be considered. If the composites of H are negative, and there are fewer than three positive responses in the primary factors (A-G), a type 2 team should be considered. If all the questions in H are negative, it may be advisable to allow the existing overhead to continue action on the fire.

Incident Complexity Analysis

| | YES | NO |
|---|---|---|
| A. FIRE BEHAVIOR | | |
| **1.** Burning Index above the 90% in the major fuel model | | |
| **2.** Potential for extreme fire behavior | | |
| **3.** Crowning profuse, or lang-range spotting | | |
| **4.** Weather forecast indicated no significant relief or worsening conditions | | |
| TOTAL | | |
| B. RESOURCES COMMITTED | | |
| 1. 200 or more personnel assigned | | |
| 2. Three or more divisions | | |
| 3. Wide varity of special support divisions | | |
| 4. Substancial air operations which is not properly staffed | | |
| 5. Majority of initial attack resources committed | | |
| TOTAL | | |
| C. RESOURCES THREATENED | | |
| 1. Urban Interface | | |
| 2. Developments and facilities | | |
| 3. Restricted, threatened, or endangered species habitat | | |
| 4. Cultural sites | | |
| 5. Unitque natural resources, special-designation areas, wilderness | | |
| 6. Other special resources | | |
| TOTAL | | |
| D. SAFETY | | |
| 1. Unusually hazardous fireline construction | | |
| 2. Serious accidents of facilities | | |
| 3. Threat to safety of visitors from fire and related operations | | |
| 4. Restrictions and/or closures in effect or being considered | | |
| 5. No night operations in place for safety reasons | | |
| TOTAL | | |

E. OWNERSHIP
1. Fire burning or threatening more than one jurisdiction
2. Potential for claims (damages)
3. Different or conflicting management objectives
4. Disputes over suppression responsibility
5. Potential for unified command

TOTAL

F. EXTERNAL INFLUENCES
1. Controversial fire policy
2. Pre-existing controversies/relationships
3. Sensitive media relationships
4. Smoke management problems
5. Sensitive political interests
6. Other external influences

TOTAL

G. CHANGE IS STRATEGY
1. Change in strategy to control from confine or contain
2. Large amounts of unburned fuel within planned permiter
3. WFSA invalid or required updating

TOTAL

H. EXISTING OVERHEAD
1. Working two operational periods without achieving objectives
2. Existing management organization ineffective
3. Overheah overextended mentally and/or physically
4. Incident action plans, briefings, etc. missing or poorly prepared

TOTAL

**INCIDENT COMPLEXITY ANALYSIS for TYPE 3,4,5**

YES NO

**A.** FIRE BEHAVIOR

1. Fuels extremely dry and susceptible to long-range spotting or you are curently experiencing extreme fire behavior.
2. Weather forecast indicate no significant relief or worsening conditions.
3. Current or predicted fire behavior dictates indirect control strategy with large amounts of fuel within planned perimeter.

**B.** FIREFIGHTER SAFETY

1. Performance of firefighting resources affected by cumulative fatigue.
2. Overhead extended metally and/or physically.
3. Communication ineffective with tactical resources or dispatch.

**C.** ORGANIZATION

1. Operations are at the limit of span of control.
2. Incident action plans, briefings, etc. missing or poorly prepared.
3. Variety of specialized operations, support personnel or equipment.
4. Unable to properly staff air operations.
5. Limited local resources available for initial attack.
6. Heavy commitment of local resources to logistical support.
7. Existing resources worked 24 hours without success.
8. Resources unfamiliar with local conditions and tactics.

**D.** VALUES TO BE PROTECTED

1. Urban Interface; structures, developments, recreational facilities, or potential for evacuation.
2. Fire burning or threatening more than one jurisdiction and potential for unified command with different or conflicting management objectives.
3. Unique natural resources, special-designation areas, critical municipal watershed, T&E species habitat, cultural value sites.
4. Sensitive political concerns, media involvement, or controversial fire policy.

***If you have checked yes on 3 to 5 of the analysis items, consider requesting the next level of incident management support.***

# Agency Administrator's Briefing to Incident Management Team

**General Information**

Name of Incident:
Type of Incident:
Incident Start Date:
Approximate Size of Incident:
Location:
Time:
Cause:
General Weather Conditions:
Local Weather of Fire Behavior Conditions:
Land Status:
Local Incident Policy:
Resource Values Threatened:
Private Property or Structures Threatened:
Capability of Unit to Support Team:

**Command Information/Written Delegation of Authority**

Agency:
Agency Administrator's Representative:

**Transition**

Name of Current Incident Commander:
Timeframe for Team to Assume Command: Date: Time:
Recommended local Participation in IMT Organization:
Current IC and Staff Roles Desired after Transitions:
Other Incidents in Area:
Other Command Orgaizations (Unified/Area/MAC):
Local Emergncy Operations Center (EOC) Established:
Trainees Authorized:
Legal Considerations:
Known Political Considerations:
Sensitive Residential and Commercial Develoments, Resource Values, Archeology Sites, Roadless, Wilderness, and Unique Suppression Requirements:
Local Social/Economic Considerations:
Private Representatives Such as Timber, Utility, Railroads, and Environmental Groups:
Incident Review Team Assigned (FAST, Audit, other):
Incident Commander:
Agency Administrator:
Local Public Affairs:
Unit FMO:
Expanded Dispatch:
Other:

**Safety Information**

Accidents and Injuries to Date:
Condition of Local Personnel:

Known Hazards:
Injury and Accident Rreporting Proceedures:

**Planning Section / General Information**
Access to Fax anc Copy Machines:
Access to Computers and printers:
Existing Pre-Attack Plans
Other Nearby Incidents Influencing Strategy / Tactics / Resources::
Training Specialist Assigned or Ordered:
Training Considerations:

**Situation Unit**
General Weather Conditions / Forecasts:
Fire Behavaior:
Local Unusual Fire Behavior and Fire History in Area of Fire:
Fuel Type(s) at Fire:
Fuel Type(s) Ahead of Fire:

**Resources Unit / Resources Orders**
Personnel on Incident (General):
Equipment on Incident (General):
Resources on Order:
Incident Demobilitzation Procedures:

**Operations Section**
Priorities for Control, WFSA Approved:
Current tactics:
Incident Accessibility for Engines and Gorund Support:

**Air Operations**
Air Tactical Group Supervisor:
Airtankers Assigned:
Effectiveness of Airtankers:
Air Base(s):

**Logistics Section / Facilities Unit**
ICP/Base Pre-Plans:
ICP/Base Location:
Catering Service / Meals provided:
Shower Facilities:
Security Considerations:
Incident Recycling:

**Supply Unit**
Duty Officer or Coordinator Phone Number:
Expanded Dispatch Organization:
Supply System to be Used (Local Supply Cache):

Single Point Ordering:

**Logistics Section / Communications**

NFRS System on Order:
Local Network Available:
Temporary:
Cell Phone Cache Available:
Landline Access to ICP:
Local Telecom Technical Support:

**Ground Support Unit**

Route to ICP/Base:
Route From ICP/Base to Fire:
Medical Unit:
Nearest Hospital or Desired Hospital:
Nearest Burn Center, Trauma Center:
Nearest Air Ambulance:

**Finance Section**

Name of Agency Administrator Representative:
Name of Incident Business Advisor (if assigned):
Agreements and Annual Operating Plans in Place:
Jurisdictional Agencies Involved:
Need for Cost Share Agreement:

**Cost Unit**

Fiscal Considerations:
Cost Collection or Trespass:
Management Codes in Use:

**Procurement Unit**

Buying Team in Place or Ordered:
Contracting Officer Assigned:
Copy of Local Service and Supply Plan Provided:
Is All Equipment Inspected and Under Agreement:
Emergency Equipment Rental Agreements:

**Compensation/Claims Unit**

Potential Claims:
Status of Claims / Accident Reports:

**Time Unit**

Payroll Procedure Established for T&A Transmittal:

***"Delegation of Authority"***

Y14

Subject: Delegation of Authority, ____________________ Wildland Fire Incident

To: ___________________________, Incident Commander

I hereby delegate authority for the management of the ___________________________ Wildland Fire Incident to you as Incident Commander of the _______________________ Type ____ IMT. This fire is currently burning on _______________________________ lands under the jurisdiction of ___________________________________. The local fire protection agencies for private property are ____________________________.

