

FIRE MANAGEMENT PLAN

GREAT SMOKY MOUNTAINS

NATIONAL PARK

1996



FIRE MANAGEMENT PLAN
FOR
GREAT SMOKY MOUNTAINS NATIONAL PARK
TENNESSEE - NORTH CAROLINA
1996

Submitted by: Lem L. Houg 8/21/96
Fire Management Officer
Great Smoky Mountains National Park
Date


Reviewed by: R. Joseph Obriel 9/3/96
Chief, Resource Management & Science
Great Smoky Mountains National Park
Date

Reviewed by: ASm Houch 9/3/96
Chief, Ranger Activities
Great Smoky Mountains National Park
Date

Recommended: Karen P. Wade 9/3/96
Superintendent
Great Smoky Mountains National Park
Date

Concur: Douglas Erskine 9/9/96
Chief, Branch of Fire Management
National Park Service
Date

Approved: Jim Bafon 9/5/96
Field Director, Southeast Field Area
National Park Service
Date



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1.0 INTRODUCTION

1.1 GENERAL

The Great Smoky Mountains National Park (GRSM) has had a policy of suppressing all wildland fires since it was established in June 1934. As in the past, suppressing wildfires will continue to be an important part of the Park's overall fire management program.

However, contrary to accepted practice when the Park was established, today it is generally recognized that not all effects of fire are "bad." The National Park Service's (NPS) policy on fire, expressed in the 1988 version of Management Policies, states that "Prescribed natural fires are the preferred means for achieving resource management objectives in natural zones." At the local level, research has shown some communities within GRSM to be dependent on fire for their very survival (Buckner et al. 1987, Sanders 1992).

Because of National Park Service policies pertaining to wildland fire, coupled with ecological considerations related to management of the Park's natural resources, this Fire Management Plan (FMP) outlines a program including wildfire suppression, prescribed natural fire and management ignited prescribed fire.

1.2 AUTHORITIES RELATING TO PLAN

The authority for fire management is found in the National Park Service Organic Act (August 25, 1916), which states that the agency's purpose is:

"...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

This authority was further clarified in the National Parks and Recreation Act of 1978:

"Congress declares that...these areas, though distinct in character, are united...into one national park system.... The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

The fire management program, carefully guided by resource management objectives, should protect cultural resources and perpetuate the natural resources and their associated natural processes.

1.3 REASONS FOR PLAN

The National Park Service Wildland Fire Management Guideline states: "All parks with vegetation that can sustain fire must have a fire management plan."

In addition, this Plan will help achieve resource management objectives as defined in the Resources Management Plan (RMP). Specifically, the RMP calls for the development and implementation of a fire management plan. The RMP also raises issues and concerns of adverse impacts of total fire suppression, the need to develop prescriptions for various types of prescribed burning, assessment of hazardous fuel loadings, and the need to integrate fire as a natural force in the Park. The RMP's objectives, and the issues and concerns mentioned above, are elaborated on in Chapter 2, "Compliance With NPS Policy."

1.4 ENVIRONMENTAL COMPLIANCE

This plan meets all National Environmental Policy Act and National Historic Preservation Act requirements. As required by policy for those fire management plans encompassing prescribed natural fire (PNF), an Environmental Assessment has been completed and a Finding of No Significant Impact issued. The plan complies with Section 106 of the National Historic Preservation Act of 1966 and Section 7 of the Endangered Species Act (as amended in 1973).

2.0 COMPLIANCE WITH NPS POLICY

2.1 NPS MANAGEMENT POLICIES, WILDLAND FIRE MANAGEMENT

National Park Service Management Policies (1988) state that "Park fire management programs will be designed around resource management objectives and the various management zones of the park."

The section entitled "Wildfire Prevention and Suppression" states:

"The methods used to suppress all wildfires should be those minimizing the impact of the suppression action and the fire itself, commensurate with effective control. The full range of suppression strategies, from confinement, through containment, to full aggressive control, will be considered by superintendents guiding suppression efforts."

The following guidance is given under the section on "Prescribed Fire":

"Prescribed natural fires are the preferred means for achieving resource management objectives in natural zones. If unnatural fuel loads exist it may be necessary to use conservative prescriptions initially to avoid excessive impacts. In some cases prescribed burns with conservative prescriptions may be needed to restore an area to a natural range of conditions. Prescribed burns may also be used to attain other resource objectives such as restoring or maintaining historic settings, maintaining open scenes, and reducing hazardous fuel accumulations.

"Permissible prescribed fire intensities may range from creeping surface fires to stand-replacing crown fires provided that the fire behavior is reasonably predictable and the effects are acceptable as defined by the prescription and management plan."

2.2 PARK ENABLING LEGISLATION

Great Smoky Mountains National Park was established "for the benefit and enjoyment of the people." This purpose was stated by Congress in the Act of May 22, 1926, that provided for establishment of the Park. That Act further defined the purpose by reference to the National Park Service Organic Act "to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

2.3 GENERAL MANAGEMENT PLAN

The General Management Plan (GMP) is both a manager's guide for meeting the objectives for Great Smoky Mountains National Park and a public statement of National Park Service management intentions. It states:

"Great Smoky Mountains National Park is distinguished by the extraordinary diversity and abundance of its plants and animals, the beauty of its mountain terrain and waterways, the quality of its remnants of pioneer culture, and the sanctuary it affords for those resources and for its modern human users. The purpose of the park is to preserve these exceptionally diverse resources and to provide for public benefit from and enjoyment of them in ways that will leave the resources—and the dynamic natural processes of which they are components—essentially unaltered."

In describing the natural environment, the GMP states:

"The park's unique combination of resources and natural processes requires special measures for protection, as well as some manipulation, to compensate for past and unavoidable continuing intervention by modern man."

The GMP continues:

"The great variety of vegetation types and animal species found in the park make the area an outstanding laboratory for the study of the relatively undisturbed native plants, animals, and physical processes. For this reason, Great Smoky Mountains National Park has received worldwide attention as an International Biosphere Reserve. The primary purpose of the park is to provide for visitor enjoyment compatible with preserving the rich assemblage of natural resources."

In discussing the Natural Zone, the GMP states:

"...natural processes will be allowed to operate wherever possible. Management practices will be undertaken to restore and/or continue the park's environment in the condition that would have prevailed without interference by nonnative plants and animals and by modern technological man."

A section of the GMP pertaining to Resources Management gives the following guidance:

"The natural zone of the park will be managed in accordance with applicable laws and National Park Service policies. This will ensure as nearly as possible that the dynamic natural conditions that would have existed without interference by modern technological man will be reinstated. In historic and development zones, exceptions may be made as necessary to support the facilities and services called for. The effects of these exceptions on ecosystems outside such zones will be mitigated to the fullest extent possible.

"Research into the natural role of fire in the park will be conducted, and measures will be instituted to restore park ecosystems as fully as possible to natural conditions, within the

constraints of protection of human lives and property inside and outside the park.

"Nesting habitat for the endangered red-cockaded woodpecker will be restored around known colony trees. The woodpecker requires open, mature stands of yellow pines, a forest type that has diminished in the park because of fire suppression and forest succession.... Cutting and possibly prescribed burning will be tested in the pinelands west of Cades Cove."

2.4 STATEMENT FOR MANAGEMENT

The following statements are found in the "Purpose and Significance" section of the Park's Statement for Management:

"The Park's purpose is therefore to preserve its exceptionally diverse resources, and to provide for public benefit from and enjoyment of those resources in ways which will leave them basically unaltered by modern human influences.

"Primary themes relating to the Park's natural resources include forest types and the diversity of plant life, abundance and diversity of wildlife, wilderness values as a sanctuary and the geology of the Great Smoky Mountains."

Under "Natural Resources" in the "Issues and Objectives" section, the following statements are made:

"In the Park, it is estimated that at least 55 percent of the approximately 100 plant taxa rare enough to appear on various federal or state rare species lists require some type of disturbance for long-term survival. Many of these plants require sunlight, mineral soil for seedling establishment and selective removal of competing plants. Unfortunately, the Park has been very successful at reducing the frequency of wildland fires, and the Park's two largest native herbivores are extirpated.

"Technically, fire, which is the major natural disturbance factor in shaping plant communities, has not played a significant role in the Park for some time. In general, the result has been the development of over-mature forests, particularly in developed areas. Natural reproduction and subsequent canopy replacement has been altered, and in some cases entirely eliminated, in these areas."

Lastly, the following paragraph is found under "Natural Zone" in the "Management Zoning" section of the Statement for Management:

"This zone encompasses the bulk of the park's land, and includes the natural resources areas of the park, such as virgin forests and forests recovering from timber harvests and agriculture. Within this zone, natural processes will be allowed to operate

wherever possible. Management practices will be undertaken to restore and/or perpetuate the Park's environment in the condition that would have prevailed without interference by non-native plants and animals and by modern technological man."

2.5 RESOURCES MANAGEMENT PLAN

The Resources Management Plan sets forth the Park's strategy to protect and preserve the natural and cultural resources of the Park. It states that lightning and Native American-caused fires have been important factors in "shaping the mosaic of vegetation throughout the eastern deciduous forests for centuries. It is documented that before European man entered the area, the American Indian was using fire as a tool in hunting, improving game habitat, improving lands for food gathering and clearing land for farming."

It goes on to state that lightning-caused fires are a normal environmental factor in Appalachian forests and that:

"The plant and animal species evolved with occasional lightning fires guiding their evolution, just as occasional drought, windstorms, and attacks of native insects also guided their evolution. Extinguishing lightning fires removes a natural ecological force whose importance is just beginning to be understood.

"Since the establishment of the park in 1934, the practice has been to extinguish all fires. This has resulted in biological changes different from those which would have resulted from the presence of natural fire. This practice has been recognized by the National Park Service as a problem since completion of the Leopold Report in 1963."

In regard to fire research, the RMP states:

"There is less fire research in the southern deciduous hardwood forests than in any other part of the country.... Research should be continued or undertaken in the following areas:

- Fuel loading inventory, classification, and mapping.
- Fire history for the park.
- Research natural role of fire.
- Determine extent and pattern of use of fire by aboriginal man.
- Research use of fire as management tool.
- Assess the ecological impacts on aquatic habitat from aerial retardant and other suppression actions.
- Prepare fire effects assessments.

- Conduct fire behavior monitoring as opportunities arise."

The RMP project statement entitled "Develop and Implement Fire Management Plan" states:

"Today's lightning fire regime is believed to be too low to perpetuate certain plant communities in the park. Given this, coupled with the fact that Native American fires no longer contribute to the fire incidence, it is believed that some biotic communities may well disappear from the park if the historic fire frequency persists.

"It appears that a fire management program, including prescribed natural and management ignited fires, should be implemented in order to perpetuate existing resources as well as to meet park and agency policies."

In addition to the above specifics, the RMP points out that additional information is needed about fire effects on native grasses, amphibians, birds, and soil-dwelling organisms. Also, the Park has never resampled existing permanent vegetation plots or gathered other historic data on fires. A detailed study of the composition of some plant communities may provide valuable evidence in reconstructing the previous role of fire.

2.6 SUMMARY

As is evident from the above RMP information and other directives, there are several unfulfilled objectives related to fire management in the Park. The development and implementation of the FMP itself is explicitly called for. In addition, because of the broad nature of the various directives, only if the FMP outlines acceptable uses of prescribed fire will several of the objectives be met. For example, the RMP states that fire was once an important factor in shaping the mosaic of the vegetation within the Park. Further, from a practical standpoint and due to policy, the Park would not be able to address objectives related to fire effects research, prescription development, and management ignited prescribed fire if they were not addressed in the FMP. As a result, this Plan outlines a comprehensive program of action to implement fire management policies and achieve objectives of the Park.

3.0 DESCRIPTION OF PARK

Great Smoky Mountains National Park (Figure 1) has been designated as an International Biosphere Reserve, thus formally recognizing its international significance as a prime example of a natural area representing the Eastern Deciduous Forest biome. Occupying an 800-square mile area in the southern Appalachians, it is a sanctuary for an exceedingly diverse array of biota, including over 1,600 kinds of vascular plants.

The highly diverse vegetation and its equally diverse associated fauna are the result of several factors including: land use history, geology, climate, and topographic variation. Environmental conditions range from extremely dry ridgetops and rock outcroppings to very mesic coves and mountaintops typically enveloped in low-lying clouds. Forest composition varies continually with differing combinations of elevation and exposure.

Major forest community types include hemlock forest, pine forest, pine-oak forest, tulip poplar forest, cove-hardwood forest, northern hardwood forest and spruce-fir forest. Another noteworthy vegetation type well represented in the Great Smokies is the southern Appalachian heath bald, which is generally dominated by rhododendrons. Grassy balds, grass- and herb-dominated areas on some mountain summits, are another treeless vegetation type.

The Park is also inhabited by a great diversity of animal species. Within the Park, at least 50 mammals, over 200 birds, 23 reptiles, 39 amphibians, 70 fishes, and many invertebrate species occur.

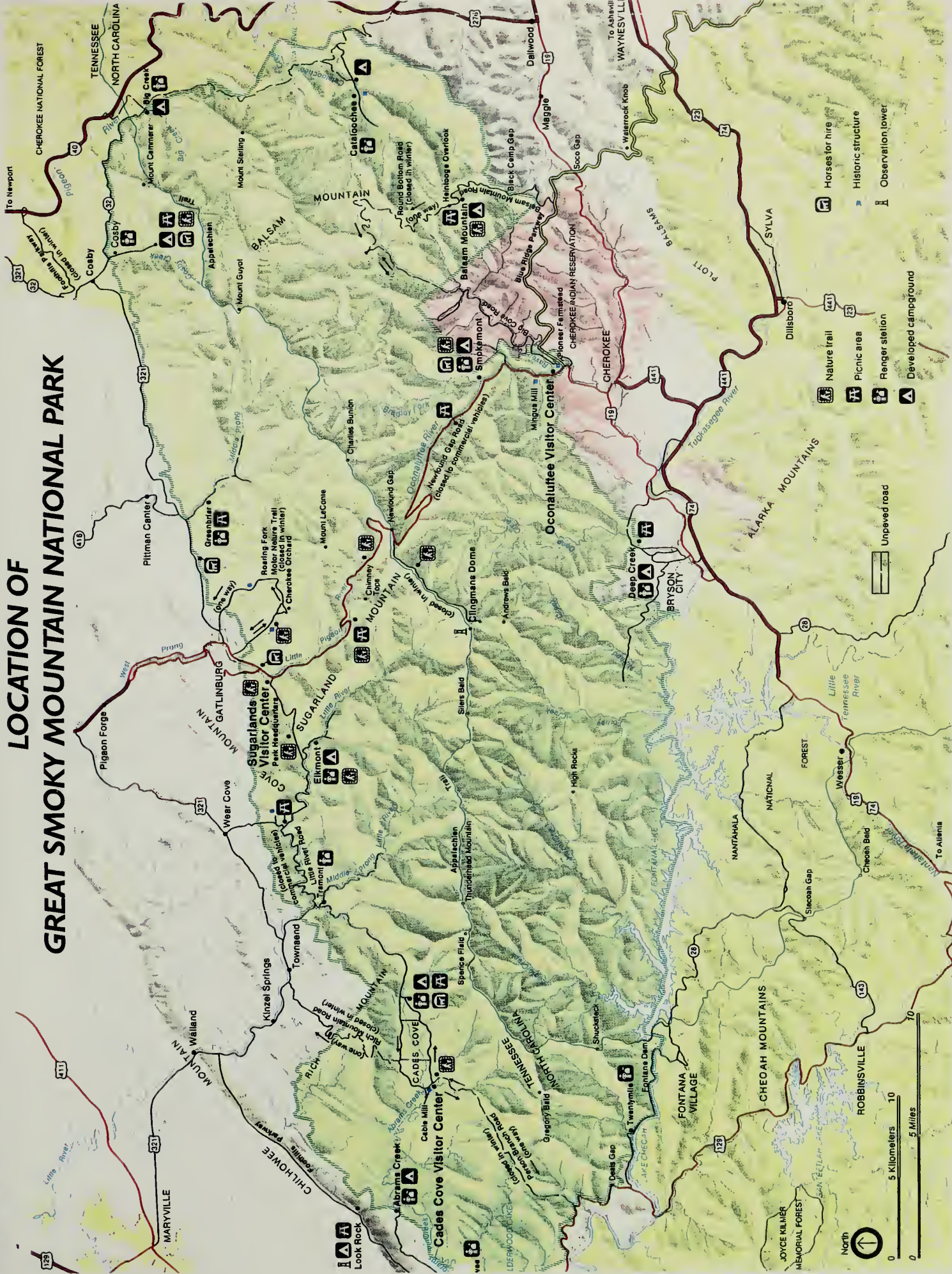
Numerous plants and animals in the Park are listed by the states of North Carolina and Tennessee or the U.S. Fish and Wildlife Service as threatened or endangered. Detailed information on endangered species in the Park is listed below.

3.1 SENSITIVE NATURAL RESOURCES

Much of the information in this section is from the Park's Pre-Attack Plan (1991). Currently GRSM has 10 federally listed plants and animals whose habitat could be affected by wildfire, or lack thereof, or associated control activities:

<u>Species</u>	<u>Locale</u>	<u>District(s)</u>
Red Wolf	Acclimation Areas	Cades Cove, Little River
Red-cockaded Woodpecker	Tabcat Creek Area	Cades Cove
Smoky Madtom	Lower Abrams Creek	Cades Cove
Yellowfin Madtom	Lower Abrams Creek	Cades Cove
Spotfin Chub	Lower Abrams Creek	Cades Cove
Appalachian Avens	Mt. LeConte	Little River
Virginia Spirea	Lower Abrams Creek	Cades Cove
Peregrine Falcon	Parkwide	Parkwide
Northern Flying Squirrel	Parkwide	Parkwide
Eastern Cougar	Parkwide	Parkwide

LOCATION OF GREAT SMOKY MOUNTAIN NATIONAL PARK



NPS policy also requires taking into account state-listed species and species considered to be "rare or unique."

Currently North Carolina lists 28 animals and 106 plant species that are known from GRSM as rare, threatened or endangered. Tennessee, similarly, lists 39 animals and 61 plant species that are known from GRSM. Even the above lists do not include rare or unusual natural communities such as virgin forests, the few remote stream reaches that still contain the southern Appalachian strain of brook trout, champion trees, etc. Some of these species and natural communities are in areas where fire is extremely rare, others require periodic fire of a certain intensity, others can tolerate fire only during a certain season, and yet others would be permanently altered by fire under some conditions.

The federally endangered peregrine falcon has been recorded in GRSM in each of the last several years. It is believed to be only a migrant and not a resident. No known nesting areas have been identified. Until such time as a specific area is determined to be important to this species, no area will be given special suppression treatment.

New data from the field means that habitat delineations and numbers of populations will change over time. Suppression areas within the Park will reflect new information.

This Plan's section on "Suppression Unit" reflects the habitat needs of the species discussed in this section.

3.2 SENSITIVE CULTURAL RESOURCES

The Park's Resources Management Plan identifies projects such as: "Evaluate Historic Landscape Management Techniques," "Prepare Historic Landscape Management Plan," "Evaluate Vegetation Threats to Historic Structures," "Rehabilitate Mt. Cammerer Fire Tower," "Plot Cemetery Graves Archeologically," and "Conduct Archeological Survey of Park." As evidenced by such a diverse list, the cultural resources of the Park warrant consideration.