You will report to the _______________________________ Incident Base following the Agency Administrator's briefing on ______________________ at _________________ am/pm at the _________________ Office. Your team will assume full command of the incident following shift change at ________________am/pm on _________________.

I expect all suppression efforts will be executed in accordance with the selected strategy identified in the WFSA prepare for the __________________________ incident. I, or my representative(s) will be available for daily review of the WFSA throughout this incident.

I have designated the preserves FMO as my representative and assigned the Fire Ecologist as the Resource Advisor to the incident.

Suppression objective priorities, as outlined in the WFSA, are:

1. ________________________________________________________________
2. ________________________________________________________________
3. The Appropriate Management Strategy will match the complexity of the vegetation, visitation and use facilities, and adjacent private values. It must emphasize the use of natural barriers on the floodplain, and line construction along the boundary coupled with burnout operations. Handline construction is preferred within the preserve. Dozer-plow units can be used for direct attack if urban interface values are threatened, but will require rehabilitation. Dozer-plow/blade units and other heavy equipment can be used along the boundary if fire behavior and adjacent values-at-risk warrant, but will require extensive rehabilitation. ATVs and other light-ground-pressure equipment may be used along the boundary, and on interior roads and trails. Cross-country travel is also permitted if limited to direct attack along the flanks of a wildfire (from within the black), or mop-up adjacent to roads/trails/control lines. Aircraft may be used, but should avoid flights over the Alabama - Coushatta Indian Reservations visitor use facilities. Water drops are acceptable throughout the preserve, but chemical retardant will not be used on floodplains or the Neches River Floodplain and Stream Corridor FMUs. The use of fireline explosives is prohibited. Exemptions will require the concurrence of the preserves management team [the Chief of Resource Management, the Chief Ranger, and the Superintendent] and the FMO.

Any _________________ suppression tactics within the ____________________ area must be approved by me or my representative. Within the _______________________ Wilderness _____________________ is approved. The following areas are designated ________________________ habitat. Suppression activities within these areas must consider _______________________.

Effective management of costs commensurate with resource values to be protected and strategic direction of the WFSA selected alternative is critical. A comptroller will be appointed and available to our staff. Property accountability will demonstrate adherence to National direction on acceptable fire loss/use rates.

Incident Resources will be responsible for Initial Attack within the Fire Management Unit and any spot fires on adjacent lands from the ______________________ Incident. The Texas Forest Service will assume Initial Attack responsibilities outside this specified area.

Resources committed to the fire are _________________________________________.

Fire information and media relations will be coordinated with the park information officer.

I request that personnel assigned to the incident be sensitive to the local community and request that as much purchasing as possible be done through local vendors.

I have included excerpts from the Fire Management Plan into the briefing documentation. Other documents that are pertinent to fire suppression efforts within the area include:

I welcome your team to the Big Thicket National Preserve and wish you a safe and successful assignment. You can reach me at 409-839-2690 ext:222 and my representative at 409-283-5824.

Superintendent,

Art Hutchinson

Appendix H: Long Term Prescribed Fire and Hazardous Fuel Treatments – Multi Year

# BIG THICKET NATIONAL PRESERVE

## Prescribed Burn Schedule - 1980 to 1995

| Area | Unit | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Big Sandy | 1201 375ac | | | | F84 | | | | | | | 91 S | | | | 95 | S |
| | 1300 1900ac | | | | | | | | | | | | | | | W | |
| | 1401 57 ac | | | | | F | | | | | S | | | | S | | |
| | 1501 1942ac | | | | | | | W | | | | | S | | | | |
| | 1601 149ac | | | | | | | | | | | | | | S | | |
| | 1602 97ac | | | | | | | | | | | | | | S | | |
| | 1605 375ac | | | | | | | | | | | | | | | | W |
| | 1606-8 862ac | | | | | | | | | | | | | S1606 | | | S |
| | 1610 680ac | | | | | | | | | | | | | S | | | |
| | 1611 202ac | | | | | | | | | | | | | | | | " |
| | 1701 | | | | | | | | | | | | | | | | |
| Hickory Creek | 2101 275ac | | | | W | | | W | | | | | W | | | | W |
| | 2201 96ac | | | | | | F | | | | | | | | | W | |
| | 2301 19ac | | | | W | | | W | | | | | | | | W | |
| | 2302 18ac | | | | " | | | " | | | | | | | | " | |
| | 2303 18ac | | | W | | | | | | | | | | W | | " | |
| | 2401 42ac | | | | | W | | | | | W | | | | W | | |
| | 2501 65ac | | | | | | W | | | | F | | | | W | | |
| | 2601 70ac | | | | | W | | | | | | W | | | S | | |
| | 2602 14ac | | | | | " | | | | | | | | W | | | |
| | 2701 65ac | | | | W | | | W | | | | W | | | | W | |
| | 2702 11ac | | | | | | W | | | | | | | W | | " | |
| Turkey Creek | 3101 1260ac | | | | | | W | | | | | | | | | | |
| | 3201 115ac | | | | W | | | | | | W | | | W | | | S |
| | 3202 76ac | W | W | | | W | | | | | | | | | W | | |
| | 3301 595ac | | | | | | " | | | | | | | | | | |
| | 3401 428ac | | | | | | " | | | | | | F | | | | S |
| | 3601 324ac | | | | | | | | | | | | F | | S | | |
| | 3701 608ac | | | | | | | | | | | | | | W | | |
| | 3702 1082ac | | | | | | | | | | | | | | | | |
| Lance Rosier | 5101 560ac | | | | | | | | | | | | | | | | |
| | 5201 827ac | | | | | | | W | | | | | | | | | |
| | 5301 180ac | | | | W | | | | | | | F | | | | | |
| | 5401 380ac | | | | W | | | | | | | F | | | | | |
| Beech Creek | 6101 466ac | | | | | | | | | | | | | | | | |
| | 6201 1757ac | | | | | | | | | | | | | | | | |
| | 6301 180ac | | | | | | | | | | | | | | | | |

W= Winter, Sp = Spring, S = Summer, F = Fall, WF = WildFire,
" = Treatment unit combined, = burn carried over to next year

LEVEL 1 - Wildwood Urban Interface, visitor use at risk, Critical Habitat for T & E Species