The Park maintains an excellent collection (75-plus) of historic structures of log, framed, and mixed construction. They date from about 1840 to the 1920s. Included among the building types are dwellings, outbuildings, churches, grist mills and school houses. Most of these structures are built of logs or hewn timbers and have wooden shingled roofs. These structures, made of highly flammable materials, are highly valued and thus warrant wildfire protection. Their needs will be addressed in future years as part of the Park's hazard fuel management program.

Maintenance of historical landscapes in Cades Cove and Cataloochee requires control of natural plant succession within historic boundaries. Both fire exclusion and prescribed fire are of value in the maintenance of these areas. Especially noteworthy are those areas in which fire may be needed to reestablish native communities which include prairie grasses.

3.3 CLIMATE

Great Smoky Mountains National Park is located in one of the nation's highest precipitation regions, averaging 64 inches annually. Thunderstorms occur throughout the year; however, the peak of the lightning fire season occurs in May. This immediately precedes the summer wet season when high humidity makes Appalachian forests very fire-resistant during most years.

Numerous climatic investigations have been completed in the Park. Temperature and growing season decrease with elevation. At 1,600 feet, the average number of days above 39 degrees F. was 122, while at 6,900 feet the average was 97. The decrease in temperature ranges between 4 degrees F. per 3,280 feet in winter to 12 degrees F. in summer. July is the warmest month and February is the coldest month. Cloud cover and precipitation both increase with elevation. While precipitation is evenly distributed throughout the year, dry periods tend to occur during April to May and September to October.

Over half of the precipitation leaves the Park through runoff by the many streams which drain it. All of the streams are relatively small, none draining more than a 200-square mile area. The waters are generally low in dissolved solids and slightly acidic.

3.4 AIR

The Park has been designated as a Class I area relative to the Clean Air Act of 1963 and amendments. This is the highest air quality class in the nation, and thus air quality in terms of chemical pollutants as well as visibility levels are of major concern.

Stations either within the interior of the Park or at Look Rock, near the western boundary of the Park, have collected data for four of the six pollutants for which national ambient air quality standards (NAAQS) have been set: total suspended particulate matter (TSP), sulfur dioxide (SO₂), nitrogen dioxide (NO₂), and ozone. Nitrogen dioxide, sulfur dioxide, and TSP have never been recorded to reach levels close to the NAAQS. Ozone levels, in contrast, occasionally approach the standard of 120 parts per billion (ppb) and have been measured at higher levels on a few occasions. High ozone levels are associated with hot, stagnant air masses and rarely occur except during the summer months.

3.5 WILDERNESS

The most recent action taken in regard to Wilderness designation was during 1987 and 1988 during which time three separate bills were introduced into Congress. None of the three bills has been passed. Lacking Wilderness designation, NPS policy dictates that all areas of potential Wilderness be managed as de facto Wilderness. The Great Smoky Mountains NP Wilderness Recommendation published in 1974 stated that under the Wilderness Act, lands so designated are to be preserved and protected "in their natural condition" so as to retain their "primeval character and influence, without permanent improvements or habitation." The GMP calls for de facto Wilderness of these same areas.

This Plan is consistent with that direction and sets forth procedures to reestablish some aspects of the Park's former primeval character (mosaic of natural communities) and influence (fire as a natural force).

4.0 PARK FIRE MANAGEMENT OBJECTIVES

For reasons previously mentioned, a policy of total fire suppression has had detrimental effects on Park resources and is inconsistent with directives at all levels. Therefore, this Fire Management Plan recognizes the need for a transition from a program of full suppression to one which promotes the use of prescribed fire.

The Park's fire management objectives are to:

- A. Protect human life and property both within and adjacent to Park boundaries.
- B. Manage all wildfires using appropriate suppression responses and tactics that will minimize adverse effects of fire and fire suppression activities.
- C. Integrate fire as a natural process into Park biotic communities to the fullest extent possible.
- D. Reestablish historic fire regimes and/or realign fuel quantities and arrangements and biotic communities through the application of management ignited prescribed fire.
- E. Reduce frequency of human-caused ignitions by implementing an aggressive fire prevention program including prevention patrols, public education, cooperation with neighboring agencies, and hazard fuel management.
- F. Establish close working relationships and mutual cooperation with surrounding fire management agencies.
- G. Promote public understanding of fire management programs and objectives.
- H. Integrate knowledge generated through fire and natural resource research into fire management decisions and actions.

4.1 STRATEGY TO ACHIEVE OBJECTIVES

The objectives described above will be achieved through the Park's presuppression, suppression, prescribed fire, prevention, and interpretive programs. These programs are briefly discussed below as they relate to the objectives; however, each is also discussed in more detail in later chapters.

Objective A - Protect human life and property both within and adjacent to Park boundaries.

This objective is addressed by the Park's prevention, presuppression, suppression and hazard fuels programs.

By implementing the Park's recently completed Wildland Fire Prevention Analysis and Plan, the probability of wildfire will be reduced. Preparedness for wildfire is commensurate with its probability by monitoring fire danger

year-round at two weather stations and by using the National Fire Danger Rating System (NFDRS). Observations from these two stations are also used for monitoring the Park's long-term drought status by calculating the Keetch Byram Drought Index (KBDI). This fire danger and drought condition information is integrated into the Park's Step-Up Plan, Preattack Plan, and Initial Attack Plan and has institutionalized preparedness activities so that life and property will be protected.

Hazard fuels have been mechanically reduced at the red-cockaded woodpecker (RCW) site and will be further reduced in the near future using prescribed fire. Other hazard fuels within the Park are presently being inventoried. In future years this inventory will be completed and actions to reduce fuels will be undertaken. These actions will significantly increase the protection of values at risk.

Objective B - Manage all wildfires using appropriate suppression responses and tactics that will minimize adverse effects of fire and fire suppression activities.

The Park recognizes National Park Service policy on acceptable suppression responses and, as in the past, will use the full range of options. Depending on the circumstances of each individual wildfire, either a "control," "contain," or "confine" strategy will be selected (please see Glossary for definitions of these terms).

By using the full range of suppression responses, unacceptable effects of suppression actions can be minimized. For example, by selecting a strategy other than control (when protection of life and property and resource protection concerns are not compromised), effects that are contrary to Park protection policies can be minimized. In addition, by using "light-hand" tactics under a control strategy, environmental degradation can be minimized. No use of retardant delivered by air tankers or bulldozers is permitted except when life or valuable property is threatened or with the express approval of the Superintendent. The Park's Pre-Attack Plan calls for a Resource Management Specialist "to provide the Incident Commander with known potential impacts to natural resources as a result of the fire or suppression tactics."

Objective C - Integrate fire as a natural process into Park biotic communities to the fullest extent possible.

By allowing lightning-caused fires to burn in predetermined areas and under prescribed conditions, this objective will be achieved. Both the areas and the conditions are specified later in this Plan.

Objective D - Reestablish historic fire regimes and/or realign fuel quantities and arrangements and biotic communities through the application of management ignited prescribed fire.

The effects of 60 years of full fire suppression and the effects of introducing many alien plants have created many needs for management ignited prescribed fires. It is planned to reintroduce fire to fire-dependent communities as soon as possible. The federally endangered red-cockaded

woodpecker (*Picoides borealis*), which may still inhabit the Park, requires more open yellow pine stands than presently exist in the Park. In addition, this type of fire will be used for such purposes as hazard fuel reduction, research, controlling alien plants, vista clearing, maintaining historical landscapes, etc.

Objective E - Reduce frequency of human-caused ignitions by implementing an aggressive fire prevention program including prevention patrols, public education, cooperation with neighboring agencies, and hazard fuel management.

The Park has recently completed a Prevention Plan which identifies the wildfire occurrence problem, details what will be done about it, and who is responsible for the actions. An interpretive strategy has been developed and is being implemented. Both of these initiatives have been completed with input from neighboring agencies.

Historical hazard fuel projects have been narrow in scope, focusing on important specific concerns such as the red-cockaded woodpecker, Table Mountain pine (*Pinus pungens*) and atypical hazard fuel risks along the Park's north boundary. However, within 2 years it is hoped that funding will be made available to complete the Parkwide assessment so that a comprehensive Hazard Fuel Management Plan can be written addressing both the structural and biological concerns of the Park.

Objective F - Establish close working relationships and mutual cooperation with surrounding fire management agencies.

As indicated above, input from other agencies will be obtained for prevention, presuppression, suppression, prescribed fire, fire research, and public education programs. The Park realizes the importance and benefits of working with those who have similar or common concerns.

Objective G - Promote public understanding of fire management programs and objectives.

The Park's fire program is in a transitional phase from that of full suppression to promoting the use of prescribed fire. Decades of fire prevention campaigns have been successful in informing the public of the undesirable aspects of wildfire. This success is a positive achievement. However, users of prescribed fire must inform the public of the rationale for such programs so that prevention messages are not confused with resource management initiatives.

The Park recognizes that departments, agencies, and managers of public lands have had many years to think about, accept, and implement present fire management policies. Now the Park is implementing an educational program that will afford the public the same opportunity to go through the philosophical evolutionary process.

Objective H - Integrate knowledge generated through fire and natural resource research into fire management decisions and actions.

Several fire management related studies have been completed in GRSM. For example, reports or theses related to fuel loading, lightning fire frequency, historical fire frequency, and Table Mountain pine have been completed and have contributed much knowledge to managers. Whenever possible, decisions will be based on this type of research.

Unfortunately, funding for this type of research is scarce and results in many more resource management questions than there are scientific answers. Couple this rather static research situation with the dynamic and evolutionary characteristic of biotic communities, and a situation exists whereby waiting for decades for the scientific answers may actually result in the loss of fire-dependent communities from the Park ecosystem. Thus, the consequences of inaction could have more detrimental impacts than a resource management action involving fire that was carried out with only the best available information at the time.

Therefore, each proposed fire management action will first be carefully evaluated from all aspects. Some projects will be postponed until studies provide guidance as to the best course of action. Others will move forward before all of the ideally desired scientific information is available because it is believed that the risks of waiting outweigh the possible negative outcomes.

The Park will accelerate its monitoring efforts to quantify fire effects on plant and animals that have received little attention in the scientific literature.

5.0 FIRE MANAGEMENT UNITS

In order to satisfy fire management objectives, three Fire Management Units (FMUs) are designated. These units are: Suppression, Conditional, and Prescribed Natural Fire (Figure 2).

5.1 FIRE MANAGEMENT UNIT 1 - SUPPRESSION

This unit has been established to address this Plan's objective to protect human life, property, and sensitive natural and cultural resources within and adjacent to Park boundaries. It is approximately 89,518 acres in size within the Park proper, plus an additional 9,457 acres of the Foothills Parkway, totaling 98,975 acres. This represents approximately 19 percent of the area administered by the Park.

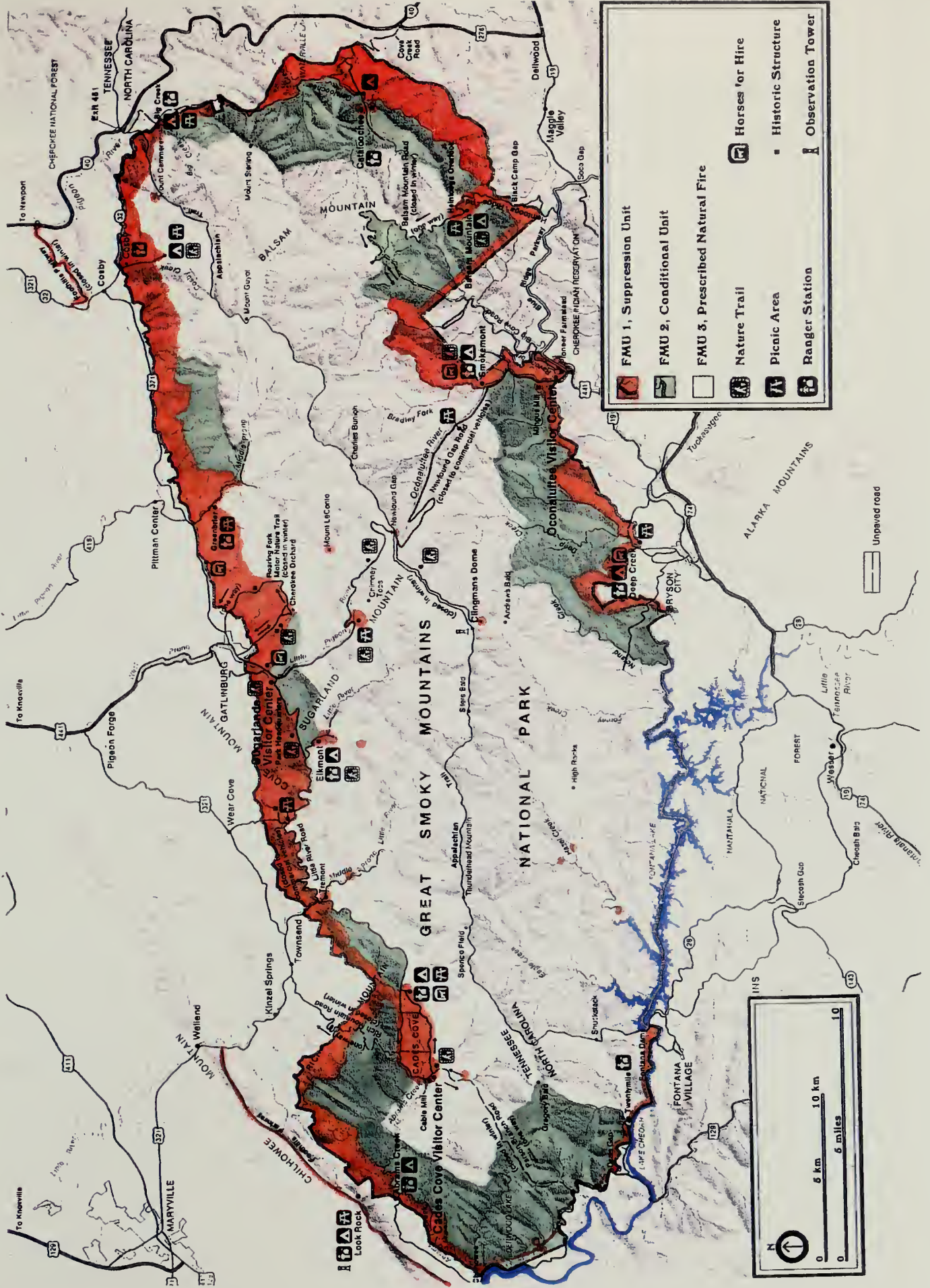
All wildfires in areas with this designation will be suppressed, regardless of cause. Management ignited prescribed fires will be used to reach natural and cultural resource management objectives and for hazard fuel reduction activities. No prescribed natural fires will be allowed.

This unit is comprised of developed, historical, sensitive natural resource, and currently identified hazard fuel areas. The list below identifies all areas which make up this unit, and Figure 2 depicts all of the areas. Immediate suppression action will be taken on wildfires in or adjacent to these areas. In addition, when a prescribed natural fire is predicted to reach the perimeter of one of these areas within 24 hours, suppression or holding actions will be taken to protect the values within the area.

<u>LITTLE RIVER DISTRICT:</u>	<u>Developed Areas</u>	<u>UIM Coordinates</u>	
	Tremont Ranger Station	N/A	
	Great Smoky Mountains Institute	N/A	
	Elkmont Ranger Station, Campground and all other structures	N/A	
	Park Headquarters:		
	Sugarlands Visitor Center	N/A	
	Twin Creeks Natural Resource Center	N/A	
	Mt. LeConte	N/A	
	<u>Historical Areas</u>		
	Greenbrier School	26100E	395270N
	Walker Sisters' Home	26200E	395390N
	Ogle Cabin	27470E	395240N
	Bales Barn and Cabin	27600E	395400N
	Reagan's Place	2765E	395450N
	Designated Elkmont Structures	N/A	

FIGURE 2

GRSM FIRE MANAGEMENT UNITS



<u>LITTLE RIVER DISTRICT:</u>	<u>Sensitive Natural Resource Areas</u>	<u>UTM Coordinates</u>
(cont'd)	<u>Red Wolf Acclimation Areas:</u>	
	Sams Creek/Thunderhead Prong	² 5810E ³⁹ 4360N
	Jakes Creek	² 6527E ³⁹ 4634N
	<u>Hazard Fuel Areas</u>	
	Ski Mountain	N/A
	Elkmont	N/A
<u>EAST DISTRICT:</u>	<u>Developed Areas</u>	
	Greenbrier Ranger Station	N/A
	Cosby Ranger Station and Campground	N/A
	Big Creek Ranger Station and Campground	N/A
	Cataloochee Ranger Station and Campground	N/A
	<u>Historical Areas</u>	
	Hiking Club Complex	N/A
	Big Cataloochee Ck. Structures	N/A
	Little Cataloochee Ck. Structures	N/A
	<u>Sensitive Natural Resource Areas</u>	
	None	
	<u>Hazard Fuel Areas</u>	
	None Presently Identified	
<u>OCONALUFTEE DISTRICT:</u>	<u>Developed Areas</u>	
	Clingmans Dome	N/A
	Newfound Gap	N/A
	Balsam Mountain Campground	N/A
	Smokemont, Tow String	N/A
	Oconaluftee Visitor Center	N/A
	Maintenance Area/Housing/Job Corps	N/A
	<u>Historical Areas</u>	
	Oconaluftee Mtn. Farm Museum	N/A
	<u>Sensitive Natural Resource Areas</u>	
	None	
	<u>Hazard Fuel Areas</u>	
	Balsam Mountain Quarters	N/A
<u>LAKE DISTRICT:</u>	<u>Developed Areas</u>	
	Twentymile Ranger Station	N/A
	Deep Creek Ranger Station	N/A
	Sugarfork Maint. Bunkhouse;	² 5885E ³⁹ 3230N

LAKE DISTRICT:
(cont'd)

Historical Areas

Calhoun House
Hall Cabin

UTM Coordinates

²5290E ³⁹2890N
²5685E ³⁹3390N

Sensitive Natural Resource Areas

None

Hazard Fuel Areas

None Presently Identified

CADES COVE DISTRICT:

Developed Areas

Abrams Creek Ranger Station-CG N/A
Look Rock Fire Tower, Ranger Station
and Campground; Picnic/Maintenance N/A
Air Quality Monitoring Station
Cades Cove N/A

Historical Areas

Structures within and adjacent to
Loop Road N/A

Sensitive Natural Resource Areas

Red-cockaded Woodpecker Site ²3100E ³⁹3500N
Whiteoak Sink ²5100E ³⁹4800N
Abrams Creek N/A
Cades Cove McCally Branch ²4200E ³⁹4010N
Stillhouse Branch ²4805E ³⁹4257N

Hazard Fuel Areas

Lake In The Sky
Red-cockaded Woodpecker Site ²3100E ³⁹3500N

Fuel Types - Fuels vary markedly among the areas within this unit. However, some generalizations can be made. Fuels mostly consist of closely cropped lawns or fields posing, for the most part, no significant threat to resource values. They are represented by NFFL (Northern Forest Fire Laboratory) fuel model 2.