LEVEL 2 - Restoration of Savannah's and Manage Hazardous Fuels

LEVEL 3 - Restore Upland Pine Community and Manage Hazardous Fuels

LEVEL 4 - Manage hazardous fuels in large fire mgmt units

# BIG THICKET NATIONAL PRESERVE

## Prescribed Burn Schedule 1995 to 2010

| Area | Unit | Acres | 95 | 96 | 97 | 98 | 99 | 20 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Big Sandy | 1201 | 375ac | S | | S | | | & | S | | ˘˙ | S | | S | | | S | |
| | 1300 | 1900ac | | | S | | | & | " | | " | " | | " | | | " | |
| | 1401 | 57 ac | | W | S | | | & | " | | " | " | | " | | | " | |
| | 1501 | 1942ac | | | | | W | | | ˘˙ | ˘˙ | S | | W | | S | | |
| | 1601 | 149ac | | | | ˘˙ | ˘˙ | ˘˙ | S | | | S | | | S | | | |
| | 1602 | 97ac | | | | | | ˘˙ | " | | | " | | | " | | | |
| | 1605 | 375ac | W | | | ˘˙ | ˘˙ ˘˙ | ˘˙ ˘˙ | " " | | | " | | | " | | | |
| | 1606-8 | 862ac | S | | | | ˘˙ | ˘˙ | " | | | " | | | " | | | |
| | 1610 | 680ac | | | | | | ˘˙ | " | | | " | | | " | | | |
| | 1611 | 202ac | " | | | | | ˘˙ | " | | | " | | | " | | | |
| | 1701 | | | | | | | | | ˘˙ | ˘˙ | S | | W | | S | | |
| Hickory Creek | 2101 | 275ac | W | | | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | W | | W | | S | |
| | 2201 | 96ac | | | | | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | W | | W | | S | |
| | 2301 | 19ac | | | S | | | WF | | | Sp | | S | | | S | | S |
| | 2302 | 18ac | | | " | | | WF | | | " | | " | | | " | | " |
| | 2303 | 18ac | | | " | | | WF | | | " | | " | | | " | | " |
| | 2401 | 42ac | | | " | | | ˘˙ | S | | " | " | | | | " | | " |
| | 2501 | 65ac | | | | Sp | | ˘˙ | S | | S | | S | | S | | S | |
| | 2601 | 70ac | | | S | | | WF | | W | " | | | S | | S | | |
| | 2602 | 14ac | | | " | | | ˘˙ | ˘˙ | " | " | | | " | | " | | |
| | 2701 | 65ac | | | S | | | WF | | " | | W | | " | | " | | |
| | 2702 | 11ac | | | " | | | ˘˙ | ˘˙ | " | | " | | " | | " | | |
| Turkey Creek | 3101 | 1260ac | | | | | ˘˙ | | | ˘˙ | S | | S | | | S | | |
| | 3201 | 115ac | S | | | W | | Sp | | ˘˙ | S | | | S | | S | | |
| | 3202 | 76ac | | | S | | F | | ˘˙ | ˘˙ | S | | | S | | S | | |
| | 3301 | 595ac | | | | | | | | ˘˙ | ˘˙ | ˘˙ | | | W | | | |
| | 3401 | 428ac | S | | | | | | | ˘˙ | ˘˙ | ˘˙ | | | " | | | |
| | 3601 | 324ac | | | S | | S | | ˘˙ | ˘˙ | Sp | S | | S | | S | | S |
| | 3701 | 608ac | | | | | | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | | W | | W | | |
| | 3702 | 1082ac | | | | | | | | ˘˙ | ˘˙ ˘˙ | ˘˙ ˘˙ | ˘˙ | | | S | | |
| Lance Rosier | 5101 | 560ac | | | | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | ˘˙ | | | | | | |
| | 5201 | 827ac | | | | | | | | | | | | | S | | S | |
| | 5301 | 180ac | | | | | ˘˙ | ˘˙ | ˘˙ | W | | S | | S | | S | | |
| | 5401 | 380ac | | | | | ˘˙ | ˘˙ | ˘˙ | W | | S | | S | | S | | |
| Beech Creek | 6101 | 466ac | | | | | | | | | | | | | | | | |
| | 6201 | 1757ac | | | | | | | | | | | | | | | | |
| | 6301 | 180ac | | | | | | | | | | | | | | | | |

W= Winter, Sp = Spring, S = Summer, F = Fall, WF = WildFire,
" = Treatment unit combined, ˘˙ = burn carried over to next year

| | |
|---|---|
| LEVEL 1 - Wildwood Urban Interface, visitor use at risk, Critical Habitat for T & E Species | LEVEL 2 - Restoration of Savannah's and Manage Hazardous Fuels |
| LEVEL 3 - Restore Upland Pine Community and Manage Hazardous Fuels | LEVEL 4 - Manage hazardous fuels in large fire mgmt units |

## *Hazard fuels reduction areas and schedule*

Appendix G-2

### Hazardous Fuel Reduction Plan

| Unit | Zone | Description | Hazard | Value | Risk | Priority | Schedule |
|---|---|---|---|---|---|---|---|
| Big Sandy Creek Unit | 1 | NORTH (Area north of FM1267) | LOW | HIGH | MODERATE | | |
| | 2 | SOUTHEAST (Area east of Big Sandy Creek and south of FM1276) | HIGH | HIGH | HIGH | 2 | 2005-2010 |
| | 3 | SOUTHWEST (Area west of Big Sandy Creek and south of FM1276, and the Menard Creek Corridor) | LOW | HIGH | MODERATE | | |
| Hickory Creek Unit | 1 | ALL | HIGH | HIGH | HIGH | 1 | 2004-2005 |
| Turkey Creek Unit | 1 | NORTHEAST (south of FM1943 to Hicksbaugh Road, and east of the creek) | MODERATE | MODERATE | HIGH | 4 | |
| | 2 | NORTHWEST (south of FM1943 to Hicksbaugh Road -west of the creek) and NORTH-CENTRAL section (from Hicksbaugh Road south to King Store Road) | MODERATE | HIGH | MODERATE | | |
| | 3 | SOUTH-CENTRAL (south of King Store Road to Village Creek) | MODERATE | MODERATE | HIGH | | |
| | 4 | SOUTHWEST (south of Village Creek to FM420) | LOW | HIGH | HIGH | | |
| Beech Creek Unit | 1 | ALL | MODERATE | MODERATE | LOW | | |
| Jack Gore Baygall and Neches Bottom Unit | 1 | ALL | LOW | MODERATE | MODERATE | | |
| Beaumont Unit | 1 | ALL | LOW | LOW to HIGH | MODERATE | | |
| Lance Rosier Unit | 1 | NORTHEAST (Coe Road east to SH770) | HIGH | HIGH | MODERATE | 3 | 2006-2010 |
| | 2 | REMAINDER (Coe Road west to SH105) | LOW | LOW to HIGH | LOW | | |
| Loblolly Unit | 1 | ALL | LOW | LOW | LOW | | |
| Neches River Corridor | 1 | ALL | LOW | LOW to HIGH | LOW | | |
| Little Pine Island Bayou Corridor | 1 | ALL | LOW | LOW to HIGH | LOW | | |
| Canyonlands Unit | 1 | Not Acquired | | | | | |
| Village Creek Corridor | 1 | Not Acquired | | | | | |
| Big Sandy Creek Corridor | 1 | Not Acquired | | | | | |

***The Wildland Fire Prevention Plan in Appendix I displays the Units and Zones. Each areas's Hazard, Value, and Risk is described***

The first priority is the entire Hickory Creek Unit (677 acres), with the Wildwood Urban-Interface the most critical. Thirty seven prescribed burns to control understory brush have deen conducted through out the unit since 1982, but were suspended along the Wildwood U/I in 1998. A pilot treatment (37 acres) consisting of chemical, mechanical (grinding), and burning along the boundary began in 2003. It was successfully completed in 2004, and expanded an additional 314 acres, completing the Wildwood U/I area, and 30 acres (chemical – prescribed burn) in the Sundew Trail area. The slash from these treatments will be prescribed burned in 2005. A funding request to complete treatment of the Hickory Creek Unit is in the 2005 budget request.

The second priority is the East side of the Big Sandy Creek Unit. A 2005 funding request to prepare an Environmental Assessment for the removal of understory brush and restoration of the native Longleaf Pine vegetative community. The area was prescribed burned during the summer of 2004, however the flammable brush will resprout. Potential treatments include: continuation of the prescribed fire only (current condition), chemical - prescribed fire, mechanical (biomass utilization for bio-diesel) – chemical – prescribed burning.

The third priority is the Wetland Pine Savannas in the northeast corner of the Lance Rosier Unit. Potential treatments include chemical treatment of understory brush and mechanical thinning of invading Loblolly Pine (with chainsaws), followed by the prescribed burning of slash.

The fourth priority is the northeast corner of the Turkey Creek Unit, and would potentially include chemical treatments of understory brush and hardwoods in Southern Pine Beetle infestation areas, followed by slash burning and the planting of Longleaf Pine seedlings.

Appendix I

**Fire Prevention Plan** *(see RM-18, Chapter 8).*

# BIG THICKET WILDFIRE PREVENTION PLAN

Big Thicket National Preserve consists of 15 management units, totaling 99,290 acres, scattered across 3,600 sq. miles. The management units range in size from 550 to 25,000 acres and total 530 miles of boundary.

Wildland fire has historically been a significant factor controlling the distribution of vegetation types along the topography – moisture gradient. The upland areas are phyric communities and require fire to maintain community structure and diversity. Typical wildland fires do not reduce natural resource values, but may threaten adjoining timberlands or structures.