There are, however, some notable exceptions. The area between Park Headquarters and the boundary line due north, with its insect-killed pine stands on steep slopes, poses the most serious known potential suppression problem (NFFL fuel models 8 and 10). The stand in the RCW protection area has been thinned and a mature pine overstory is present. This is best represented by NFFL fuel model 11. The red wolf acclimatization area consists primarily of hardwoods. The sensitive areas for the preservation of certain plants consist of several fuel types of small, insignificant acreages.

Fire History - By and large, most of the historical wildfires have occurred outside this zone. Most GRSM wildfires have been caused by arson and have started along road shoulders and away from developed areas (Figures 3, 4 and 5).

FIGURE 3

GREAT SMOKY MOUNTAINS NATIONAL PARK

Summary of Fire Occurrence, 1931 - 1991

Total Number of Fires = 1,198

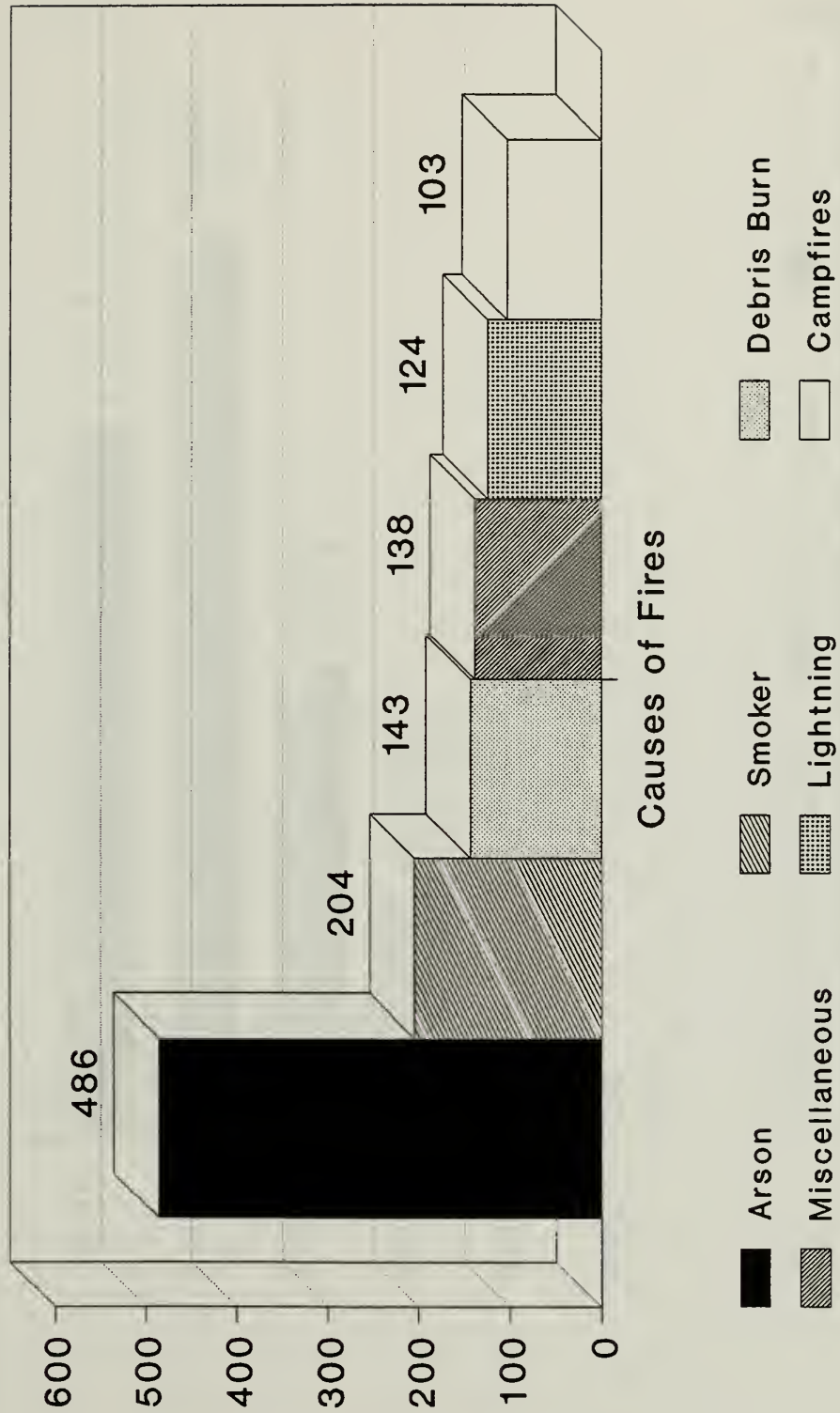
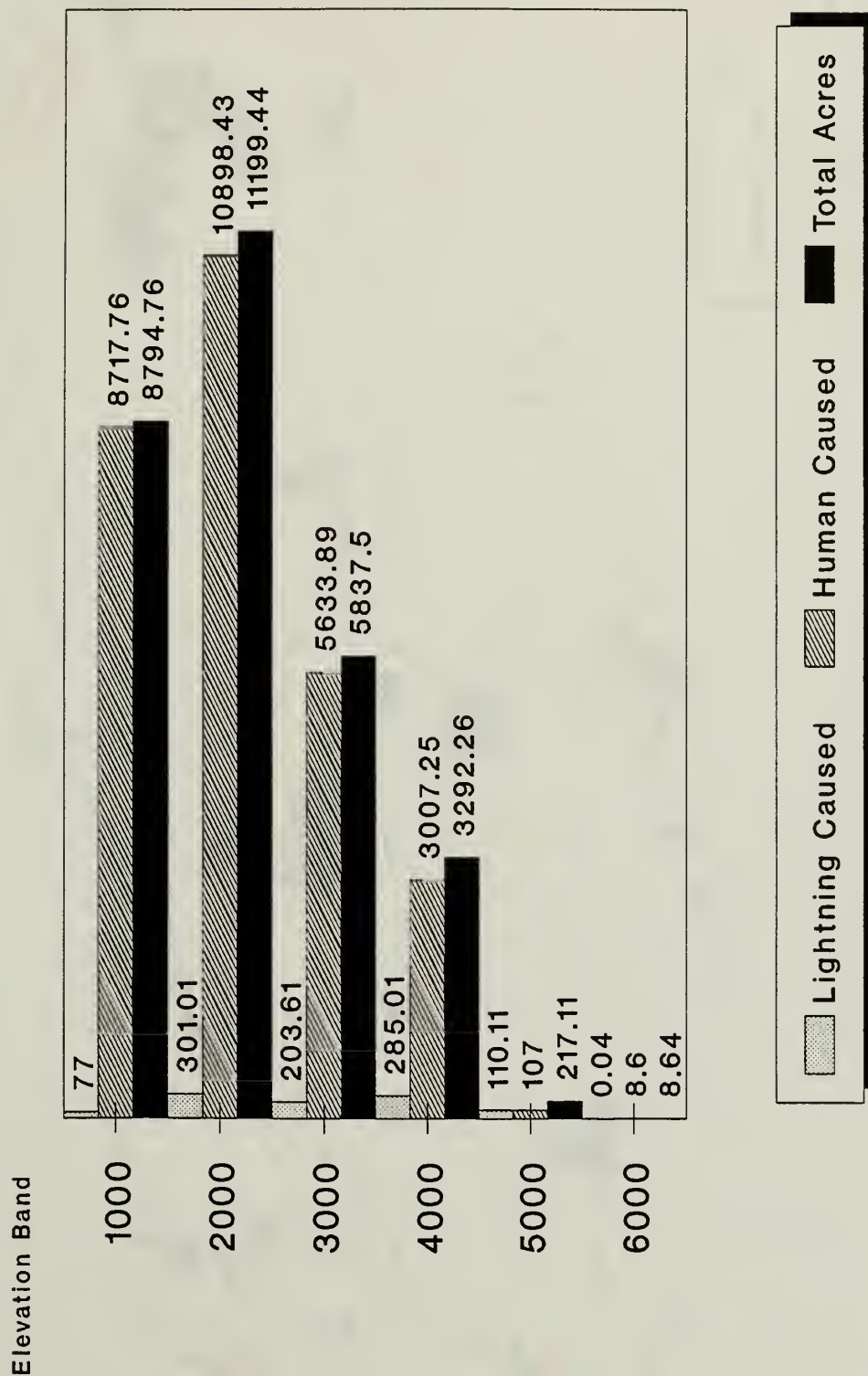


FIGURE 4

GREAT SMOKY MOUNTAINS NATIONAL PARK

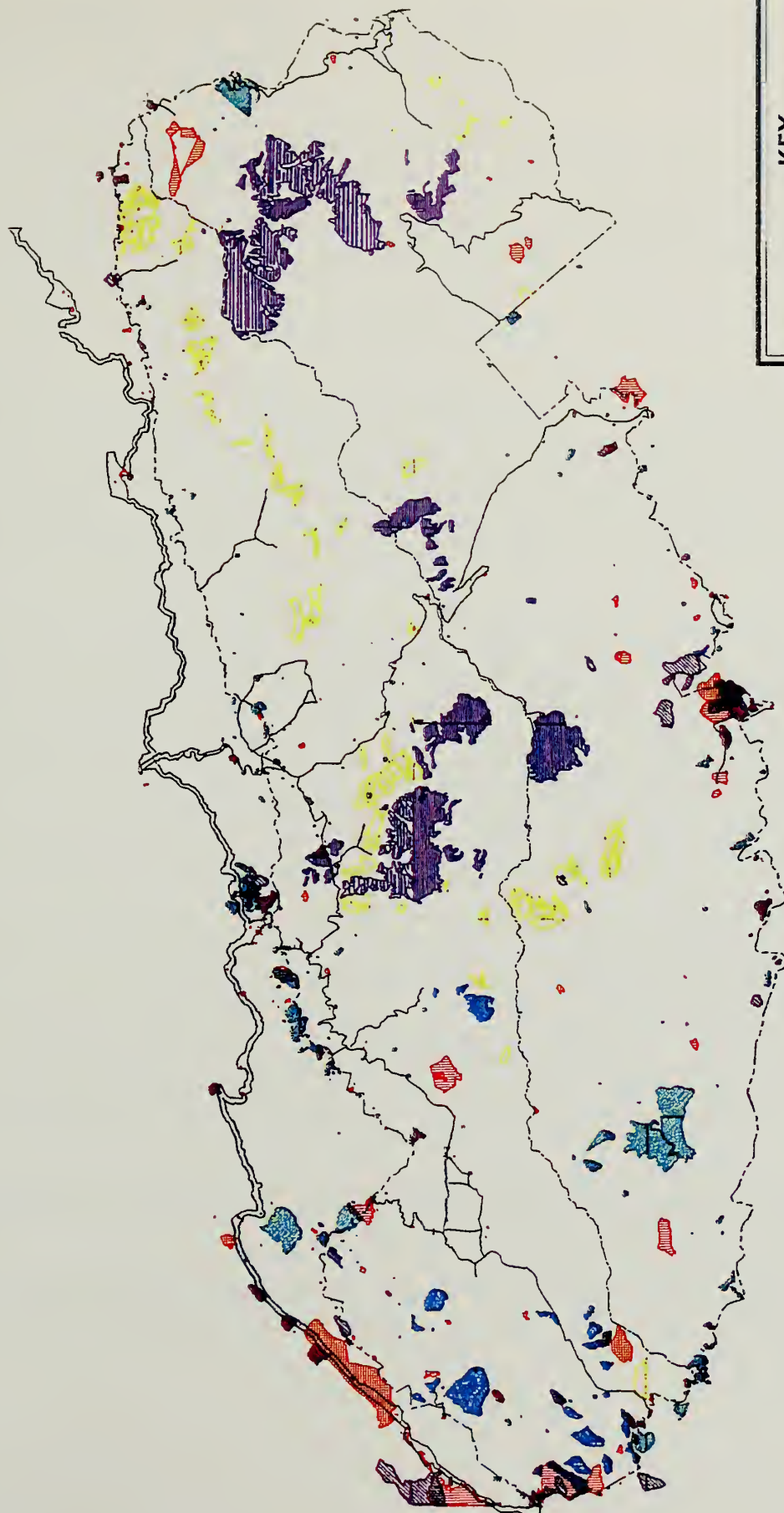
Fire Acreage, 1931 - 1991

Total Acreage - 29,349.71



AREAS BURNED BY WILDFIRES

Unknown - 1990



KEY

Unknown Years	Yellow
1920 - 1929	Blue
1930 - 1939	Aqua
1940 - 1949	Green
1950 - 1959	Blue Violet
1960 - 1969	Orange
1970 - 1979	Red Violet
1980 - 1989	Red

Scale 1:380000

Fire Behavior - In NFFL fuel model 2 areas, normal fire behavior does not pose a controllability problem. Many areas are flat and have light fuel loads. However, areas with uncut old fields pose a control problem under extreme conditions.

The hazard fuel area above Park Headquarters (and smaller areas like it), represented by NFFL fuel models 8 and 10, can pose major control problems even under normal circumstances. For example, the Park was not in a significant drought in the fall of 1991 but torching and crowning did occur in an area with similar fuels. Under drought conditions, crowning and spotting of .5 miles have been documented.

5.2 FIRE MANAGEMENT UNIT 2 - CONDITIONAL

This unit has been established to address four objectives of this Plan: to protect human life, property, and sensitive natural and cultural resources within and adjacent to Park boundaries; to suppress all wildfires using appropriate suppression responses; to avoid unacceptable effects of fire and fire suppression; and to integrate fire as a natural process into Park biotic communities to the fullest extent possible. The unit is approximately 93,309 acres in size. This represents approximately 18 percent of the area administered by the Park.

A primary purpose of this unit is to provide a buffer between the Park boundary and FMU 3, Prescribed Natural Fire Unit, in areas where it is needed. This unit generally consists of a 0- to 5-mile-wide band inside the entire Park boundary. The actual line that delineates the width of this unit varies in distance from point to point in order to make the unit more identifiable and defensible; that is, rather than assigning the unit an arbitrarily uniform width, the width was adjusted to take advantage of ridgetops, streams, trails, etc. In the vicinity of Fontana Lake, this unit does not exist. Detailed maps showing the exact location of the unit boundaries will be located in the Fire Management Office and District Rangers' Offices.

Whether lightning-caused ignitions within this unit will be declared wildfires and suppressed or will be allowed to burn as PNFs will be determined on an ignition-by-ignition basis. If a PNF within this unit is predicted to leave the Park within 48 hours and/or does not otherwise meet the Unit 2 prescription constraints as detailed in Section 9.4 of this Plan, the fire will be declared a wildfire and appropriate action taken. However, if the circumstances are such that there is little or no chance of fire escaping the Park and all of the prescription constraints of Unit 3 are met, the Park Superintendent may decide to allow the fire to burn into that unit.

Importantly, in most cases, the Park boundary is downslope of the inside perimeter of this unit, thereby aiding the efforts to keep fires within the Park.

All human-caused fires will be declared wildfires and the appropriate suppression response will be taken.

Management ignited prescribed fires will be used to reach resource management objectives outlined in this Plan.

Fuel Type - Forest types of mesic and xeric oak, mesic hardwood and tulip poplar, and cove hardwood comprise 45 percent of this unit and are represented by NFFL fuel model 9. Pine and pine-oak represent 55 percent of the area and are represented by NFFL fuel models 8 and 10.

Fire History - Most of the Park's wildfires have occurred within this unit. Wildfires have not occurred in a random, evenly spaced manner throughout this unit. Locations such as the "Road to Nowhere," the Park boundary adjacent to NC Highway 129, TN Highway 73 where it enters the Park adjacent to Townsend, Katy Holler, and the Cosby area have historically been areas of high fire occurrence.

Fire Behavior - Normal fire behavior in fuel model 9 areas can be characterized as low- to medium-intensity. In contrast to this, areas of fuel model 8 are usually moderate and areas of fuel model 10 can be of high intensity even under normal conditions; this was demonstrated as recently as the fall of 1991. Direct attack can be made in most instances.

In contrast to normal conditions, fire behavior under extreme conditions is highly erratic and very intense in all major fuel types. Fire quickly exceeds the capability of hand crews to make a direct attack.

5.3 FIRE MANAGEMENT UNIT 3 - PRESCRIBED NATURAL FIRE

Lightning-caused fires within this unit will be managed for beneficial effects if they meet all prescription elements. Chapter 9 details these elements. This unit is approximately 327,985 acres in size. This represents approximately 63 percent of the area administered by the Park.

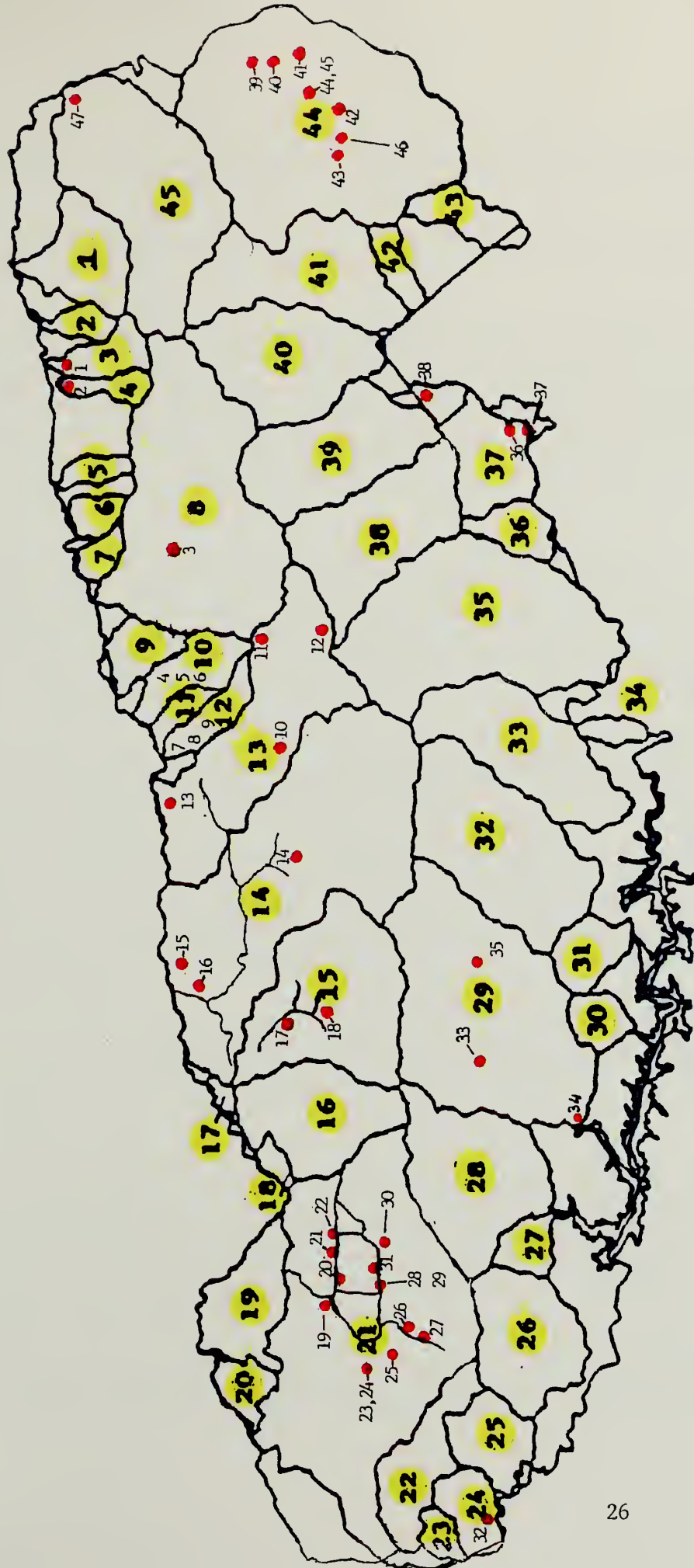
To facilitate identification of values (developed areas, cultural areas, significant resource areas) that need protection from PNF, all parts of the Suppression Unit are shown by watershed in Figure 6.