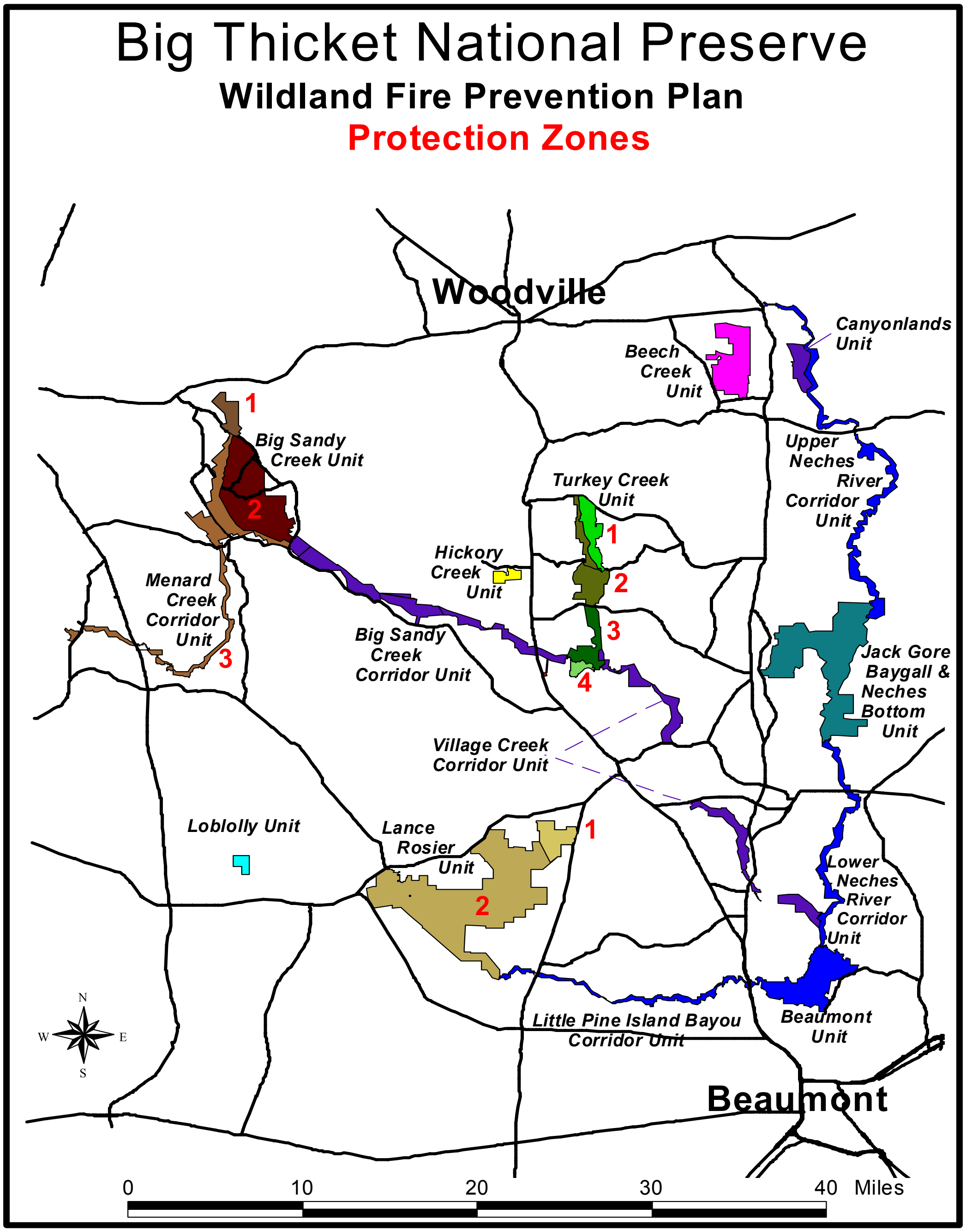
Local wildland fires are suppressed by Texas Forest Service and timber-company crews. While they are usually successful utilizing tractor-plows for direct attack, a wildfire will occasionally grow to 500+ acres and threaten structures.

Preserve wildfire occurrence is low (four per year) and typical fires are small (< 10 acres), but occasionally reach 100's of acres in size. Initial attack forces are generally successful utilizing burnouts from constructed handlines and existing barriers. These statistics are considerably less than the East Texas norms and reflect the acquisition of waterways for the Preserve. Floodplain fuel types (associated with waterways) comprise 71% of preserve vegetation types, and are not generally flammable.

The upland fuel types in the Big Thicket can support an intense, rapidly moving headfire that may endanger adjoining structures. A critical wildland/urban interface occurs between the Hickory Creek Unit and Wildwood Subdivision (2.5 miles); and a mixed interface occurs along sections of all units (40 miles). The remaining boundary (366 miles) adjoins private or commercial timberlands that have high timber values.

This plan subdivides units into compartments of similar risks (ignition potential), hazards (fuels), and values (structures). The maps display critical areas in red, moderate areas in yellow, and low priority areas in green. Each compartment is listed with the specific hazard, value, and risk factors identified. Specific prevention measures and responsible personnel are also identified. The appendix contains maps of each unit and historical fire occurrence.

Big Thicket Preserve has an active prescribed burn program, completing 70 burns on 11,285 acres since 1980 (see Map # 2). These burns accomplish resource management goals and control hazardous fuels on 90% of the critical areas and 40% of the moderate areas. The remaining 10% and 60% will be included in the prescribed burn program as weather and funding permit.



**FP ZONE – BIG SANDY #2 (HIGH)**

## HAZARD

High — Very flammable upland pine and Upper-Slope Pine-Oak vegetation types throughout area.

## VALUE

High — Scattered residences along east boundary and residential inholdings near Big Sandy Creek. The community of Dallardsville is one mile east of unit.

## RISK

High — Public access on paved or dirt roads, and hunting during the fall. The area includes a horse trail.

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Continue periodic hazardous fuel treatments.
2. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.
3. Ranger residence will be occupied by a firefighter (Engine Boss). A wildland engine is available for quick response.
4. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent.

Responsible Person(s):

1. Chief of Operations – ongoing
2. Ranger at Residence – ongoing
3. Fire Management Officer – ongoing
4. FMO and Superintendent – as needed

**FP ZONE – HICKORY CREEK (HIGH)**

**HAZARD**

High — Grass/brush fuels promote intense/fast-burning fires.

**VALUE**

High — Wildwood Subdivision (Resort Community), and scattered rural homesteads are adjacent to the boundary.

**RISK**

High — Visitor use on the Sundew Trail, public access on county roads, debris burns on homesites, plus high-power transmission lines and pipelines cross the unit.

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Continue periodic hazardous fuel treatments.

2. Firefighting equipment in ranger vehicles during periods of high/extreme fire danger.

3. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent. Fire Danger signs will be posted at the trailhead as conditions warrant.

4. Wildwood Fire Department will be notified when high/extreme fire danger is reached.

5. Fire Management Officer may meet with homeowners in the Wildwood Community to discuss urban interface issues and conduct housing surveys upon request.

6. During extreme fire danger, equipment and personnel may be pre-positioned in this area.

Responsible Person(s):

1. Chief of Operations – ongoing
2. Fire Management Officer/Chief of Interpretation – as needed
3. Fire Management Officer – ongoing
4. Fire Management Officer – as needed
5. Fire Management Officer – ongoing
6. Fire Management Officer – ongoing

**FP ZONE – LANCE ROSIER #1 (HIGH)**

## HAZARD

| | |
|---|---|
| High | Very flammable grass/brush fuels in area. |

## VALUE

| | |
|---|---|
| High | Little Rock Church is adjacent to boundary, private pasture/ timberland adjacent to south boundary, commercial pine plantation adjacent to north boundary. |

## RISK

| | |
|---|---|
| Moderate | Public access on county dirt roads and pipelines, historical incidence of arson. |

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Continue periodic hazardous fuel treatments.

2. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

3. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent. Fire Danger signs will be posted at trailhead when conditions warrant.

4. Structure adjacent to boundary will be surveyed for risk factors and mitigation actions recommended to owners.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer/Chief of Interpretation – as needed

3. Fire Management Officer – when requested

4. Fire Management Officer – ongoing

**FP ZONE – TURKEY CREEK #1 (MODERATE)**

## HAZARD

| | |
|---|---|
| Low to Moderate | The center of the unit is floodplain forest, with areas of flammable vegetation along the east boundary. |

## VALUE

| | |
|---|---|
| Low to Moderate | Scattered rural homesites along east boundary. |

## RISK

| | |
|---|---|
| High | Accidental ignition from adjacent homeowners, visitor use on the Turkey Creek Trail and Pitcher Plant Trail, and public access on county roads. |

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Continue periodic hazardous fuel treatments.
2. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.
3. Structures adjacent to boundary will be surveyed for risk factors with mitigation actions recommended to owner.