As a standard operating procedure, mitigating actions will be initiated on a prescribed natural fire when it is predicted that it will reach a unit boundary within 48 hours. More specifically, it will be standard operating procedure to manage PNFs so that they do not enter the Conditional Unit. When a PNF is predicted to reach the interior FMU 2 boundary within 48 hours, mitigating actions will be taken to suppress, contain, or otherwise protect Unit 2.

Exceptions to the standard operating procedure pertaining to the boundary can be made by the Superintendent when safety, escape concerns and values are not compromised. For example, there may be times when due to fuel type, topography or weather forecasts there would be little additional risk involved and additional resource management objectives could be achieved if the fire were allowed to burn into the Conditional Unit.

FIGURE 6

VALUES TO BE PROTECTED BY WATERSHED



Fire History: During the post-logging era, ca. 1920s, large areas of this unit burned. According to various accounts, much logging slash was present and the resulting fires were catastrophic.

Since 1900 virtually all of the large fires occurred in this unit. However, it is estimated that less than 20 percent of the Park's fires were within this unit.

Of 56 Table Mountain pine stands inspected during the summer of 1992, 57 percent had evidence of unrecorded fires that predate the Park's formation. Although this survey was not randomly done throughout the Park and it did focus on areas that one would expect to burn relatively frequently, these data do raise questions about previously published reports concerning the Park's fire frequencies, etc., that were based solely on existing documentation. Additional research needs to be done to piece together the Park's fire history.

Fuel Types: This unit comprises the vast majority of the Park. Approximately 73 percent of this unit is classified as NFFL fuel model 9; this includes cove-hardwood, mixed mesic hardwood and tulip poplar, and oak (mesic and xeric) forests. Approximately 26 percent of this unit is classified as NFFL fuel models 8 and 10; this includes spruce-fir, pine, and pine-oak forest types. Approximately 1 percent of the unit is comprised of heath and grassy balds and grape thickets.

Fire Behavior: In some areas, normal and extreme fire behavior are unknown due to the absence of fire since the Park was established. For example, no fires on heath balds are recorded.

Fire behavior within this unit is similar to Unit 2. Normal fire behavior in fuel model 9 areas can be characterized as low- to medium-intensity. In contrast to this, areas of fuel model 8 are usually moderate and areas of fuel model 10 can be of high intensity even under normal conditions; this was demonstrated as recently as the fall of 1991. Direct attack can be made in most instances.

In contrast to normal conditions, fire behavior under extreme conditions is highly erratic and very intense in all major fuel types. Fire quickly exceeds the capability of hand crews to make a direct attack.

5.4 FIRE EFFECTS

Because the majority of fuel types are similar in the three FMUs, fire effects can be generalized on a Park-wide basis. Effects vary in all fuel types depending on, at least, conditions of fuel, weather, soil, duff, litter and season in which the fire occurs. Most of the information which follows in this section is excerpted from an unpublished paper written by the Vegetation Management Section of GRSM.

Spruce-Fir - These species occupy the higher elevations of the Park. Red spruce is not vigorous and mature Fraser fir trees are nearly all dead. Due to the high amount of rainfall at this elevation, there is normally little

chance of fire occurring. However, there are very high dead fuel loadings present which may burn under extreme drought conditions.

Northern Hardwoods - These cool, wet areas of yellow birch, basswood, sugar maple, etc., usually are found on upper north slopes. They have virtually no known fire history.

Heath Balds - Some workers suspect fire may play a role in the creation of these ericaceous shrublands. Fire may play a role in maintaining these balds at very long intervals, as well. These are often mixed with Table Mountain pine.

Mesic Oaks - This consists of red oak predominantly, but also white oak and occasionally black and chestnut oaks. GRSM may contain most of the old-growth oak forest left in the eastern U.S. Fire may have played a role in maintaining these forests, but little research has been done on them, and oaks are not reproducing well in the Appalachians. Fire does appear to be important in forests of this type in the northern Midwest. Gypsy moth defoliations are a great concern in these areas.

Cove Hardwoods - These areas are not dominated by any one species and are located in moist coves. Fire is thought to have little impact here; the chief disturbance is catastrophic windthrow. Old-growth cove forests have a 1- to 2-percent canopy failure per annum on the average. This community borders others that have regular fires and may tend to regulate spread of wildland fires.

Hemlock Forests - These are found along streams and in moist coves and sheltered, mid-elevation, northerly ridges. They can sustain limited surface fires (which are extremely destructive to Tsuga), but extensive fire is not known here. This type is often embedded in cove hardwoods or northern hardwoods.

Table Mountain Pine - Mid-elevation, dry, exposed slopes, usually even-aged stands which may date to the last fire. This species is not adapted to tolerate high-intensity fire as individual trees. However, cones open in succeeding days to a prepared seed bed. The species appears to be declining from acreage of Park establishment era.

Low-Elevation Pine Type - Several types are lumped here. They form extensive stands in the west end of the Park, along sections of the Foothills Parkway and at a few sites along Fontana Reservoir. Fire is a main disturbance and, as with Table Mountain pine, fire frequency and intensity may be linked to southern pine beetle infestations. Strategies of these pines vis-a-vis fire include high-frequency/low-intensity regimes and usually only pioneer establishment, with effective dispersal to new sites.

Grassy Balds - Prevailing thought in land management agencies in the 1970s and 1980s was that these were of European-American origin. We now believe that both pre-settlement and settler-cleared balds exist in the southern Appalachians. Native mega-herbivores probably played a key role in maintaining these relatively unstable, succession-prone communities.

Research, first by the National Park Service, then U.S. Fish and Wildlife Service and recently the USDA Forest Service, has demonstrated that while fire may be useful as an adjunct treatment to maintaining a bald by removing thatch, it is definitely contraindicated for restoration. Fire stimulates woody invaders, such as Rubus, Robinia, Crataegus, etc., and will accelerate loss of the bald. What created the balds is completely unknown and is likely completely different from the processes that maintained them.

5.41 Rare Plant Populations in GRSM That Might Benefit from Fire

The following four species are only a few of the rare plants requiring fire. Other taxa are under study and the list is expected to grow.

Betula papyrifera var. cordifolia (Heart-leaved paper birch) - A disjunct northern species. This population is in a cool, moist, high-elevation habitat. There is evidence of fire at the site, although fires are very uncommon in this community type. Mineral soil for seedling establishment might bolster this population.

Delphinium tricornis (Dwarf larkspur) - A perennial in GRSM that is threatened by encroaching competition. Fire may reduce competition and stimulate growth.

Platanthera peramoena (Purple fringeless orchid) - A perennial that has been absent from its documented location in GRSM since 1982. Its former habitat has rapidly diminished in part by the invasion of Japanese grass. Fire might reduce the invasive species, assisting in the orchid population's recovery through the "release" of dormant seeds and/or stimulating root systems. Most orchids require some sort of disturbance, usually in some particular quality and scale to maintain populations.

Silene ovata (Rough-leaved campion) - A perennial that occupies light gaps in old-growth mesic oak forests. GRSM has three known populations which may benefit from fire, mainly through the maintenance of the oak community of which they are a part (see Mesic Oaks, above).

5.42 Exotic Plant Species for Which Fire Is a Potential Means of Control

Alliaria petiolata (Garlic mustard) - A biennial herb that begins vegetative growth in early spring and blooms from April through June. The species reproduces readily from seed, can grow in dense shade, and is rapidly invasive in floodplain forests, savannas and roadsides. Garlic mustard is widespread in the Midwest and Northeast; so far, two infestations have been found in the Park. Fire has been used successfully to control this species in the Midwest. Fall or early spring burns are best, with treatments repeated for several years.

Lonicera japonica (Japanese honeysuckle) - An aggressive colonizer of successional fields and disturbed areas such as roadsides; it can also become established in mature forests. The semi-evergreen vine climbs and drapes over native vegetation, completely covering large areas. It spreads from seed and vegetative runners. In fire-adapted communities,

prescribed burns during the spring greatly reduce the vine's coverage and crown volume. Repeated fires reduce honeysuckle volume by up to 50 percent over a single burn. Fire may also be used in combination with applications of approved herbicides during the dormant season.

Pueraria lobata (Kudzu) - A very aggressive woody vine with large, starchy perennial roots. It is shade-tolerant and usually occupies disturbed areas. The vine spreads primarily from vegetative runners and can rapidly shade out and kill native plants of all sizes. Fire can be effective in reducing aboveground biomass, which facilitates and reduces the need for chemical control.

Microstegium vimineum (Japanese grass) - A low, spreading, annual grass which is widespread in the Park and dominates many shaded, disturbed sites. It is prolific in the production of seeds, which can remain viable in the soil for over 5 years. Fire could be useful in reducing this species when timed correctly to prevent seed development.

5.5 ANNUAL FIRE WEATHER CYCLE

The annual fire weather cycle is more a function of growing season and temperature than precipitation. Average precipitation is relatively constant throughout the seasons. Warm temperatures and dormant vegetation conditions in the spring and fall condition the fuels for easy ignition. In contrast, during the winter, cold temperatures prolong the wetting effect of the precipitation, and in the summer the green condition of the foliage (coupled with the usual higher humidity) makes for poor ignition conditions under normal circumstances.

As a result of the above weather cycles, normally March through April and October through November constitute the two fire seasons. Normal extremes during this time consist of a few days of fire danger in the very high and extreme categories. Fires occurring on these days can be expected to spread rapidly and burn with high intensity. Depending on fuel type, spotting and crowning can occur. More than likely, an indirect attack would be necessary. The use of air tankers is warranted when structures are at risk.

Exceptions to the norm have occurred. Atypical dry spells in any season can result in more fires and/or unusually higher fire intensities. For example, in 1987 a summer drought made the normally fireproof hardwood forest burnable. Numerous lightning-caused fires in and near the Park that summer burned hundreds of acres with high intensity. Daily detection flights had to be made and the Knoxville Air Tanker Base had to be activated.

Unless there is an unusual amount of snow on the ground, atypical warm temperatures in February will condition fuels so that they are highly flammable. This happened in 1992 and although the Park did not have any fires of significance, thousands of acres in areas under state jurisdiction burned.

6.0 FIRE ORGANIZATION RESPONSIBILITIES

The Park fire organization requires the participation of many employees to accomplish fire management goals. It is important that an interdivisional approach be used so that all aspects of the program are addressed. This Plan identifies the positions involved in conducting an effective fire management program.

6.1 SUPERINTENDENT AND ASSISTANT SUPERINTENDENT

- Ensure that the fire management program at the Park is adequately planned and implemented, and that the Fire Management Plan is reviewed annually and revised as necessary.
- Ensure that proper preparation and approval of individual prescribed burn plans and hazard fuel projects are accomplished.
- Ensure that adequate suppression capability and training are maintained to provide an adequate force of fire-qualified personnel to handle the normal wildfire and prescribed fire load.
- Certify, on a daily basis, that adequate resources are available to manage all PNFs by signing the PNF Decision Record (Appendix 3).
- Ensure that both a briefing statement and a Limited Delegation of Authority (Appendix 4) are prepared for incoming incident management teams.
- Maintain public and media relations pertaining to both suppression and prescribed fire, and ensure that effective cooperative relationships with other agencies and adjacent landowners are maintained.
- Ensure the implementation of a viable and effective fire prevention program.

6.2 CHIEF, RESOURCE MANAGEMENT AND SCIENCE

- Coordinates and oversees all aspects of the prescribed fire program.
- Directs the staff functions of fire management through the Fire Management Officer (FMO).
- Serves as chair of the Prescribed Fire Committee; presents committee recommendations to the Superintendent for review.
- Briefs the Superintendent, Assistant Superintendent, and Chief Park Ranger on current fire management activity.
- Consults with Superintendent on any fire-related research proposals or recommendations.

Although the Chief of Resource Management and Science has overall responsibility for planning and executing this program, its success requires an interdivisional cooperative effort.

6.3 NATURAL RESOURCE MANAGEMENT SUPERVISOR

- Provides Resource Advisors to the Incident Commander (IC).
- Responsible for development of rehabilitation programs resulting from fire-related activities.

6.4 INVENTORY AND MONITORING COORDINATOR

- Responsible for fire effects long-term monitoring program. Works with National Biological Service to develop research initiatives.
- Provides the IC with known potential impacts to natural resources, especially rare species and habitats, as a result of the fire or suppression tactics.

6.5 FIRE MANAGEMENT OFFICER

Provides overall direction and scientific and specialized expertise to the fire management program.

- Responsible for FIREPRO budget and approves expenditures in emergency presuppression and suppression activities.
- Assists the initial attack IC in the completion of the Escaped Fire Situation Analysis (Appendix 6) when a fire enters extended attack status.
- When an extended attack situation warrants, completes a Fire Complexity Analysis (Appendix 7) and advises the Chief of Ranger Activities and the Chief of Resource Management and Science.
- Prepares a Limited Delegation of Authority to be signed by the Superintendent.
- Serves as Agency Administrator's Representative between the Park Superintendent and Incident Commander of incident management teams brought in to manage project fires.
- Serves as the primary Mobilization Coordinator with the interagency mobilization center on the Cherokee National Forest for any out-of-park aircraft, fire crews, or fire resources needed for fire management activities.
- Ensures that properly qualified personnel are assigned to all phases of fires.

- Administers the national guidelines for the fire qualifications system. Coordinates and oversees the firefighter fitness testing program for fire personnel.
- Supervises the staff at the interagency air tanker base in Knoxville.
- Prepares and revises cooperative fire agreements with adjacent federal, state and local agencies and municipalities.
- Informs all Divisions of the fire danger situation.
- Recommends to Chief of Ranger Activities closure of areas or restriction of fire use when fire danger reaches critical levels.
- Coordinates management of Job Corps Type II crew with Center Director.
- Responsible for overall coordination and supervision of the prescribed fire program in the Park.
 - (a) Serves as the Park's Prescribed Fire Manager. Responsible for all aspects of prescribed fire.
 - (b) Assigns Burn Bosses and approves all burn plans.
 - (c) Reviews and signs Interagency Prescribed Natural Fire Burn Plan (Appendix 5).
 - (d) Ensures that each PNF is monitored in accordance with NPS policy.
 - (e) Trains and equips members of monitoring crews to ensure that personnel can monitor prescribed fires and document weather, fuels, fire behavior and effects.
 - (f) Serves as a member of the Prescribed Fire Committee. Provides technical advice and recommendations to the committee.
 - (g) Notifies Chief, Resource Management and Science when any potential PNFs are ignited so that the Prescribed Fire Committee can be convened.

6.6 FIRE PROGRAM CLERK

- Tracks the FIREPRO budget; prepares time and attendance reports, travel authorizations, and travel vouchers; and prepares hiring packets for the Fire Management staff.
- Enters fire reports, daily situation reports, and WIMS (Weather Information Management System) weather data into the computer database.
- Records Prescribed Fire Committee minutes and maintains records of all Park fires.

- Coordinates the dispatch of Park personnel to provide assistance to other parks and agencies.
- Serves as a collection point for Crew Time Reports and coordinates the accurate transfer of information to fire timesheets by Park timekeepers.
- Formulates, maintains, and disseminates rosters of fire-qualified resources to Park supervisors.

6.7 FIXED-WING BASE MANAGER

- Coordinates Knoxville Air Tanker Base operations with the Cherokee National Forest.
- Maintains the Park's Remote Automated Weather Stations (RAWS).

6.8 ENGINE FOREMAN

- Supervises FIREPRO seasonals employed in Tennessee.
- Responsible for engines stationed at Headquarters.
- Responsible for primary Park fire cache.
- Implements field aspects of hazardous fuels program.
- Coordinates prescribed burn unit preparations with Burn Bosses.

6.9 CHIEF PARK RANGER

- Coordinates and oversees all aspects of the fire suppression program.
- Coordinates wildland fire-related issues with the Chief of Resource Management and Science.
- Ensures that identified individuals within the Park are prepared and qualified to perform suppression duties.
- Responsible for public safety (evacuations, traffic control, etc.) during wildfire and prescribed fire incidents.
- Recommends to the Superintendent and enforces area closures or fire-use restrictions when fire danger reaches critical levels.
- Serves as first Alternate Mobilization Coordinator.
- Reviews all purchases and obligations made or proposed for fire suppression accounts.
- Reviews all obligations made or proposed for emergency presuppression.

- Ensures that rental of OAS-approved contract aircraft for detection and incident overflights is in accordance with provisions of NPS-60, Aviation Management Guideline.
- Ensures that Division personnel comply with arduous duty fitness standards for timely firefighter certification.
- Serves as a member of the Prescribed Fire Committee.

6.10 DISTRICT RANGERS

- Receive fire calls in their districts, assess and analyze the situation.
- Appoint initial attack Incident Commanders and ensure that all fires within the Park have a minimum of one firefighter and an IC Type 4 assigned to them.
- Dispatch district forces to fires in their districts. Request additional Park personnel resources when needed. Request out-of-park resources, including aircraft, through the FMO.
- Notify Chief Ranger when fire exceeds 10 acres, or the capabilities of their personnel.
- Ensure that initial attack caches are maintained in compliance with established standards.
- Ensure that fire reports are prepared and received by the Fire Management Office in the prescribed period of time.
- Establish and maintain an organization of individuals sufficient in training and size to handle initial attack of normally expected wildfires.
- Assist in conducting management ignited prescribed burns.
- Provide for public safety and implement evacuations, if necessary.
- Ensure that all potential Incident Commanders are informed of procedures to follow in regard to PNF.
- Ensure that all ignitions are investigated.
- Serve as members of Prescribed Fire Committee when fire is within their district.
- Ensure that initial attack ICs know what to do in potential PNF situations.
- Post "Area Closed...Emergency" signs when required by Step-Up Plan.

- Hire and supervise FIREPRO presuppression seasonal employees, if assigned to their districts.
- Administer physical fitness tests to firefighters within their districts.

6.11 COMMUNICATIONS CENTER

- Collects standard information on smoke reports.
- Notifies appropriate District Ranger and FMO of smoke reports.
- Follows the mobilization guidelines within the Initial Attack Plan.
- Notifies Inventory and Monitoring Coordinator when fire is expected to reach 10 acres or more in size.
- Maintains a current roster of fire qualified resources.

6.12 PRESUPPRESSION SEASONAL EMPLOYEES

Primary individuals in the Park available for wildland fire dispatches.

- Maintain fire caches and fire equipment.
- Make patrols through the Park and on Foothills Parkway.
- Work on hazard fuel reduction and fuel inventory programs.
- Help prepare burn plans and burn units.
- Help conduct and monitor prescribed fires.