Responsible Person(s):

1. Chief of Operations – ongoing
2. Fire Management Officer – as requested
3. Fire Management Officer – ongoing

**FP ZONE – TURKEY CREEK #2 (MODERATE)**

## HAZARD

| | |
|---|---|
| Moderate | The northwestern area is floodplain forest, with higher flammability vegetation along the west boundary. Upperslope forest occurs alongthe Ranch House Road, and An upland pine site is adjacent to the west boundary. |

### VALUE

| | |
|---|---|
| High | Scattered rural homesites, oil production facilities, Triple D Guest Ranch, and the Ranch House facility. |

### RISK

| | |
|---|---|
| Low to Moderate | Visitor use on Turkey Creek Trails, accidental ignition from adjacent homeowners, public access on county roads, and powerlines. |

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

2. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the Superintendent. Fire Danger will be posted at trailheads.

3. Structures adjacent to boundary will be surveyed for risk factors and mitigation actions recommended to owners.

4. Planned ignitions will be used to control hazardous fuels.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer/Chief of Interpretation – as needed

3. Fire Management Officer – as requested

4. Fire Management Officer – ongoing

**FP ZONE – TURKEY CREEK #4 (MODERATE)**

## HAZARD

Low — Area is predominately floodplain forest types.

## VALUE

High — Log Cabin (Contact Station) and a few scattered rural homesteads outside boundary.

## RISK

High — Visitor use at Contact Station and trail complex, and debris fires escaping from adjacent homes.

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

2. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent. Fire Danger signs will be posted at trailhead when conditions warrant.

3. Structure adjacent to boundary will be surveyed for risk factors and mitigation actions recommended to owners.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer/Chief of Interpretation – as needed

3. Fire Management Officer – as requested

**FP ZONE – BIG SANDY #1 (LOW)**

## HAZARD

| | |
|---|---|
| Low | Area is predominately less flammable floodplain forest and is generally moist. A narrow strip of more flammable fuels occurs along the west boundary. |

## VALUE

| | |
|---|---|
| High | Alabama-Coushatta Reservation adjacent to north boundary includes commercial and administrative structures and scattered residences. A commercial pine plantation is adjacent to east boundary. |

## RISK

| | |
|---|---|
| Low to Moderate | Visitor Use Trail – West of Big Sandy Creek |

SPECIFIC PREVENTION ACTIONS REQURED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

2. Alabama-Coushatta Forestry Department will be altered when fire danger reaches high/extreme.

3. The Indian Springs Fire Department and Alabama-Coushatta Forestry Department will be altered when any wildfire threatens to cross onto the Reservation.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer – as needed

3. Fire Management Officer – as needed

**FP ZONE – BIG SANDY #3 and MENARD CREEK (LOW)**

## HAZARD

| | |
|---|---|
| Low | Area consists of predominately less flammable vegetation types with scattered patches of upper slope vegetation. |

## VALUE

| | |
|---|---|
| High | Several small communities and scattered residences are adjacent to the boundary; young pine plantations along west boundary. |

## RISK

| | |
|---|---|
| Moderate | A county dirt road passes through area, increased Risk near the small communities of Hoop-n-Holler, Big Thicket Lake Estates, and Six lakes Campground. |

SPECIFIC PREVENTION ACTIONS REQUIRED

Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

Responsible Person(s):

Chief of Operations – ongoing

**FP ZONE – TURKEY CREEK #3 (LOW)**

## *HAZARD*

Moderate — Area is predominately floodplain forest types with scattered pockets of more flammable vegetation. A large area of sandhill pine vegetation type occurs.

## VALUE

Moderate — Timber Company lands (pine plantation) adjacent.

## RISK

Low — Visitor use on the Turkey Creek Trail, vehicle access on paved county road.

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.
2. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent. Fire Danger signs will be posted at trailhead when conditions warrant.
3. Planned ignitions will be conducted to control hazardous fuel conditions.

Responsible Person(s):

1. Chief of Operations – ongoing
2. FMO/Chief of Interpretation – as needed
3. Fire Management Officer – ongoing

**FP ZONE – BEECH CREEK (LOW)**

## HAZARD

Moderate — The area is predominately lower slope and floodplain forest. About 800 acres of mid and upper slope forest occur in the northern half of the unit.

## VALUE

Moderate — Scattered rural residences occur along the south and west boundaries. Commercial Pine Plantation surround most of the unit.

## RISK

Low — Accidental ignition possible from adjacent homeowners, visitors on the Beechwoods Trail, or hunters during the fall season.

SPECIFIC PREVENTION ACTIONS REQUIRED

Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of superintendent.

Responsible Person(s):

Fire Management Officer
Director of Operations
Chief Ranger
Superintendent

**FP ZONE – BEAUMONT UNIT (LOW)**

## HAZARD

| | |
|---|---|
| Low | Fuels are floodplain forest type and will not generally carry a fire. Area is broken up by numerous waterways. |

## VALUE

| | |
|---|---|
| Low to High | Several small communities (Lakeview and Lumberton) are and adjacent with scattered residences near boundary. The City of Beaumont is south of this unit. |

## RISK

| | |
|---|---|
| Low to Moderate | Accidental ignition due to recreational use (Hunting in the fall) or homeowner activities. |

SPECIFIC PREVENTION ACTIONS REQUIRED

Current regulations restricting campfires to sandbars are enforced by rangers.

Responsible Person(s):

Rangers – ongoing

**FP ZONE – JACK GORE BAYGALL (1 AND 2) – NECHES BOTTOM (LOW)**

## HAZARD

Low — Most of the area is bottomland hardwoods with small areas of flammable vegetation occurring along the west boundary and along Timber Slough Road.

## VALUE

Moderate — A few rural homesites along west boundary.

## RISK

Low to Moderate — Public access along Timber Slough Road and Zigzag Oil Road; historic incidence of arson ignitions and possible accidental ignition from homesite trash burning). The area is heavily hunted during the fall season.

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

2. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent.

3. Regulations restricting campfires to sandbars will be enforced by patrol rangers.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer/Superintendent – as needed

3. Ranger Staff – ongoing

**FP ZONE – NECHES RIVER CORRIDOR (LOW)**

## HAZARD

| | |
|---|---|
| Low | Fuels will generally not sustain fire spread. |

## VALUE

| | |
|---|---|
| Low to High | Visitor day-use facilities (picnic tables, restrooms), and adjacent housing communities. |

## RISK

| | |
|---|---|
| Low | Visitor use occurs on waterway or sandbars. |

SPECIFIC PREVENTION ACTIONS REQUIRED

Regulations restricting campfires to sandbars will be enforced by patrol rangers.

Responsible Person(s):

Ranger Staff – ongoing

**FP ZONE – LITTLE PINE ISLAND BAYOU (LOW)**

## HAZARD

| | |
|---|---|
| Low | Fuels are floodplain forest types and will not generally carry a fire. |

## VALUE

| | |
|---|---|
| Low to High | Bevil Oaks and Pineywood communities are south of corridor unit. |

## RISK

| | |
|---|---|
| Low | Public access along SH 105, and several county roads. Visitor use is concentrated at the Hwy 69 bridge. Potential for accidental ignitions from homeowner activities. |

SPECIFIC PREVENTION ACTIONS REQUIRED

Regulations restricting campfires to sandbars will be enforced by patrol rangers.

Responsible Person(s):

Ranger staff – ongoing

## FP ZONE – LANCE ROSIER #2 (LOW)

## HAZARD

| | |
|---|---|
| Low | Area is predominately flatland hardwoods and is generally moist; small ridges and pimple mounds support more flammable vegetation |

## VALUE

| | |
|---|---|
| Low to High | Saratoga Community is outside boundary; oil field adjacent. |

## RISK

| | |
|---|---|
| Low | Public access along county dirt roads-Cotton and Teel Roads, historical incidence of multiple ignitions (creeping ground fires). |

SPECIFIC PREVENTION ACTIONS REQUIRED

1. Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

2. Visitor use in backcountry and trail areas may be restricted during periods of high/extreme fire danger by order of the superintendent.

Responsible Person(s):

1. Chief of Operations – ongoing

2. Fire Management Officer/Superintendent – as needed

**FP ZONE – LOBLOLLY (LOW)**

## HAZARD

Low Leaves/needle ground fuels are generally moist.

## VALUE

Low No development within area, scattered rural homesteads south of area.

## RISK

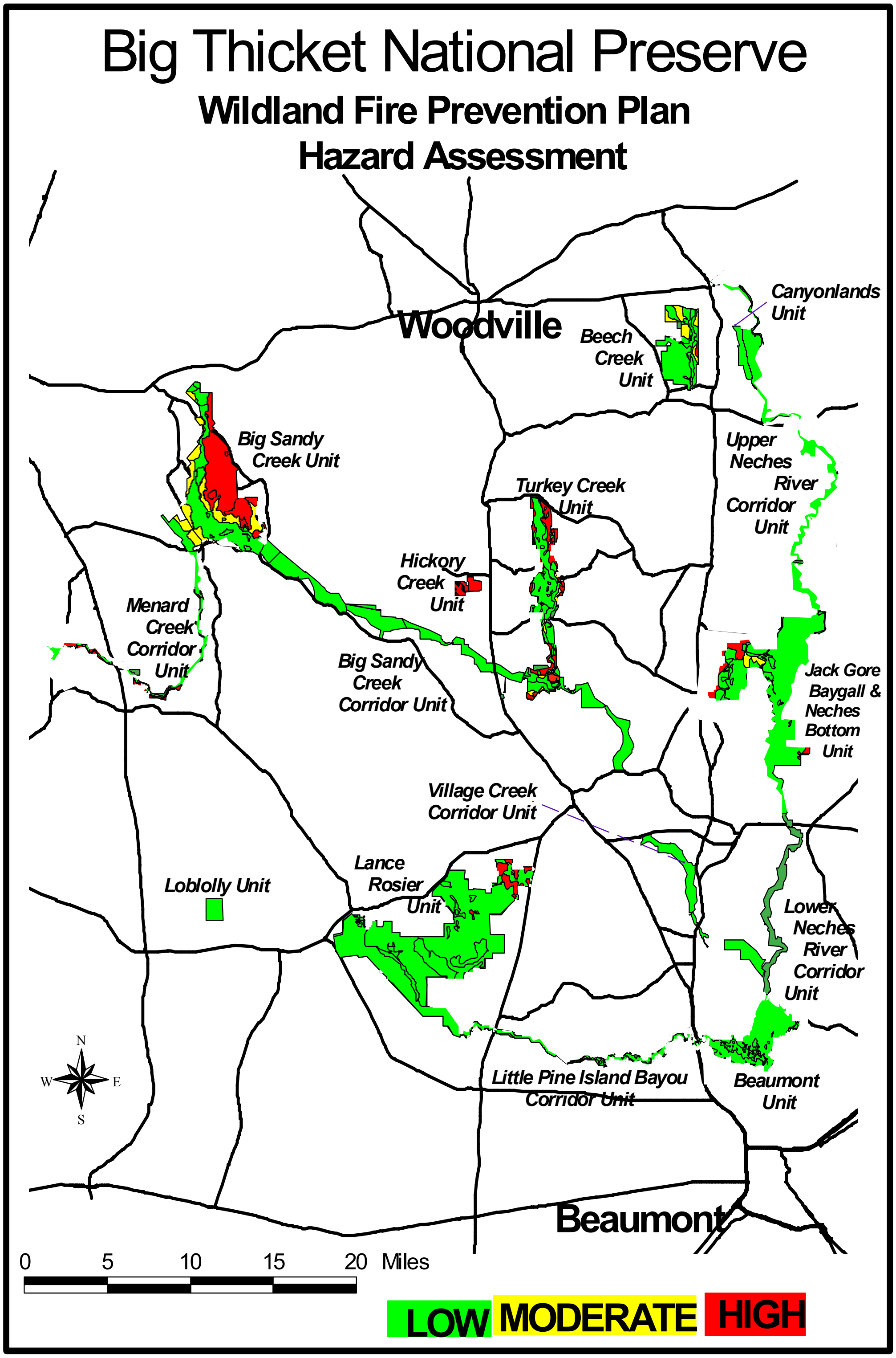
Low Public access on county road, but traffic is generally local.

SPECIFIC PREVENTION ACTIONS REQUIRED

Rangers will have firefighting equipment in their vehicles during periods of high/extreme fire danger.

Responsible Person(s):

Chief of Operations – ongoing


Big Thicket National Preserve
Wildland Fire Prevention Plan
Hazard Assessment
Woodville
Beech Creek Unit
Canyonlands Unit
Big Sandy Creek Unit
Turkey Creek Unit
Upper Neches River Corridor Unit
Hickory Creek Unit
Menard Creek Corridor Unit
Big Sandy Creek Corridor Unit
Jack Gore Baygall & Neches Bottom Unit
Village Creek Corridor Unit
Lance Rosier Unit
Loblolly Unit
Lower Neches River Corridor Unit
Little Pine Island Bayou Corridor Unit
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Miles
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MODERATE
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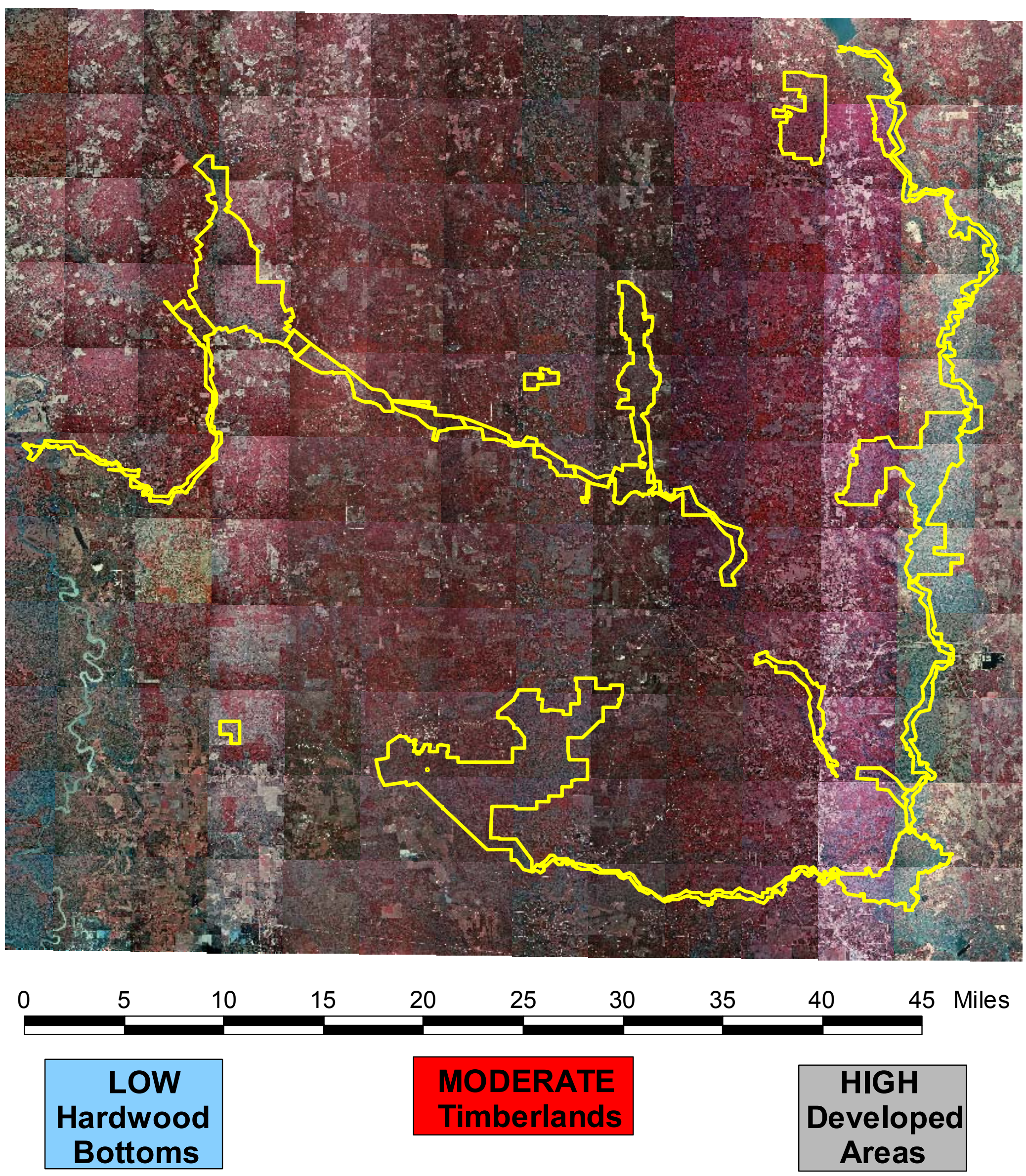
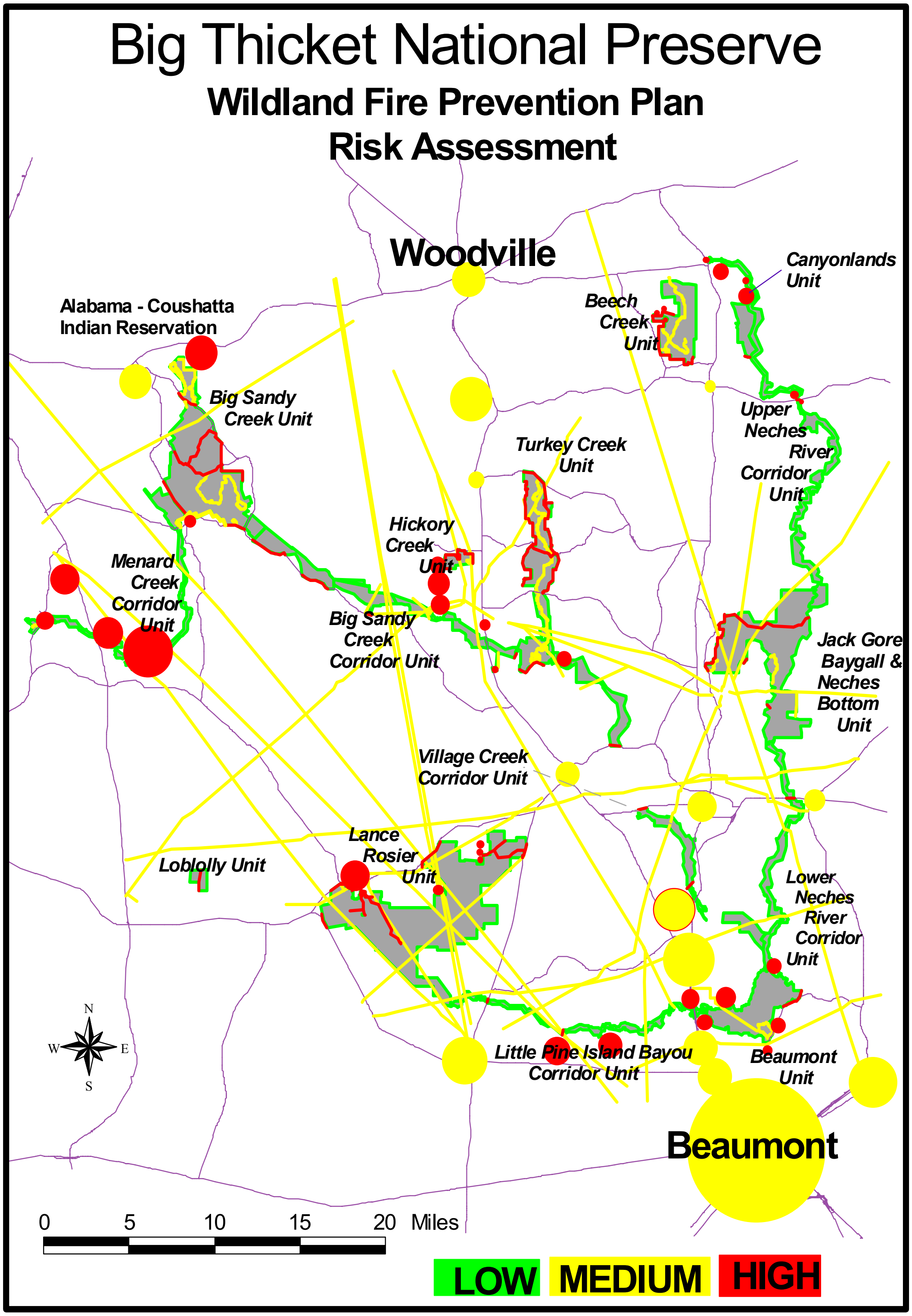
# Big Thicket National Preserve