6.13 ALL DIVISION CHIEFS - GENERAL

During a potential fire emergency, each Park Division will render all possible assistance, including contributing personnel, equipment, and supplies.

- Ensure that all interested employees and those with assigned suppression responsibilities are available for fitness testing and training to support the maximum potential firefighter roster.
- Adjust schedules as needed to ensure that firefighters are readily available for in-park assignments.
- Provide supplies and equipment that may be needed in emergency fire suppression activities.
- Contribute firefighters. In order to maintain skills and to contribute to the interagency need, each Division will supply at least the following number of firefighters when crews are activated:

Ranger Activities	4
Resource Management & Science	3
Maintenance	4
Visitor Services	2

These firefighters will be available for 3-week interregional assignments.

6.14 INCIDENT COMMANDER

The IC is responsible for the safety of the personnel and the fire suppression effort from the time of assignment until the fire is declared out or he/she is replaced. The IC will devise implementation tactics that are consistent with the Fire Management Plan, strategies of the Prescribed Fire Committee, strategies contained in the Limited Delegation of Authority, and strategies analyzed in the Escaped Fire Situation Analysis. The initial attack IC and FMO will jointly complete the Escaped Fire Situation Analysis when an extended attack situation develops.

6.15 INITIAL ATTACK AND MONITORING TEAMS

If an ignition has a realistic chance of being a PNF, either the initial attack personnel will be cross-trained as Fire Behavior and Weather Monitors or separate Monitors will be dispatched as soon as possible. On most fires, two or three persons will be sufficient to address the initial attack and monitoring responsibilities. The initial monitoring team will be prepared for at least a 2-day assignment.

The initial attack IC must be knowledgeable of what actions to take when an ignition has PNF possibilities; for example, all lightning-caused ignitions in FMU 2 that are determined by the initial attack IC as having a chance of escaping the Park or jeopardizing values within 48 hours will be suppressed immediately.

6.16 PRESCRIBED BURN BOSS I OR II

The Prescribed Burn Boss I or II actively manages all phases of assigned prescribed natural or management ignited fire until the fire is declared out or reclassified as wildfire.

- Develops the Prescribed Burn Plan.
- Reviews and signs Interagency Prescribed National Fire Burn Plan (Appendix 5).
- Provides daily reports to Fire Management Office on the status of the fire for inclusion in Situation Reports.
- Ensures that burns are conducted according to national, regional, and Park policies.
- Works with Engine Foreman to prepare units for burning.

6.17 PRESCRIBED FIRE BEHAVIOR MONITOR

Assigned to all prescribed fires.

- Complete assigned monitoring forms and provide input for completing the Interagency Prescribed Fire Burn Plan.
- Follow established local, regional and national monitoring procedures and policies.

6.18 PRESCRIBED FIRE COMMITTEE

The purpose of the Prescribed Fire Committee is to provide consistent and coordinated management of PNF and management ignited prescribed fire. The Committee will consist of the Chief of Resource Management and Science, who shall chair the committee; the Chief of Ranger Activities; the FMO; the Chief of Interpretation and Visitor Services; and the District Ranger from the district in which the fire is burning or where a prescribed burn is scheduled. The committee may request technical expertise from other individuals at any time. The Superintendent and Assistant Superintendent may also serve on the committee.

Specifically, the role of the committee is to (a) evaluate all new fire starts in the Park's PNF units to determine whether the fire is within prescription, (b) ensure that all approved decision criteria and daily validation of PNF are carried out as defined above by position, and (c) annually review all aspects of the prescribed fire program.

6.19 FIRE QUALIFICATIONS NEEDS

All employees working on suppression or prescribed fire assignments will be qualified under the NPS Wildland Fire Management Qualifications System. Initial attack crews working on suppression fires will be supervised by a person qualified at least at the IC Type 5 level. Prescribed Fire Behavior Monitors will be certified in those positions.

The following is the list of minimum wildfire suppression and prescribed fire resources to manage the normal fire year. At times the Park will need to depend on interagency resources to meet this minimum.

Suppression Resources

<u>Position</u>	<u>Fully Qualified</u>	<u>Trainees</u>
Incident Commander Type V	15	N/A
Incident Commander Type IV	10	3
Incident Commander Type III	5	2
Safety Officer Type II	1	1
Strike Team Leader-Crew	5	1
Single Resource Boss-Crew	7	2
Advanced Firefighter/Squad Boss	12	2
Firefighter-Type II	60	N/A

Single Resource Boss-Helicopter	4	N/A
Firing Boss (Single Resource)	4	1
Pump Operator	8	2
Sawyer	8	2
Helispot Manager	3	1
Engine Boss	3	1
Engine Operator	5	2
Field Observer	4	1
Status/Check-In Recorder	4	1
Personnel Time Recorder	4	1
Dispatch Recorder	4	2
Incident Head Dispatcher	2	2
Support Dispatcher	3	1
Supply Unit Leader	2	1
Ordering Manager	3	1
Medical Unit Leader	2	1
Tool & Equipment Specialist	4	N/A
Fire Cache Manager	3	N/A
Fixed-Wing Base Manager	2	1
Mixmaster	5	1

Prescribed Fire Resources

Prescribed Fire Manager	1	1
Prescribed Burn Boss I	2	1
Prescribed Burn Boss II	6	2
Information Officer	2	1
Suppression Positions	6	2
Holding Crew Member	40	N/A
Ignition Specialist	6	2
Ignition Crew Member	12	N/A
Prescribed Fire Behavior Analyst	2	1
Prescribed Fire Behavior Specialist	3	1
Prescribed Fire Behavior Monitor	5	2

6.20 COOPERATING AGENCIES

Agencies cooperating with the Park include the USDA Forest Service, Bureau of Indian Affairs, TN Division of Forestry, NC Division of Forestry, City of Gatlinburg, City of Townsend, City of Bryson City, National Weather Service and Tennessee Valley Authority. Appendix 1 consists of copies of all fire-related agreements.

The Cherokee National Forest Fire Dispatch Office serves as the Tennessee Interagency Mobilization Center for all interagency resources. This is the primary contact for the Park to request additional firefighting resources. As the Department of Interior Resource Mobilization Coordinator for the State of TN, the Park frequently assigns a Support Dispatcher to this Center.

7.0 WILDFIRE PROGRAM

7.1 PREVENTION

A recent thrust of NPS policy has been directed toward wildfire prevention. In line with this, a goal of the Park fire management program is to reduce the threat and occurrence of human-caused wildland fires. Wildfire prevention efforts must be directed toward ignitions which pose the greatest potential to cause unacceptable damage or loss. Toward this end, a Wildfire Prevention Analysis and Wildfire Prevention Plan has been completed (Appendix 2).

This plan specifically analyzes the Park's risks, hazards, and values. Subsequent to the analysis, general activities related to education, engineering and enforcement are specified to decrease wildfire occurrence.

Public education is called for through a variety of methods: printed materials, mass media outlets, signs, posters, interpretive/educational programs, and outreach programs.

Wildfire prevention engineering is the process of reducing risks and hazards by shielding or removing heat sources, or by removing fuels. This is a very important component of the prevention plan. Creating defensible zones around values at risk can significantly reduce chances of loss. Mechanical and prescribed fire are means of reducing fuels, thereby minimizing the threat of ignition or fire damage.

According to NPS policy:

"Wildfire prevention enforcement should be practiced at the minimum level necessary to gain compliance with the fire laws and regulations.... All wildfires will be investigated at the earliest possible time. The investigation may range from a documented determination of cause by the initial attack firecrew to criminal investigation by a qualified arson investigator."

Because of the importance of the information derived from the investigations, the Park has a policy of aggressively investigating all wildland fires.

7.2 FIRE BEHAVIOR

Fire behavior varies greatly between fuel types at any point in time and within a fuel type over the course of time. Generally, Park vegetation is represented by using the NFFL hardwood litter, closed timber litter, heavy logging slash, timber, and short grass fire behavior models.

During years of average environmental conditions (precipitation, wind speeds, relative humidities, temperatures and fuel moistures), fires can typically be suppressed using direct attack methods in all fuel models. Direct attack means constructing a fireline right on the fire perimeter, keeping one foot in the burned area and one foot in the unburned area. It is possible to get extreme fire behavior under average conditions, but this is usually a relatively short-lived occurrence.

During years of extreme conditions (protracted drought such as that experienced in the mid- to late 1980s, below average fuel moistures, high wind speeds, low relative humidities, and high temperatures), extreme fire behavior can occur in all Park fuel models. In conifers, torching and crowning can be expected. High intensities, rapid spread, and long flame lengths and spotting can occur in most fuel types. Indirect attack methods (constructing a fireline some distance from the fire perimeter), air support, engines, multiple crews, and an incident management team can be required to manage fires under these conditions.

Table 1 presents a synopsis of predicted fire behavior under average and extreme conditions by fuel model.

TABLE 1. PREDICTED FIRE BEHAVIOR COMPARISON BETWEEN AVERAGE AND EXTREME CONDITIONS.¹

Fuel Model	% of Park	Rate of Spread (Ft/Min)		Flame Length (Feet)		Fireline Intensity (BTU/Ft/Sec)		Method of Attack	
		Average Conditions	Extreme Conditions	Average Conditions	Extreme Conditions	Average Conditions	Extreme Conditions	Average Conditions	Extreme Conditions
Hardwood Litter	84	6	55	2	7	34	372	Direct Attack	Indirect Attack
Closed Timber With Litter	10	4	5	1	2	4	17	Direct Attack	Indirect Attack
Heavy Logging Slash ²	3	—	55	—	19	—	3232	—	Indirect Attack
Open Timber with Litter and Understory	2	4	73	3.5	88	88	1913	Direct Attack	Indirect Attack
Short Grass	1	42	270	3	8	45	449	Direct Attack	Indirect Attack

¹ "Average Conditions" refers to years with average precipitation, fuel moistures, wind speeds and relative humidities. "Extreme Conditions" refers to drought conditions, such as in mid- to late 1980s, coupled with corresponding below-average fuel moistures, high windspeed, and low relative humidity.

² Represents fuels in spruce-fir community due to high tree mortality. Does not burn under average conditions.

7.3 PRESUPPRESSION

As stated in NPS policy, presuppression planning is the foundation of an effective fire management program. It includes activities conducted before fire occurrence to ensure the ability of the Park's fire management organization to initiate effective action. The responsibilities are numerous: maintain supplies and equipment to meet normal fire year requirements, maintain fully qualified personnel commensurate with local needs, monitor fire danger, prepare and follow a step-up plan based on staffing classes derived from the NFDRS, prepare pre-season risk analyses, maintain detection and initial attack capabilities, prepare appropriate pre-attack plans and initial attack plans, and develop and maintain agreements to coordinate interagency operations.

The following measures will be taken to ensure that all aspects of presuppression are addressed:

January: By the end of this month, all trained firefighting personnel will submit updated information to the Fire Management Office. This includes a new aerobic fitness score (if needed for the position), previous year's fire experience, requested trainee assignments for the current calendar year, and requested training for the next fiscal year.

February: By the middle of this month, the Fire Management Office will issue individuals their revised fire qualification cards. By the end of the month, sooner if dry conditions exist, the District Rangers and Engine Foreman will ensure that all fire cache supplies, equipment, pumps, and engines are ready for use. The air tanker base will be prepared for operation.

March-May: Spring fire season: Maintain a state of readiness as per Staffing Classes (Tables 2 and 3 of this Plan). With information received in January and from input received from the Assistant Chief Rangers, the FMO will complete a training needs analysis. Air tanker base will be staffed.

June: Caches are restocked. District Rangers and Engine Foreman will submit updated cache inventories to the Fire Management Office. FMO holds spring fire season critique with the Chief Ranger, Assistant Chief Rangers, and District Rangers (others may be asked to attend). FMO attends interagency meeting to program training for next fiscal year.

July-August: Maintain and increase Park employees' skills through interagency wildfire assignments. Basic fire suppression courses will be taught.

September: The same preparations that were made in February must be made again by the District Rangers and Engine Foreman to ensure preparedness for the fall fire season.

October-November: Fall fire season. Maintain a state of readiness as per Staffing Classes (Tables 2 and 3 of this Plan).

December: Caches are restocked. FMO holds fall fire season critique with Chief Ranger, Assistant Chief Rangers, District Rangers (others may be asked to attend).

Interagency fire management courses are typically hosted by the Park in cooperation with the Cherokee National Forest. Courses are taught at varying times of the year using an interagency mix of instructors.

7.4 EMERGENCY PRESUPPRESSION

Emergency presuppression involves actions taken to provide extra protection during extreme or unusual fire danger when staffing classes IV or V are in effect.

Appropriate activities for use of emergency presuppression funds include hiring of emergency temporary firefighters, placing existing staff on extended tours of duty, pre-positioning resources, increasing or initiating special detection operations, and leasing initial attack aircraft. All of these actions are aimed at ensuring prompt responses should fires occur.

The Park's authority to spend emergency presuppression funds is tied to the NFDRS Burning Index (BI). The BI is designed to reflect the difficulty in controlling a new fire start. When a value equal to or greater than the 90th percentile is reached, funds can be expended as outlined in the approved Step-up Plan.

The Park has two fire seasons based upon a statistical analysis of fire occurrence. The fire seasons are identified as:

Spring - February 20 through April 30

Fall - October 20 through December 10

There are five staffing classes that describe escalations in presuppression responses to increased fire danger. Tables 2 and 3 show the actions to be taken for each of the five staffing classes in North Carolina and Tennessee, respectively. All BIs are for fuel model E of the 1978 version of NFDRS.

TABLE 2. PRESUPPRESSION STAFFING CLASSES - NORTH CAROLINA

STAFFING CLASS	BURNING INDEX RANGE	ACTIONS TO BE TAKEN
I	0-7	<p>Confirmation that available and qualified initial attack firefighters are outfitted with personal protective equipment.</p> <p>Specify normal tours of duty and number of initial attack personnel.</p> <p>Equipment and supplies should be inventoried and serviced, if necessary.</p>
II	8-14	Specify normal tours of duty and number of initial attack personnel available.
III	15-27	Specify normal tours of duty and number of initial attack personnel available.
*		Necessary equipment and personal protective gear should be immediately available (e.g., in patrol or work vehicles, at work site, etc.).
IV	28-37	<p>AUTHORIZATION TO USE EMERGENCY PWE 381 FUNDS MUST BE REQUESTED VIA FIRE MANAGEMENT OFFICE.</p> <p>Potential 6- or 7-day work week for regular initial attack personnel and key management personnel. Potential for extended tours determined on a daily basis.</p> <p>Intensified road patrols for prevention and detection purposes will be initiated.</p> <p>Precautionary fire hazard bulletins will be initiated via local public media, on Park bulletin boards, and in public contacts.</p>
V	38-40	Closure of campgrounds and other identified areas of Park, and prohibition of open-pit fires will be considered.

*NOTE: If high visitation period is determined to pose exceptional human-caused risk of wildland fire, move into Staffing Class IV planning level.

TABLE 3. PRESUPPRESSION STAFFING CLASSES - TENNESSEE

STAFFING CLASS	BURNING INDEX RANGE	ACTIONS TO BE TAKEN
I	0-7	<p>Confirmation that available and qualified initial attack firefighters are outfitted with personal protective equipment.</p> <p>Specify normal tours of duty and number of initial attack personnel.</p> <p>Equipment and supplies should be inventoried and serviced, if necessary.</p>
II	8-13	Specify normal tours of duty and number of initial attack personnel available.
III	14-25	Specify normal tours of duty and number of initial attack personnel available.
*		Necessary equipment and personal protective gear should be immediately available (e.g., in patrol or work vehicles, at work site, etc.).
IV	26-30	<p>AUTHORIZATION TO USE EMERGENCY PWE 381 FUNDS MUST BE REQUESTED VIA FIRE MANAGEMENT OFFICE.</p> <p>Potential 6- or 7-day work week for regular initial attack personnel and key management personnel. Potential for extended tours determined on a daily basis.</p> <p>Intensified road patrols for prevention and detection purposes will be initiated.</p> <p>Precautionary fire hazard bulletins will be initiated via local public media, on Park bulletin boards, and in public contacts.</p>
V	31-40	Closure of campgrounds and other identified areas of Park, and prohibition of open-pit fires will be considered.

*NOTE: If high visitation period is determined to pose exceptional human-caused risk of wildland fire, move into Staffing Class IV planning level.

7.5 FIRE DETECTION

In addition to reports by Park employees, primary fire detection is also accomplished by some of the 8 to 10 million visitors per year and from commercial aircraft overflights of the Park. However, during times of very high and extreme fire danger, special ground patrols are activated to detect fires. Special aerial patrols may be arranged in cooperation with the Cherokee NF.

7.6 PRE-ATTACK PLAN

The Park's Pre-attack Plan addresses the elements outlined in Section III, Chapter 7, of the NPS Fire Management Guideline.

7.7 FIRE SUPPRESSION

The National Park Service Wildland Fire Management Guideline states:

"The objective of fire suppression in the National Park Service is to suppress wildfires at minimum cost consistent with values at risk while minimizing the impacts from suppression activities."

Prompt and accurate reporting is essential to efficient fire suppression. The Park's Initial Attack Plan specifies who is responsible for what in terms of getting resources assigned to fires.

All fire suppression activities will be based on human safety and protection of property and Park resources. One of the three suppression strategies described above will be employed (i.e., confine, contain, control). An Escaped Fire Situation Analysis will be completed to assist in development of the control strategy. Helicopters, portable pumps, chainsaws, and other mechanized equipment may be used in the Park if authorized by the IC and permitted by the Superintendent. Existing helispots or natural landing sites must be employed unless new ones are specifically approved by the Superintendent. Air tankers can be used as necessary to effect the strategy approved by the Superintendent.

See Section 7.8 for constraints placed on chemical retardant use.

Prescribed fires which exceed the limits of an approved prescription will be reclassified as wildfires and handled under appropriate suppression responses. Once a prescribed fire has been declared a wildfire, it will be suppressed and cannot revert back to prescribed fire status.

Initial Attack

District Rangers will be responsible for the execution of initial attack fire responses within their districts, including assignment of the IC. They will ensure that the Communications Center is notified of all initial attack actions taken in their districts and that all individuals meet agency fire qualifications standards for the positions to which they are assigned. The FMO will monitor the initial attack and provide assistance as needed.

The District Rangers will be responsible for meeting the following time objectives:

- Reporting of fire - as soon as possible.
- Dispatch firefighters to fire - 10 minutes after report for initial attack firefighters and 20 minutes for others.
- Travel to fire - As quickly as safety allows while staying within the speed limit.

An IC Type 5 (or higher qualified) will be assigned to every fire within the Park and will be responsible for all actions taken on the fire from size-up to demobilization, unless he/she is replaced. After arriving on the wildfire, the IC will inform the Communications Center of the size of fire, rate of spread, fire potential, and personnel and equipment requirements. The Communications Center will immediately pass this information to the FMO.

Unless life, property, or a sensitive natural resource is immediately threatened, the first priority will be to determine the location and cause of ignition. If PNF is a possibility, consultation with the FMO is necessary before further action. If the fire was caused by lightning and is located in the Prescribed Natural Fire or Conditional Unit, the decision-making process will follow the Decision-Making and Notification Flowchart in the PNF section of this plan. However, if the ignition was human-caused, the fire will be suppressed immediately.

Extended Attack

Extended attack occurs when a fire has not been contained or controlled by the initial attack forces and continues either until transition to a higher level incident management team is completed or until the fire has been contained/controlled. **Extended attack action requires an Escaped Fire Situation Analysis to guide the re-evaluation of suppression strategies.** This will be completed by the assigned IC and the FMO.

The Fire Complexity Analysis

The Fire Complexity Analysis is a checklist intended to guide the agency administrator in determining when a transition from extended attack to a higher qualified incident management team is necessary. Before additional resources are ordered, an analysis must be completed and becomes part of the fire record. If an extended attack situation exists and the weather forecast suggests that the fire is likely to increase in size and complexity, the FMO will complete the analysis. The Chief of Resource Management and Science and the Chief Ranger will be immediately notified of the results. After consultation with these Division Chiefs, the required out-of-park resources will be immediately requested by the FMO through the Tennessee Interagency Mobilization Center. The amount and type of assistance requested will depend on the present and expected complexity of the fire situation. If an Incident Commander is one of the resources ordered, the transfer of responsibility for suppression actions on the fire will be done only through a Limited Delegation

of Authority signed by the Superintendent or designated Acting. It is the responsibility of the FMO to prepare the limited Delegation of Authority for the Superintendent's signature.

7.8 MINIMUM IMPACT SUPPRESSION

Fire management activities within the Park will be carried out in a manner that minimizes impacts to the Park's natural and cultural resources. Incident facilities, when practical, will be located outside of natural and historic zones. Suppression forces will choose methods and equipment commensurate with suppression needs and a strategy that will least alter the landscape or disturb Park resources. Of primary importance is the need to impress upon suppression forces the minimum impact suppression guidelines found in NPS-18, Section 3, Chapter 8. These guidelines take the Park ethic into account in firefighting practices; they are not an excuse to relax normal safe firefighting practices. Techniques and policies of minimum impact firefighting that will be used in the Park include (but are not limited to):

- a. Minimize use of retardant. The Park's aquatic ecosystem requires protection for various reasons. The higher elevations support populations of the native brook trout. The streams at the lower elevations support a very diverse fish population with state-listed species, plus some of the most diverse aquatic insect populations in the nation. The Park is known for its quality fishing and serves as an ecological model for the region. As a result, it will be standard practice to keep chemical retardant at least 200 yards from any stream or lake.

Because of unique characteristics or special uses, there are a few streams or areas in the Park that require more than the 200 yard-wide buffer zone. These are listed below:

Abrams Creek from the Abrams Creek Ranger Station downstream to Chilhowee Lake. Retardant is prohibited within .25 mile of this stretch of stream due to the presence of a federally endangered fish species.

Big and Land Creeks in North Carolina. Retardant is prohibited within .25 mile of the entire stretch of these streams because they are a water source for Bryson City.

Whiteoak Sink, the Sinks, Bull Cave, Gum Swamp, Houston Chambers Pond, and Big Spring Cove have unique hydrological and geomorphological features resulting in sensitive habitats. Retardant is restricted within .25 mile of these areas.

The upper reaches of Clingmans Creek. Chemical research plots are located in this area. Retardant is restricted within this drainage above 4,800 feet.

- b. Cold-trailing the fire edge when practical.

- c. Use of natural firebreaks or wetlines wherever possible (in lieu of handline construction). Waterbars on handlines on steep slopes.
- d. Use of soaker hose or foggers in mop-up to avoid "boring" and hydraulic action on soils.
- e. Firelines kept to the minimum width needed to allow backfiring, burnout, or the creation of a safe blackline. Natural barriers wherever possible.
- f. Minimal tree-falling. Snags within or adjacent to firelines will be removed only if they show evidence of fire, present hazard to firefighters, or constitute a legitimate threat to the fireline integrity. Living trees will be undisturbed whenever possible. Lower branches will be pruned whenever possible to remove ladder fuels rather than removing the tree.
- g. Archeological protection measures taken to protect cultural resources. Plows and dozers will not be used unless absolutely necessary.
- h. Debris scattered or removed as prescribed by the Resource Advisor.
- i. All firelines, camps, or other disturbance in visually sensitive areas will be rehabilitated to maintain a natural appearance.
- j. After the fire emergency is over, transport of personnel, equipment, and trash out of the Park that is consistent with Park resource management objectives.
- k. Engines used only on established roads within Park boundaries, unless approval from the Superintendent or FMO has been obtained to leave Park roads.
- l. Bulldozers allowed only with written authorization from the Superintendent, who may authorize their use when high value resources are at risk. In these cases, Para-archeologists and/or Natural Resource Specialists will be assigned to dozers (if possible) to minimize damage to resources.

7.9 MINIMUM IMPACT REHABILITATION

Rehabilitation will only be required where the impacts of the fire or associated suppression actions are significant and can be mitigated. If the previously outlined minimum-impact suppression actions are used, only minimal rehabilitation will likely be necessary. Park Management will play an active role in approving suppression activities. The Limited Delegation of Authority to ICs and the Escaped Fire Situation Analysis are key facets in this process.

Rehabilitation efforts will include (but are not limited to): flush-cutting all stumps that are cut with a chainsaw; water-barring any constructed line where erosion is likely; re-contouring any line trenches, spreading any material piled in berms along firelines; raking debris over constructed

firelines; removing any abandoned supplies, equipment, or garbage; and rehabilitation and cleanup of camps, helispots, or drop points.

Burned areas will not be seeded; residual seed and sprouting from surviving rootstalks will provide natural revegetation. This method is superior even to introduction of "native" seeds. Seed-bearing materials cut along the lines can be scattered as mulch to guarantee indigenous seed. Consideration will also be given to the use of organic mats for controlling erosion.

Rehabilitation of firelines and other efforts to control erosion will start as soon as possible, perhaps even before a fire is declared out. This is especially important if firefighting equipment and personnel are still available. Funding of the direct costs of rehabilitation will be through an emergency fire account.

7.10 RECORDS AND REPORTS

The Fire Management Office will keep the following Park records: Fire Report (DI-1202), fire atlas, fire weather records, fire equipment inventories, and other historic records.

During the fire season, a daily situation report will be entered in the NPS Wildland Fire Management Computer System.

The FMO will provide the Division Chiefs and the Superintendent with reports on any fires that occur within the Park.

The FMO, Chief of Resource Management and Science, and Chief of Ranger Activities will review all Park fires over 100 acres in size. Smaller fires may be reviewed if necessary.

For all fires involving a Type I or II team, an in-depth review will be conducted by the Regional Fire Management Officer. Park personnel will participate as requested.

7.11 SAFETY

Accident prevention in fighting fire is extremely important. Special hazards and situations include falling snags and limbs, rolling rocks, sharp and heavy cutting and digging tools, dehydration, and fatigue. It is the responsibility of every individual to contribute to the safety of assignments. Every Incident Commander is responsible for ensuring that safety instructions are given and followed on the job.

8.0 MANAGEMENT IGNITED PRESCRIBED FIRE PROGRAM

8.1 LONG-TERM MANAGEMENT IGNITED PRESCRIBED FIRE PROGRAM

Eight fire management program objectives were discussed in Chapter 4. One of them specifies a management ignited prescribed fire (MIPF) program to accomplish some Park resource management objectives. In addition, two other objectives cannot practically be achieved without MIPF. One of these two pertains to prevention and the reduction of hazard fuels, and the other to basing fire management actions on scientific findings.

MIPF is needed due to alterations in the natural fire regime. As long as current development (community expansions, roads, lakes, etc.) and fire suppression trends continue, the fire regime that was present in and around GRSM before European man impacted the area will not be reestablished. More specifically, neither the frequent natural fires ignited by Native Americans nor the lightning-caused fires which once started outside the Park and burned freely into it still occur. After studying lightning fires in southern Appalachian forests, Barden (1974) concluded that "If lightning fires were permitted to burn in Great Smoky Mountains National Park, they probably would not maintain the widespread pine forests which now clothe southern slopes at lower elevations." Thus, to offset the absence of Native American fire and the reduced lightning-caused fire frequency, a long-term MIPF program is needed.

There are additional reasons to have a long-term MIPF program. Critical habitat of the endangered red-cockaded woodpecker can be preserved and/or recreated. Biotic communities such as the Table Mountain pine require periodic fire; according to Sanders (1992), "Fire is the only disturbance that creates the three conditions necessary for successful regeneration of this highly intolerant species." Other yellow pine communities are dependent on fire. It is speculated that the absence of fire in the old-growth oak communities may be hastening the disappearance of this resource. Hazard fuels will periodically need to be reduced to establish defensible zones adjacent to highly developed areas and to protect sensitive natural resource areas. Some historic scenes and vistas may best be maintained in terms of dollars and environmental impacts through the use of fire. Exotic plant proliferation is a major concern of resource managers, and it is believed that prescribed fire will be an important tool in the treatment of some of these alien species. A synopsis of habitats and areas that require MIPF are listed below. Fire frequency and intensity are discussed.

Pine, pine-oak and oak-pine - These forest associations are abundant in the west end of the Park, especially west of Cades Cove. They are also found at low elevations eastward along the Park boundary, both in Tennessee and North Carolina. Several species of pines in the "yellow pine" group, together with several oak species, characterize this assemblage of natural communities which dominates the Park's low-elevation, dry, sunny, relatively warm habitats. They occur with black gum (Nyssa sylvatica), red maple (Acer rubrum), sourwood (Oxydendrum arboreum), dogwood, several species of blueberries, mid-height to tall grasses and many summer-blooming wildflowers.

The natural role of fire here is believed to be one of frequent, low- to occasionally moderate-intensity fires. Harmon (1980) found that yellow pine forests in the western portion of GRSM were burned once every 12 years on the average between 1850 and 1940. The low ridge topography of these forests is often oriented southwest to northeast. High-intensity fires may have been formerly uncommon and localized before the recent fuel build-ups of the last 60 years. In any case, high-intensity fires that make uphill runs are quickly checked by ridge summits and the moister, low-resin fuels on the cooler north-facing slopes.

Table Mountain Pine - Table Mountain pine is a southern and central Appalachian endemic that occurs in nearly pure, even-aged stands at mid-elevations in the Park, and as scattered groves and individuals at low elevations. This species has serotinous cones that open after fire. A study of Table Mountain pine currently underway shows 60 stands of this species, 5 acres and larger, in the Park. Most are above 2,500 feet in elevation. Studies by Sanders (1992) in the Park and in other sites in eastern Tennessee suggest that high-intensity, stand-replacing fire is necessary to regenerate Table Mountain pine. Fire occurrence in these stands is infrequent.

Heath Balds - These tall shrublands are often found in association with Table Mountain pine. They are thick, almost impenetrable, well-defined vegetative patches that usually occur on mid- to high-elevation ridgetops in the central and eastern sections of the Park. About 300 stands are believed to exist. Their genesis and ecological processes are not well known, but evidence of past fires can be discerned at many of them. Because they are dominated by ericaceous shrubs, a high-intensity fire definitely could occur under the right conditions, although none has in recent decades. Fire occurrence in these stands is infrequent. Currently there is little evidence of reproduction.

Mesic Oak - This forest type is usually at mid-elevations up to 5,000 feet on south-facing slopes. Recent work in the Park's old-growth mesic oak, which is dominated by red oak (Quercus rubra), indicates a radical change in reproduction under the canopy around 60 years ago. Most trees 60 years and younger are highly shade-tolerant and fire-intolerant species, such as Canadian hemlock (Tsuga canadensis), American beech (Fagus grandifolia), and maples. The youngest oaks are often 60-80 years old. Studies in other eastern sites strongly support the hypothesis that the incidence of fire is positively correlated with continued oak regeneration.

In mesic oak and several other forest associations, flowering dogwoods (Cornus florida) were formerly common. They have been greatly reduced in the past 5 years (Windham et al. 1992) by an introduced fungus, dogwood anthracnose (Discula destructiva). Current research work has shown that the fungus does not survive well in drier, windier microclimates. Fire may be helpful in maintaining dogwoods by opening understories and sterilizing the infected leaves on the forest floor.

Northern Hardwoods, Cove Hardwoods and Mixed Mesic Hardwoods - Northern hardwoods occur on mid- to high-elevation northerly aspects. This association is characterized by birches, maples, basswoods, beech and buckeyes. Northern

hardwood sites are very moist year-round and are thought to naturally have extremely infrequent, low-intensity fires.

Cove hardwoods are well studied in the Park and are found on moist, fertile locations at low to mid-elevations. No one tree species characterizes the canopy of this type, but tuliptree (Liriodendron tulipifera), magnolias, hemlocks, silverbell (Halesia tetraptera), and a number of other species are usually present. Cove hardwoods are believed to have a naturally infrequent fire occurrence due to the moist, shady conditions typical of these sites. This forest type makes up approximately one-third of the Park's forested area (MacKenzie 1991).

Mixed mesic hardwoods include most of the streamside and alluvial forest stands in the Park and occur at low to mid-elevations. A wide variety of tree species occur in this "catch-all" category: black walnut (Juglans nigra), sycamore (Platanus occidentalis), ironwood (Carpinus caroliniana), hemlock, yellow poplar, elms, and sweetgum (Liquidambar styraciflua), among many others. These are moist sites in which a portion may be periodically disturbed by flooding. These sites are believed to have infrequent, low-intensity fires.

Grassy Balds - Several small, ridgetop, grassy balds occur along the main ridge of the Park in the western and central sections. Two of them (Russell and Spence Fields) are known to be of Euro-American origin, probably cleared for grazing of stock. Two others, Gregory and Parson Balds, are known to have been extant in 1821 during the first interstate boundary survey. At this time the Cherokees still held the land, but Euro-Americans were beginning to settle the closest lowlands in Cades Cove. There is no evidence regarding the historic uses/origins of the other larger balds (Andrews, Silers, etc.).

Perennial grasses and some ericaceous shrubs are typical of the grassy balds. Shade-intolerant rare species are known from Gregory and Parson Balds. Fire was probably used on the balds by Euro-Americans and perhaps by Native Americans as well. Recent work by several agencies in the Appalachians has shown that fire is contraindicated when restoring grassy balds that have been invaded by woody species and brambles. Fire may be useful, however, in maintaining vigorous grasslands. In 1988, a 2-1/2-acre area on Gregory Bald burned as the result of an accidental fire.

Spruce-Fir - The Park contains about three-fourths of all the spruce-fir forest type left in the southern United States (USDA Forest Service 1988). Unfortunately, almost all mature Fraser fir (Abies fraseri) has been killed by an introduced insect, the balsam woolly adelgid (Adelges piceae). Tens of thousands of dead, bleaching snags are evident from highly visited peaks in the central high elevations. This has led to much speculation about the temporary flammability of these dead stands. Large or intense wildfires in spruce-fir are viewed as extremely infrequent events in a natural regime. Even the adelgid-killed fir stands lose almost all their fine fuels through decay in 18 months. The very high precipitation and almost daily fog events make these high forests the wettest in this part of the continent. In the unprecedented droughts of 1984-88, several small wildfires occurred near or ran into spruce-fir stands and all were self-extinguished.

As may be inferred from the above, it would take extreme drought conditions for fire to occur in this habitat. There are no plans to use MIPF in the spruce-fir areas.

Hazard Fuel Reduction - Hazardous fuels exist adjacent to some developed areas. Where possible, these fuels will be treated mechanically and with low-intensity prescribed fire to reduce the wildfire risk. In order to maintain defensible zones, some areas will have to be treated every 5 to 10 years.

Endangered, Threatened and Rare Species - The federally endangered red cockaded woodpecker prefers pine forests without dense understory. Historically the Park has had populations of these birds. Low- to moderate-intensity MIPF will be used to reopen forest areas where colonies once existed. Reduced populations of reptiles, such as the northern pine snake (Pituophis melanoleucus), are believed to be linked to 60 years of fire exclusion within the Park. It is believed that many other animal species in these categories would also benefit from the effects of MIPF.

Approximately 160 species of plants are considered rare in the Park due to lack of duff, soil, and/or canopy disturbance. The primary natural disturbance factor in the Park is fire. Prescribed fire of varying intensities and frequencies will be experimented with to develop prescriptions to help perpetuate some of these species.

Summary

During the first few years, the Park will be using MIPF on a limited basis and will monitor the effects in great detail. The average annual burned area may range from 10 to 50 acres.

In the long term, depending on funding, personnel availability, and air quality constraints, the average annual burned area may range from 1,000-7,000 acres. The upper end of this range would provide for the maintenance of the pine/pine-oak/oak-pine habitat as well as all other habitat types and areas of special concern. A return interval of 20 years was arbitrarily used for the pine/pine-oak/oak-pine areas to come up with this estimate. Seven thousand acres represents .013 percent of total Park acreage.

8.2 GENERAL PLAN FOR MANAGEMENT IGNITED PRESCRIBED FIRE

All MIPF will have objectives consistent with the Park's Resources Management Plan, will be approved by the Superintendent, and will comply with current national, regional, and Park policies/standards concerning planning and implementation.

The Chief of Resource Management and Science will be responsible for an annual review and update of a Five-Year Management Ignited Prescribed Fire Schedule. This will be a dynamic document that will integrate the biological, hazard fuel, and research needs of the Park and will project, by year, those areas to be burned over the next 5 years. The updating of this document will set in motion the following important actions: preburn inventories/monitoring; budget

requests; assignment of Burn Bosses; and the writing, review, and approval of burn plans.

Burn plans will address the air quality regulations for the state in which the burn unit is located, including any annual deadlines for submitting plans for state approval.

8.3 CORRELATION OF FIRE MANAGEMENT UNITS AND MANAGEMENT IGNITED PRESCRIBED FIRE

As indicated in Chapter 5 where each of the three FMUs is discussed, MIPF can be used in all three units to achieve resource management objectives.

8.4 PERSONNEL QUALIFICATIONS/MOBILIZATION

Given all the purposes for use of MIPF in GRSM, once the program becomes operational, many individuals will be needed to fill the required positions. Eventually numerous burns per year will occur requiring a wide range of expertise. For the operational program, it is estimated that the following will be needed:

	<u>Fully Qualified</u>	<u>Trainees</u>
Prescribed Fire Manager	1	1
Burn Boss I	2	1
Burn Boss II	6	2
Holding Crew Member	40	N/A
Ignition Specialist I	6	2
Ignition Specialist II	10	3
Prescribed Fire Behavior Analyst	2	1
Prescribed Fire Behavior Specialist	3	1
Prescribed Fire Behavior Monitor	5	2
Information Officer	2	1
Incident Commander Type 3	10	2

Once a burn plan has been approved by the FMO, it will be presented to the Chief of Resource Management and Science who will advise and request approval from the Superintendent. On the burn itself, regular fireline procedures will be mandatory. On the more complex fires, an Information Officer may be assigned. All appropriate cooperators and neighbors will be notified in advance of a MIPF (see Appendix 9 for Prescribed Fire Notification List).

8.5 MANAGEMENT IGNITED PRESCRIBED FIRE MOBILIZATION

The Prescribed Burn Unit Plan found in the NPS Wildland Fire Management Guideline will be completed before any MIPF is ignited. This plan will not be considered complete until it is signed by the preparer, reviewed and approved by the FMO, the Chief of Resource Management and Science, and the Superintendent.