## Wildland Fire Prevention Plan
## Value Assessment




Big Thicket National Preserve
Wildland Fire Prevention Plan
Risk Assessment
Woodville
Canyonlands Unit
Beech Creek Unit
Alabama - Coushatta Indian Reservation
Big Sandy Creek Unit
Upper Neches River Corridor Unit
Turkey Creek Unit
Hickory Creek Unit
Menard Creek Corridor Unit
Big Sandy Creek Corridor Unit
Jack Gore Baygall & Neches Bottom Unit
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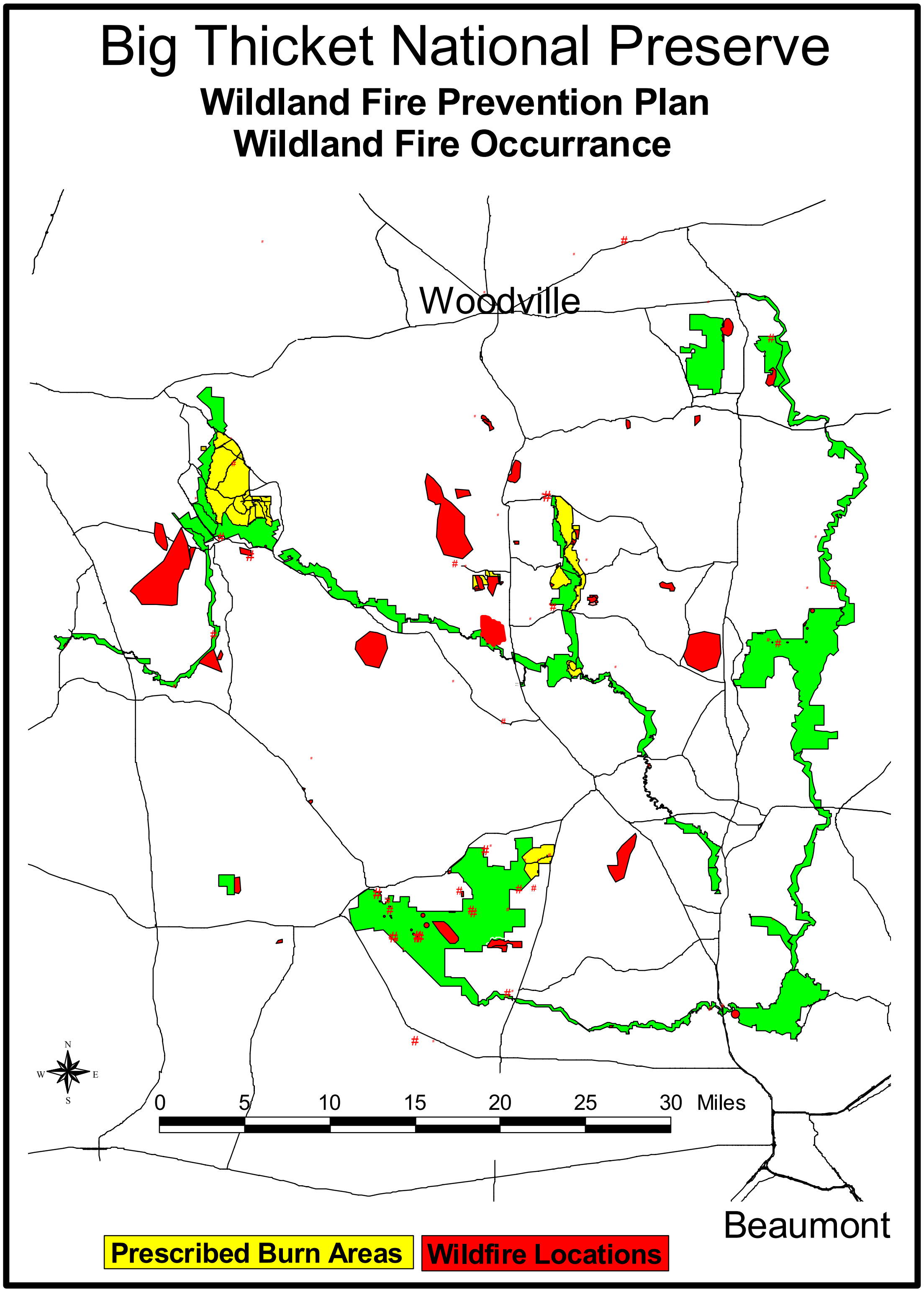
Big Thicket National Preserve
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Wildland Fire Occurrance
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25
30
Miles
Beaumont
Prescribed Burn Areas
Wildfire Locations

Appendix J

**Rental Equipment Agreements**

*NONE*

Appendix K

## ***Contracts for Suppression and Prescribed Fire Resources***

North Texas Fire Resources – Contract for engine resources for prescribed burns, fire suppression, or Staffing level Iv or V risk assignments.