The NPS Fire Complexity Analysis must be completed as part of the Burn Unit Plan. As the name implies, this Complexity Analysis categorizes the burn as

to its relative complexity and alerts the Burn Boss of potential problem areas.

The FMO is responsible for obtaining the necessary prescribed burning permit from the state and county where the burn is scheduled. A qualified Prescribed Burn Boss will implement each burn plan.

8.6 FIRE EFFECTS AND FIRE BEHAVIOR MONITORING

To facilitate and standardize fire behavior and effects monitoring, GRSM has adopted the Western Region Monitoring Handbook as the guideline to be used in the Park. This monitoring system has established levels of monitoring activity related to fire management goals and strategies. Level 1 covers reporting all fires, and levels 2, 3, and 4 call for monitoring of fire conditions, short-term effects, and long-term change, respectively. The levels are cumulative; requirements include all levels below the highest specified. Monitoring at all four levels is required for management ignited prescribed fire.

The scope of monitoring actually carried out will be determined by the objectives stated in the burn plan. Thus, the monitoring may take only a few hours or, if changes in fuels or alterations of the biotic community are desired, sampling may continue over a period of years. Normally, the monitoring frequency will be on 1-, 2-, 5-, and 10-year schedule.

The Park's Inventory and Monitoring Coordinator is responsible for all fire effects monitoring and research. The FMO is responsible for all weather, fuel, and fire behavior monitoring.

8.7 DOCUMENTATION, REPORTING, AND CRITIQUE REQUIREMENTS

Documentation and Reporting

As prescribed fires are being conducted, they will be reported on the NPS Wildland Fire Management Computer System.

The Burn Boss is responsible for completing the Department of Interior Fire Report Form, DI-1202, and for those parts of the burn plan requiring post-ignition completion. The Fire Behavior and Weather Specialist will complete the specified forms in the Monitoring Handbook. Additional documentation pertaining to fuel consumption and biological responses will be required on most burns; the nature and scope of the requirements will be dependent on the burn objectives.

When possible, the Video Image Analysis System will be used to document fireline intensity so that this characteristic can be better correlated with fire effects.

Critiques

Prescribed fires, as well as wildfires, will be critiqued in accordance with NPS-18 guidelines. The critique will document any changes in the management,

operation, prescriptions, training, or procedures that might be needed to improve the effectiveness or efficiency of the program.

In addition, before releasing personnel from a fire, the Burn Boss will hold a brief critique. Important points brought forth during these critiques will be included in the final burn report. All individuals working on prescribed burns will receive a written evaluation by their supervisors. The FMO will evaluate the Burn Boss.

The Prescribed Fire Committee can review any fire that it deems necessary and, at least annually, the Committee will review the entire MIPF program.

9.0 PRESCRIBED NATURAL FIRE PROGRAM

As stated in Chapter 4, a fire program objective is to "Integrate fire as a natural process into Park biotic communities to the fullest extent possible." Natural fires have not been allowed to burn in the Park for at least 60 years. This has resulted in biological changes different from those which would have resulted from the occurrence of natural fire. The practice of suppressing natural fires has been recognized by the NPS as a problem for the past 30 years.

It is generally accepted that the Park's biotic communities evolved with occasional fire guiding their evolution, just as occasional drought, windstorms, and attacks of native insects also guided their evolution. Fire has, more than likely, been a factor shaping several biotic communities within the Park. Spur and Barnes (1980) clearly documented the essential role that fire has played in maintaining yellow pine ecosystems. More recently, Sanders (1992) documented Table Mountain pine's dependence on fire. Also, it is speculated that fire may have been an important factor in maintaining some of the old-growth oak stands. As the role of fire is increasingly understood throughout the Park ecosystem, it is believed that its recognized importance will likewise increase.

In summary, natural fires are a significant factor in maintaining biotic communities. Essentially these fires have been absent in the Park for over 60 years and, according to the Park's Statement for Management, the result has been the development of over-mature forests, particularly in developed areas. Natural reproduction and subsequent canopy replacement have been altered, and in some cases eliminated.

PNF prescription parameters are specified later in this chapter. As long as PNF is burning within the specified prescription for that area, the ecological results will be considered to be within the acceptable range. More specifically, acceptable results in the two units in which PNF could be authorized range from "cool" (slow-moving, low-intensity fire) to "hot" (fast-moving, stand-replacing fires).

9.1 PRESCRIBED NATURAL FIRE OBJECTIVES BY FMU

FMU 1, the Suppression Unit. PNF will not be allowed. The objective is to suppress all natural ignitions. If fire is needed to reach resource management objectives, it will be MIPF.

In order to protect components of this unit from PNF, all of its values potentially at risk have been listed by major watersheds (Table 4) designated by Parker and Pipes (1990). In addition, these same values (except backcountry shelters) potentially at risk are depicted on a map (Figure 6) to further facilitate their recognition. This information, along with other prescription parameters, will be considered by the Superintendent before making a decision about whether a lightning-caused fire will be considered a wildfire or PNF within FMU 2 or 3.

TABLE 4. POTENTIAL VALUES AT RISK FROM FIRE BY WATERSHED

Watershed No.	Watershed Name	Acres	Values to Protect
1	Cosby Creek	6869	Cosby Knob Shelter
2	Greenbrier Creek	1663	0
3	Indian Camp Creek	3042	Baxter Cabin (1)
4	Dunn Creek	1658	Tyson McCarter Complex (2)
9	Ramsey Creek	1492	0
4	Soak Ash Creek	1586	0
7	Copeland Creek	1346	0
8	Middle Prong Little Pigeon	30632	Hiking Club Complex (3) Tricorner Knob Shelter
9	Dudley Creek	3160	0
10	Roaring Fork	4489	Ephraim Bales Complex (4) Alfred Reagan Complex (5) Homer Bales Complex (6) Mt. LeConte Shelter
11	Baskins Creek	1265	0
12	LeConte Creek	2809	Noah Ogle Barn (7) Noah Ogle House (8) Noah Ogle Tubmill (9)
13	West Prong Little Pigeon	22325	Chimneys Picnic Area (10) Mt LeConte Lodge (11) Newfound Gap "Head" (12) Headquarters & VC Complex (13) Mt. LeConte Shelter Mount Collins Shelter Ice Water Springs Shelter
14	East Prong Little River	39390	Elkmont Complex (14) Walker Sisters Complex (15) Little Greenbrier School (16) Silers Bald Shelter Mount Collins Shelter Double Spring Gap Shelter
15	Middle Prong Little River	18584	Tremont Complex (17) Red Wolf Exclosure (18) Derrick Knob Shelter

TABLE 4. POTENTIAL VALUES AT RISK FROM FIRE BY WATERSHED (cont'd)

Watershed No.	Watershed Name	Acres	Values to Protect
16	West Prong Little River	11146	0
17	Little River (lower) Little River Combined	69937	0
18	White Oak SInk	1069	0
18	Hesse Creek	7502	0
20	Cane Creek	2666	0
21	Abrams Creek	48856	Cades Cove M. Bap. Church (19) Cades Cove Meth. Church (20) Cades Cove P. Bap. Church (21) John Oliver Cabin (22) Elijah Oliver Complex (23) Oliver Red Barn (24) Cable Complex (25) Henry Whitehead Place (26) Red Wolf Exclosure (27) Lawson Complex (28) Kermit Caughron Res. (29) Carter Shields Cabin (30) Tipton Oliver Complex (31) Spence Field Shelter Mollies Ridge Shelter Russel Field Shelter
22	Panther Creek	7158	0
23	Shop Creek	1435	0
24	Tabcat Creek	3711	Red-cockaded Woodpecker Site (32)
25	Parson Branch	5087	0
26	Twentymile Creek	10363	Birch Spring Gap Shelter
27	Lost Cove Creek	2337	Birch Spring Gap Shelter
28	Eagle Creek	14764	Mollies Ridge Shelter Russel Field Shelter Spence Field Shelter

TABLE 4. POTENTIAL VALUES AT RISK FROM FIRE BY WATERSHED (cont'd)

Watershed No.	Watershed Name	Acres	Values to Protect
29	Hazel Creek	29970	Hall Cabin (33) Calhoun House (34) Sugarfork Maint. Bunkhouse (35) Silers Bald Shelter Derrick Knob Shelter
31	Pilkey Creek	2426	0
31	Chambers Creek	3437	0
32	Forney Creek	18562	Double Spring Gap Shelter
33	Noland Creek	14074	0
31	Peachtree Creek	1383	0
35	Deep Creek	27576	0
36	Copper Creek	2723	0
37	Oconaluftee River (lower)	7867	Mingus Mill (36) Oconaluf. Mtn. Farm Museum (37)
38	Oconaluftee River West	13943	Smokemont Church (38) Ice Water Spring Shelter Kephart Shelter
39	Bradley Fork and Oconaluftee River	35777	Kephart Shelter Pecks Corner Shelter
40	Raven Fork	13466	Pecks Corner Shelter Tricorner Knob Shelter
31	Straight Fork	14358	Laurel Gap Shelter
42	Stillwell Creek	2065	0
43	Bunches Creek	3681	0
44	Cataloochee Creeks: Little Big	39847	Little Cat. Baptist Church (39) Jim Hannah Cabin (40) Palmer Complex (41) Caldwell Complex (42) Woody Complex (43) Cataloochee School (44) Hub Caldwell House (45) Will Messer Barn (46) Laurel Gap Shelter
45	Big Creek	22310	Ranger Station (47) Cosby Knob Shelter Davenport Gap Shelter

This sorting of the values by drainage will also aid the assigned Burn Boss in ensuring that mitigating actions are taken to protect the values after the initial decision is made to declare a PNF.

FMU 2, the Conditional Unit. This unit provides a buffer between the Park boundary and FMU 3, the Prescribed Natural Fire Unit. PNF is allowed in this unit to integrate fire as a natural process in Park biotic communities to the fullest extent possible. All lightning-caused ignitions that are determined by the initial attack IC as having a chance of escaping the Park or jeopardizing values within 48 hours will be suppressed immediately.

However, if the initial attack IC decides that there is no chance of the fire escaping the Park within 48 hours, if no human safety or structural protection values are compromised, and if all of the other PNF prescription parameters of Unit 2 are met, ignitions can be treated as potential PNFs. In these cases, after going through the Initial Decision-Making and Notification Flowchart (Table 5), the Superintendent may declare such an ignition a PNF.

If a lightning-caused fire is declared a PNF and it eventually burns into FMU 3 (the PNF Unit), the prescriptions and constraints of that unit will dictate the fire's management. NPS policy permits holding actions on PNFs to establish and maintain perimeters or to protect values at risk. This may be necessary in order to manage PNF in FMU 2.

Further rationale for giving the Superintendent the prerogative to declare some natural fire ignitions within Unit 2 as PNF is the fact that much of the Park's boundary is downslope of FMU 2. Having the boundary downslope of an ignition reduces the risk of fire escaping the Park. Coupling this with some other favorable circumstances, such as when the ignition is near FMU 3, when there are favorable current and forecasted wind conditions, when there is forecasted precipitation, etc., there may be little reason to expend suppression dollars. In addition, PNF in this unit would help achieve resource management objectives.

All PNFs exceeding a prescription element will be reclassified as wildfires and handled under appropriate suppression responses. Once a prescribed fire has been declared a wildfire, it will be suppressed and cannot revert back to prescribed fire status.

FMU 3, Prescribed Natural Fire. The objective of this unit is to manage lightning-caused fires as naturally occurring events until they are extinguished naturally or they do not meet one or more prescription elements. These prescription elements are noted later in this chapter.

As a standard operating procedure, holding action will be taken on a natural fire in Unit 3 when it is predicted to reach a unit boundary within 48 hours, if not before. Exceptions to this procedure can be made by the Superintendent, when, after considering the current and forecasted weather and fire behavior, he/she determines that little would be at risk and much would be gained (savings of suppression dollars and achieving more resource management objectives).

For example, if a fire starts within a watershed and a historic cabin is projected to be at risk in 48 hours, the Superintendent has several options depending on variables such as weather and fuel conditions, accessibility to the cabin, availability of holding resources, etc. One option might be to start suppression actions immediately. Another might be to contain the threatening portion of the fire. Still another option might be to simply secure the cabin by making a defensible zone adjacent to it by removing fuel. The best strategy would depend on which set of variables mentioned above actually existed at the time.

Larger PNFs will typically be best managed on a watershed basis. In contrast to trying to control fires at midslope, using ridgetops and the associated changes in vegetation types will afford fire managers the best opportunities to contain fires when the need arises.

It is recognized that in order to have a successful PNF program, components of FMU 1 must be protected. As mentioned above, in order to facilitate this protection effort, values potentially at risk have been identified by watersheds in Figure 6. This information, along with other prescription parameters, will be considered by the Superintendent before making the decision as to whether a lightning-caused fire will be considered a wildfire or PNF. This information will also aid the assigned Burn Boss in ensuring that protective measures are taken to safeguard the values after the initial decision to declare an ignition a PNF.

Any PNF exceeding a prescription element will be declared a wildfire and appropriate suppression actions taken.

9.2 GENERAL PLAN AND ANNUAL CALENDAR FOR PRESCRIBED NATURAL FIRE PROGRAM

Success of this program is wholly dependent upon interdivisional cooperation. The Division of Interpretation and Visitor Services must incorporate a message about the importance of fire in the GRSM ecosystem into the Park's programs. The Division of Ranger Activities must have informed personnel in the field who are able to establish the cause of the fire, determine the FMU and determine what action to take relating to potential PNF. This Division must also have qualified employees to help staff the fire. The Division of Resource Management and Science is responsible for providing expert advice on the resources and must also help provide qualified staff on fires. The Maintenance Division will also be needed for qualified individuals for holding, ignition, monitoring, etc.

Each Division has its inherent responsibilities, but that does not mean that cross training is discouraged. In fact, employees of the Maintenance, Interpretation and Visitor Services, and Administration Divisions are encouraged to become Prescribed Fire Behavior Monitors, Holding Crewmembers, Ignition Crewmembers, etc.

The following measures will be taken to ensure that all aspects of the PNF program are addressed:

January: Those employees required to meet a specified aerobic fitness score for their fire position(s) will be tested. All prescribed fires will be monitored.

February: The Prescribed Fire Committee will meet to review the Park's monitoring plan, minimum staffing needs, number and status of PNF-qualified Park employees, and training and trainee needs; and to conduct a general program review. The training needs identified will be programmed into the interagency training schedule and the FIREPRO budgeting process. All prescribed fires will be monitored.

After reviewing the PNF program in terms of Park, regional and national standards/policy, the committee will make its recommendation to the Superintendent as to whether or not natural ignitions during the coming fire seasons should be considered PNF. All prescribed fires will be monitored.

March-May: Any PNF fire will be monitored and managed according to policy.

June: As part of seasonal employee orientation, all Divisions will emphasize their roles in the PNF program. For example, Interpretation and Visitor Services can instruct all of their employees to inform the public that all fires should be reported to a ranger for investigation and, because of safety and resource management concerns, not be extinguished by them. This message could be mentioned at campfire, visitor center, and other programs. Maintenance, Ranger Activities, and Resource Management personnel assigned to the backcountry should be instructed to look for PNF and instructed what to do and what not to do if one is located. As much as possible, the FMO should have PNF Monitors and Burn Bosses and their supporting supplies and equipment prepared for an assignment.

Any PNF fire will be monitored.

July-September: Any PNF fire will be monitored. As much as possible, the FMO should have PNF Monitors and Burn Bosses and their supporting supplies and equipment prepared for an assignment.

October: The Prescribed Fire Committee will meet to review any PNF which has occurred since the last review. The committee will also use this opportunity to review the program and provide the FMO with feedback. All prescribed fires will be monitored.

November-December: Training may be conducted. All prescribed fires will be monitored.

9.3 PNF MANAGEMENT AND MONITORING

Prescriptions: Before a natural ignition can be declared a PNF, it must meet the prescription parameters specified in the next section. Generally, conditions related to the Keetch Byram Drought Index, Burning Index, availability of holding forces, number of on-going PNFs in the Park, visitor safety, restricted areas, and Regional Preparedness levels must be met.

Initial Decisions: When a lightning-caused fire is confirmed within FMU 2 or 3, the Park Dispatcher will immediately inform the FMO or the Acting designee. The FMO will conduct an initial evaluation of the fire using the Initial Decision-Making and Notification Flowchart. The situation may require additional information about the fire, dispatching of a monitoring team to the site to collect environmental information, or an aerial reconnaissance. If the outcome calls for suppression, then the FMO will inform the Park Dispatcher, who will pass the information on to the initial attack IC. If the outcome allows for additional PNF consideration, however, the FMO will request a meeting of the Prescribed Fire Committee and will assign a Prescribed Burn Boss and a Prescribed Fire Behavior Monitor.

The FMO or his/her representative will provide the Prescribed Fire Committee with a specific accounting of all items on the "Initial Decision-Making and Notification Flowchart" and other specifics of the potential PNF. After review of this information, the committee will inform the Park Superintendent of its recommendations. If the Park Superintendent approves the candidate PNF, he/she will authorize it by signing the "NPS-PNF Decision Record" form.

The FMO will assign appropriately qualified personnel to manage the fire. If these are not available from within the Park, they will be ordered from cooperating agencies or from other Parks. The FMO, Park resource specialists, and the individuals assigned will complete the "Interagency Prescribed Natural Fire Burn Plan", Appendix 5. The specified signatures authorizing the Burn Plan will be obtained.

Monitoring: On a daily basis the Superintendent (or her/his qualified designee) will certify, in writing, that all PNFs are within prescription and adequate resources are available to ensure that each PNF will remain within prescription through the next 48-hour period. The information for making this decision will be collected by the FMO or assigned Burn Boss, but the certifying signature must be the Superintendent's or designee. If the fire is predicted to exceed its prescription or one of the other constraints is not met, it will be declared a wildfire and the appropriate suppression strategy initiated.

PNFs will be continually monitored and evaluated from the time of discovery until they are declared out to ensure that they remain within prescription. As long as a fire remains within prescription, it will be allowed to burn; thus, a fire may burn for weeks. Ongoing PNFs that no longer meet prescription parameters will be reclassified as wildfires and suppressed.

9.4 PNF PRESCRIPTION PARAMETERS AND CONSTRAINTS

Many variables will need to be examined to determine whether a fire is a candidate for a PNF; examples include the Keetch Byram Drought Index, Burning Index, protection of life and property, threatened natural or cultural resources, projected fire perimeter, the availability of monitoring funds, availability of PNF and suppression resources, and air quality restrictions.

9.41 Protection of Life and Property:

Human life and property will be considered and safeguarded before a PNF is declared. A consideration when managing a PNF is possible closure of the watershed(s) in which the fire is burning or may burn into. Also, smoke will occasionally temporarily reduce visibility along major Park roads and adequate measures such as special signing and road closures may be in order.

9.42 Holding/Suppression Resource Availability:

If at any time sufficient holding forces (including both numbers of people and required qualifications) are not available, PNF ceases to be an option and the fire must be classified as a wildfire and appropriate suppression action taken.

Holding resources must be available to keep the fire within the Maximum Manageable Area specified in the burn plan.

FMU 1. PNF is not allowed. Holding actions will be initiated on a PNF when its perimeter is projected to reach this boundary within 48 hours.