Appendix L

**<u>Burned Area Emergency Stabilization and Rehabilitation Plan</u>**

The steepest slopes within the preserve are located in the Canyonlands Unit (<25%, with a maximum rise of 125', and a longest run of 650'), forming the western terrace of the Neches River. The Big Sandy Creek Unit has rolling topography and gentle slopes (<11%, with a maximum rise of 70', and a longest run of 900'). Steeper slopes with less elevation gain and shorter horizontal distances occur along Turkey Creek. Fireline construction on steep slopes is generally avoided, but may be accomplished with handtools. Waterbars will occasionally be needed to control erosion. Terracing, seeding, soil fencing, etc., are not typically used on these gentle slopes.

Firelines constructed with the use of handtools or light equipment (ATV rake/mower) do not significantly disturb soils, and do not require rehabilitation.

Dozer-plowed lines will be rehabilitated by rolling the berms back into the plowed line using handtools, small track-hoe, or other light ground pressure equipment. The best results are achieved if accomplished before the berms are crushed by equipment / foot traffic, or rainfall. Significantly scarred trees or 'bowed' saplings will be cut and left on the dozer line to obscure the fireline path.

Dozer-blade lines will be rehabilitated using a small track-hoe, dozer, or other light ground pressure equipment to restore the original ground contours. The equipment work area should be confined to the existing damage area. Brush will be incorporated into the fill material when possible to provide soil stabilization. Significantly scarred trees or 'bowed' saplings will be cut and left on the dozer line to obscure the fireline path.

Pasture fencing will be repaired to secure livestock, and any burned fence posts replaced with a metal 'T' post.

If extensive emergency rehabilitation is needed to reduce the effects of a wildland fire, the Preserve can request funding through the Burned Area Emergency Rehabilitation (BAER) Fund. This fund is administered by the NPS Branch of Fire and Aviation Management at the National Interagency Fire Center. The specifics of the policy can be located in 620 DM 3. BAER project requests totaling $300,000, or less, can be approved by the Regional BAER Coordinator. Submissions over this amount are reviewed at the regional level, and forwarded to the Fire Management Program Center for approval. Requests for BAER funding must be made to the Area Fire Management Officer within 72 hours of control of the fire.

# Appendix M 2001 Federal Wildland Fire Management Policy Compliance

**1. SAFETY**
Firefighter and public safety is the first priority. This Fire Management Plan and all activities described within reflect this commitment.

**2. FIRE MANAGEMENT AND ECOSYSTEM SUSTAINABILITY**
The full range of fire management activities will be used to help achieve ecosystem sustainability, including its interrelated ecological, economic, and social components.

**3. RESPONSE TO WILDLAND FIRE**
The 2001 Federal Wildland Fire Management Policy considers fire a critical natural process to be integrated into land and resource management plans and activities on a landscape scale, and across agency boundaries. The response to wildland fire presented in this Fire Management Plan is limited to suppression activities only.

**4. USE OF WILDLAND FIRE**
The 2001 Federal Wildland Fire Management Policy states that wildland fire will be used to protect, maintain, and enhance resources and, as nearly as possible, be allowed to function in its natural ecological role. This Fire Management Plan does not allow the use of wildland fire for resource benefit.

**5. REHABILITATION AND RESTORATION**
Rehabilitation and restoration efforts will be undertaken to protect and sustain ecosystems, public health, and safety, and to help communities protect infrastructure.

**6. PROTECTION PRIORITIES**
The protection of human life is the single, overriding priority. Setting priorities among protecting human communities and community infrastructure, other property and improvements, and natural and cultural resources will be based on the values to be protected, human health and safety, and the costs of protection. Once people have been committed to an incident, these human resources become the highest value to be protected.

**7. WILDLAND URBAN INTERFACE**
The operational roles of federal agencies as partners in the Wildland Urban Interface are wildland firefighting, hazardous fuels reduction, cooperative prevention and education, and technical assistance.

The Big Thicket NP has managed hazardous fuels in the urban interface with prescribed fire treatments since 1982, and completed an extensive chemical and mechanical fuels treatment in the Wildwood Urban Interface in 2004. The treatment will be expanded to cover the remaining area in the Hickeory Creek Unit in 2005, and additional treatments are planned for high risk areas in the Big Sandy Creek Unit.

**8. PLANNING**
Every area with burnable vegetation must have an approved Fire Management Plan. Fire Management Plans are strategic plans that define a program to manage wildland and prescribed fires based on the area's approved land management plan. Fire Management Plans must provide for firefighter and public safety; include fire management strategies, tactics, and alternatives; address values to be protected and public health issues; and be consistent with resource management objectives, activities of the area, and environmental laws and regulations.

This Fire Management Plan is a strategic plan that provides for firefighter and public safety, addresses values to be protected, public health issues, and is consistent with resource management activities, activities of the area, and is consistent with environmental laws and regulations.

**9. SCIENCE**
Fire Management Plans and programs will be based on a foundation of sound science. Research will support ongoing efforts to increase our scientific knowledge of biological, physical, and sociological factors. Information needed to support fire management will be developed through an integrated interagency fire science program. Scientific results must be made available to managers in a timely manner and must be used in the development of land management plans, Fire Management Plans, and implementation plans.

This Fire Management Plan is based upon, and utilizes, the best available science and relevant research available.

**10. PREPAREDNESS**
Agencies will ensure their capability to provide safe, cost-effective fire management programs in support of land and resource management plans through appropriate planning, staffing, training, equipment, and management oversight.

This Fire Management Plan provides guidance for safe, cost-effective fire management, supporting land and resource management plans through appropriate preparedness activities.

**11. SUPPRESSION**
Fires are suppressed at minimum cost, considering firefighter and public safety, benefits, and values to be protected, consistent with resource objectives.

The preserve's fire staff will be co-located with the Woodville facilites of the Texas Forest Service to enhanse these objectives.

**12. PREVENTION**
Big Thicket NP coordinates prevention activities with the Texas Forest Service, and other affected groups and individuals, to prevent unauthorized ignition of wildland fires.

**13. STANDARDIZATION**
Agencies will use compatible planning processes, funding mechanisms, training and qualification requirements, operational procedures, values-to-be-protected methodologies, and public education programs for all fire management activities.

Big Thicket NP actively participates in interagency planning processes, funding mechanisms, training and qualification requirements, operational procedures, and values-to-be-protected methodologies.

**14. INTERAGENCY COOPERATION AND COORDINATION**
Fire management planning, preparedness, prevention, suppression, fire use, restoration and rehabilitation, monitoring, research, and education will be conducted on an interagency basis with the involvement of cooperators and partners.

Big Thicket NP and the Texas Forest Service will be developing the Woodville Interagency Fire Center to increase interagency cooperation and coordination. The preserve fire staff is interating with other interagency partners in developing the Fire Program Analysis (FPA).

**15. COMMUNICATION AND EDUCATION**
Agencies will enhance knowledge and understanding of wildland fire management policies and practices through internal and external communication and education programs. These programs will be continuously improved through the timely and effective exchange of information among all affected agencies and organizations.

Big Thicket NP has an active public education program.

**16. AGENCY ADMINISTRATOR AND EMPLOYEE ROLES**
Agency administrators will ensure that their employees are trained, certified, and made available to participate in the wildland fire program locally, regionally, and nationally as the situation demands. Employees with operational, administrative, or other skills will support the wildland fire program as necessary. Agency administrators are responsible and will be held accountable for making employees available.

Big Thicket NP has contributed staff time to interagency all-risk assignments since it's inception, and coordinates assistance from Parde Island National seashore, Lyndon B. Johnson National Historical Park, and San Antonio Missions National Historical Park.

**17. EVALUATION**
Agencies will develop and implement a systematic method of evaluation to determine effectiveness of projects through implementation of the 2001 Federal Fire Policy. The evaluation will assure accountability, facilitate resolution of areas of conflict, and identify resource shortages and agency priorities.

A regional and national team performed a successful review and audit of the fire management program in 2002.