FMU 2. PNF is allowed under a narrower range of conditions than FMU 3. Holding actions will be taken to keep the fire within the Maximum Manageable Area defined in the burn plan.

A PNF in this unit could be allowed to burn uninterrupted out of FMU 2 and into FMU 3.

FMU 3. PNF is allowed under a broader range of conditions. Lightning-caused fires will be allowed to burn uninterrupted until they threaten the established Maximum Manageable Area boundaries or violate some other prescription parameter.

9.43 Number of Ongoing PNFs:

As was demonstrated during the summer of 1992 when an inaccessible lightning-caused wildfire burned for about 1 week, fires can smolder for days, yet not burn even .1 acre. Due to fuel types, climate, ridgetops, remoteness, size of Park, etc., circumstances could occur when there would be little risk in having more than one PNF in the Park at the same time. In FMU 2 no more than three PNFs that are greater than 5 acres are allowed at the same time. In FMU 3 no more than five that are greater than 5 acres are allowed at the same time. The Parkwide total cannot exceed five that are greater than 5 acres in size at any one time. There is no maximum Park-wide burn acreage for any one year. A Maximum Manageable Area will be established for every fire.

9.44 Air Quality:

When an ignition is being considered for classification as a PNF, the air quality regulations of the state that it is in will be consulted. Smoke management is a major concern of the Park; the latest technology available to the Park will be used to minimize potential problems.

9.45 Keetch Byram Drought Index:

Actual Keetch Byram Drought Index values on days when historically Park fires occurred were used to establish the prescription levels.

This prescription parameter will be considered only on the day of ignition to help decide if the fire should initially be considered a PNF. On all subsequent days, the maximum predicted fire perimeter for the next 48 hours in relation to the Maximum Manageable Area and the availability of hold forces will be the primary parameters considered.

The maximum drought index allowable at the nearest weather station to declare a lightning-caused ignition a PNF is:

FMU 2 - 550

FMU 3 - 650

9.46 Staffing Classes:

Staffing classes are based on the NFDRS Burning Index. BI decisions will be based on NFDRS Fuel Models E and R respective to the stations for each state. These stations are the Cherokee RAWS for NC and Indian Grave Gap RAWS for TN.

FMU 3. There is no upper or lower limit for FMU 3. Natural fires will be allowed to burn in all staffing classes. High- and low-intensity fires will meet the Park's resource management objectives. Suppression actions will be initiated based on fire perimeter predictions in relation to the Maximum Manageable Area.

FMU 2. When the current and predicted (next day's) staffing class is 4 or 5, all ignitions will be suppressed unless exempted by the Superintendent.

If the ignition is in a remote portion of the Park, burning primarily towards FMU 3 with no significant values at risk, after review the Superintendent may declare a fire PNF within any staffing class.

9.47 Regional Preparedness Levels:

At Southern Area Preparedness Levels IV and V, all prescribed fires must have daily approval from the NPS Field Director. Tables 5 and 6 summarize the PNF prescriptions.

TABLE 5. INITIAL DECISION-MAKING AND NOTIFICATION FLOWCHART

Fire discovered and reported to Communications Center



Communications Center notifies District Ranger and FMO



District Ranger assigns Incident Commander & Initial Attack Crew



Lightning-caused fire? ⇒ NO - Appropriate suppression response

YES



Fire within FMU 2 or 3 ? ⇒ NO - Appropriate suppression response.
(PNF not allowed in FMU 1)

YES



FMO consults Initial Prescription Parameters



INITIAL PRESCRIPTION PARAMETERS		
Prescription Parameter	FMU 2 Conditional	FMU 3 PNF
Protect Life, Property, Sensitive Resources	All possible adverse effects can be mitigated.	All possible adverse effects can be mitigated.
Holding/Suppression Resource Availability	Resources available to manage projected maximum perimeter within Park boundary for at least 48 hours.	Resources available to manage projected maximum perimeter within unit boundary for next 48 hours.
Regional Preparedness Level	At Region Level IV or above, NPS Regional approval needed.	At Regional Level IV or above, NPS Regional approval needed.
Number of On-Going PNFs	PNF numbers are less than 3 that are greater than 5 acres each. Parkwide total cannot exceed 5.	No more than 5 allowed, greater than 5 acres each. Parkwide total cannot exceed 5.
Air Quality/Smoke Management	All state air quality regulations and burning permit requirements adhered to.	All state air quality regulations and burning permit requirements adhered to.
Keetch Byram Drought Index	< 550	< 650
Staffing Class	PNF disallowed when current and predicted (next day's) Staffing Class both ≥ 4 .*	No lower or upper BI limit.
*Unless specifically exempted by Park Superintendent		



TABLE 5. INITIAL DECISION-MAKING AND NOTIFICATION FLOWCHART (cont'd)

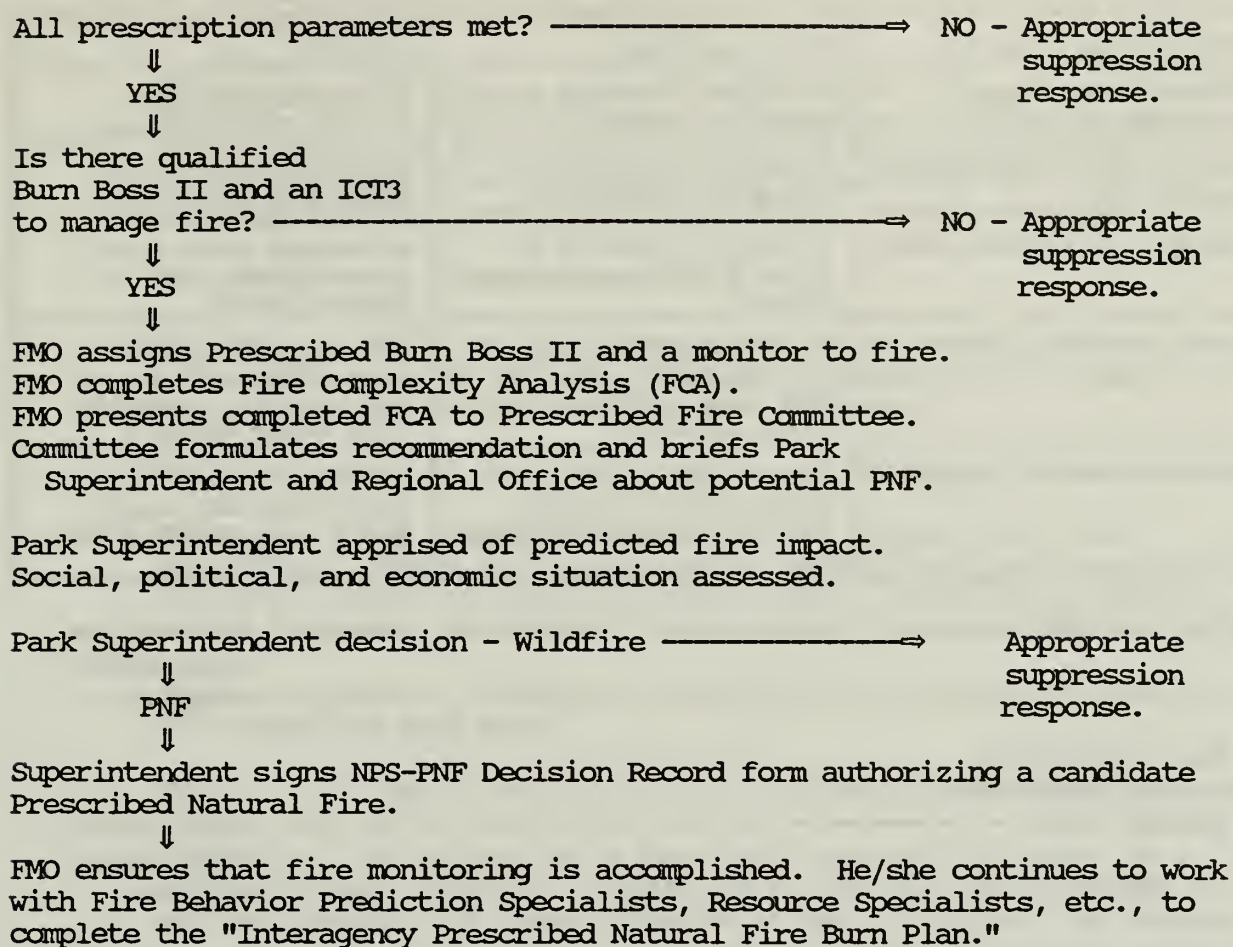
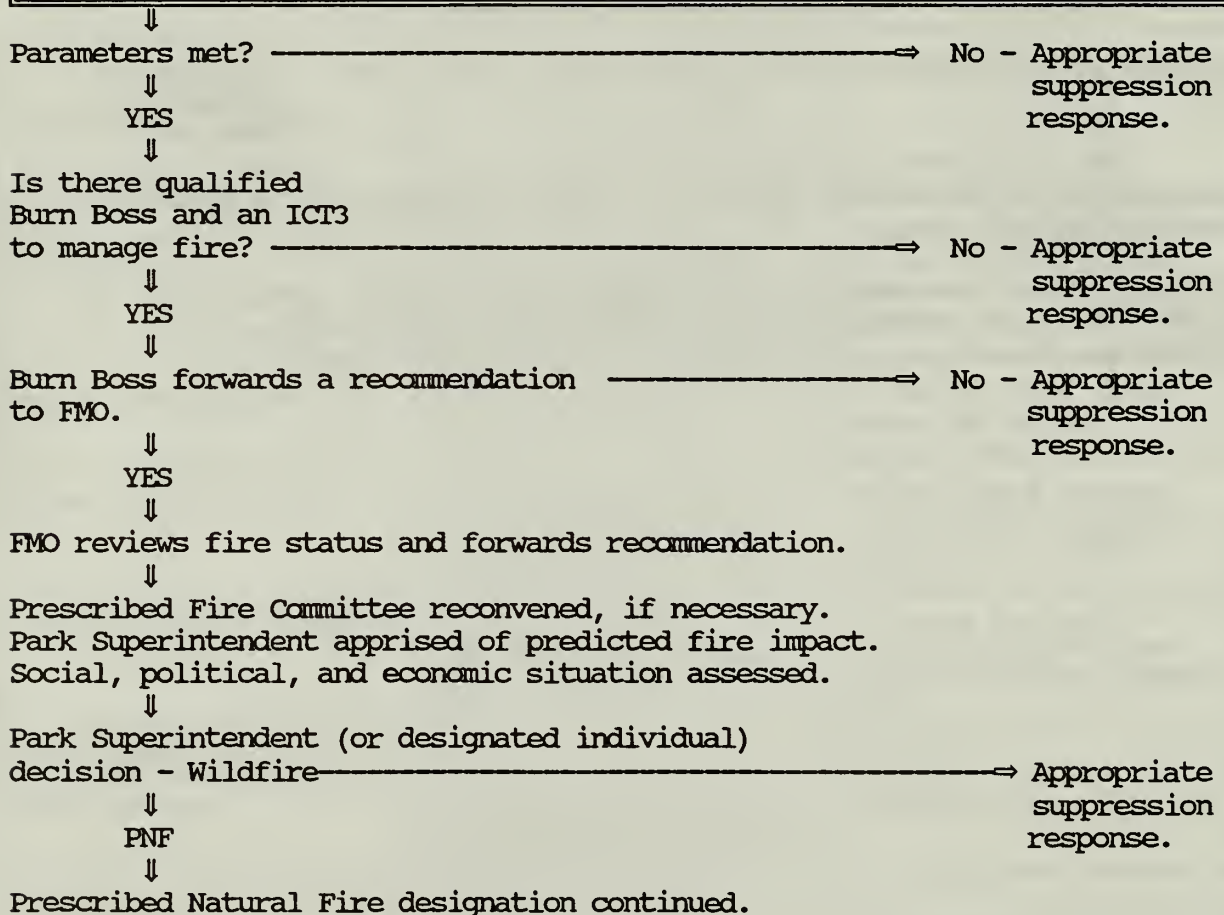


TABLE 6. DAILY REEVALUATION OF PRESCRIPTION PARAMETERS

Prescription Parameter	FMU 2 Conditional	FMU 3 PNF
Protect Life, Property, Sensitive Resources	All possible adverse effects can be mitigated.	All possible adverse effects can be mitigated.
Holding/Suppression Resource Availability	Resources available to manage fire within MMA.	Resources available to manage fire within MMA.
Regional Preparedness Level	At Regional Level IV or above, NPS Regional approval needed.	At Regional Level IV or above, NPS Regional approval needed.
Number of On-Going PNFs	No more than 3 allowed, greater than 5 acres, at same time. Parkwide total cannot exceed 5.	No more than 5 allowed, greater than 5 acres, at the same time. Parkwide total cannot exceed 5.
Air Quality/Smoke Management	All state air quality regulations and burning permit requirements adhered to.	All state air quality regulations and burning permit requirements adhered to.



9.5 POSSIBLE PNF IMPACTS/MITIGATIONS

- a. PNF could adversely affect Park values such as developed, cultural and sensitive natural resource areas.

Mitigation - PNF will be managed so that these areas are not allowed to burn. All values of this nature have been identified, listed, and depicted on a map by watershed so that the Superintendent and Burn Bosses will have this information readily available to them. Prescriptions have been developed and they will be followed.

- b. PNF could escape the confines of the Park.

Mitigation - FMU 2 has been established to reduce this risk. Sufficient resources must be available to effectively implement the holding strategy for at least the next 48 hours.

- c. PNF could adversely impact air quality and smoke may become a hazard.

Mitigation - All PNFs will comply with the appropriate state regulations. Smoke will be managed to reduce the likelihood of it becoming a hazard on roads and other areas. In the event it does become a hazard, the road will be temporarily signed/closed.

The funding/fiscal tracking of the PNF will be the responsibility of the Prescribed Burn Boss.

- d. PNFs will change the composition of existing biotic communities.

Mitigation - No mitigation is necessary because this impact is a desired effect. However, changes due to PNF will be documented as much as possible and formal research on the effects will be sought.

9.6 PNF RECORDS

The final prescribed natural fire project record will include the following:

- Interagency Prescribed Natural Fire Burn Plan
- DI-1202 plus narrative
- Daily weather forecasts and spot weather forecasts
- Cumulative Fire Map showing acreage increase by day
- Total cost summary
- Monitoring data
- Critique of fire projections

These documents will reside in the Park Fire Management Office.

10.0 SMOKE MANAGEMENT

Smoke from wildfires and prescribed fires may decrease visibility both within the Park and in nearby communities such as Townsend, Gatlinburg, Cosby, and Cherokee. Smoke generated by prescribed fire will be managed in compliance with the legal requirements of the Clean Air Act and will comply with air pollution control regulations specified by NC and TN. Smoke on roadways must be monitored and appropriate traffic control measures taken to ensure safety.

In Tennessee, approval for a PNF is obtained from the local county office of the TN State Department of Forestry. In North Carolina, approval for a PNF is obtained from the NC Division of Environmental Management-Air Quality Division.

11.0 PUBLIC SAFETY

All aspects of the GRSM fire program will provide for public safety. Wildfires will be managed so that assigned firefighters and the visiting public are protected. Both management ignited prescribed fire and PNF will be managed so that all safety considerations are adhered to.

Smoke from all fire types must be carefully monitored so that drivers are informed of possible road hazards. Visitors will be informed of fire within specific watersheds, and area closures may have to be implemented to ensure visitor safety.

All fires will be monitored and evaluated as conditions change. The Division of Ranger Activities is responsible for enforcing all closures, and the Burn Boss will ensure that closure and informational signs on all prescribed fires are properly posted.

12.0 PUBLIC INFORMATION AND EDUCATION

The need for this type of program has been documented previously within this and other plans. All Divisions within the Park are responsible to communicate fire's role in the Park ecosystem to the general public. The Interpretation and Visitor Services Division is responsible for the development and dissemination of this information. The Resource Management and Science Division is responsible for consulting on this development when requested. An overall interpretive strategy was developed and documented in 1992.

13.0 ANNUAL PLAN REVIEW/FIRE CRITIQUES

This plan will be reviewed annually by the FMO.

All prescribed fires will be critiqued and a written evaluation will be completed by the FMO on all Burn Bosses for all fires. As indicated in the PNF chapter, all PNFs will be reviewed by the Prescribed Fire Committee. In addition, at least twice per year the committee will meet to evaluate the PNF program.

As indicated within section 7.10, at least the FMO, Chief of Resource Management and Science, and Chief of Ranger Activities will review all Park wildfires over 100 acres in size. Smaller fires may be reviewed if necessary.

For all fires involving a Type I or II Incident Management Team, an in-depth review will be conducted by the Regional Fire Management Officer. Park personnel will participate as requested.

14.0 CONSULTATION AND COORDINATION

The necessity of consulting and working with other agencies, organizations, towns, etc., is unquestioned. Fire suppression, hazard fuel reduction projects, and the writing of major fire management plans are examples of activities that must be done on a coordinated basis.

As noted previously, the Park has numerous Memoranda of Understanding. It is the responsibility of the FMO and personnel of the Division of Ranger Activities to maintain these documents and to ensure that an open line of communication is maintained with cooperators.

Occasionally the Park will need additional wildland fire resources; these will be ordered through the Tennessee Interagency Coordination Center which is part of the Cherokee National Forest.

15.0 BIBLIOGRAPHY

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Sanders, G.L. 1992. The role of fire in the regeneration of Table Mountain pine in the southern Appalachian mountains. Master's Thesis, University of Tennessee, Knoxville. 125 pp.

Spurr, S.H. and B.V. Barnes. 1980 Forest Ecology. Third edition. The Ronald Press Co., New York, NY. 687 pp.

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16.0 GLOSSARY OF TERMS

Confine - Managing a wildfire to remain within predetermined natural boundaries (such as a watershed) until the fire is out.

Contain - Restricting a wildfire to a certain area until out, using natural or constructed barriers that will stop the spread of the fire under the prevailing and forecasted weather conditions.

Control - Fighting a wildfire aggressively through the skillful use of personnel, equipment, and aircraft to establish firelines around a fire to halt its spread, and to extinguish all hotspots until out.

Fuel - All material (whether in the ground, on the surface, or in the air) that may be burned, including duff, logs, branches, needles and twigs. Fuel is divided into four size classes:

- 1-hour time lag - < 1/4 inch (grass, litter, duff)
- 10-hour time lag - 1/4 inch - 1 inch (twigs and small stems)
- 100-hour time lag - 1 inch - 3 inches (branches)
- 1000-hour time lag - > 3 inches (large branches and stems)

Incident Commander Type 3 (ICT3) - The Incident Commander Type 3 is responsible for incident activities of multiple resources including the development and implementation of strategic decisions, and for approving ordering and releasing resources. Depending on the size of the incident, jobs such as operations and logistics may be delegated to other personnel.

Incident Commander Type 4 (ICT4) - The Incident Commander Type 4 is responsible for incident activities of single resources during the initial attack stage of an incident, including the development and implementation of strategic decisions, and for approving, ordering and releasing resources.

Management Ignited Prescribed Fire - The skillful application of fire to natural fuels under conditions of weather, fuel moisture, soil moisture, etc., that will allow confinement of the fire to a predetermined area, and at the same time will produce the intensity of heat and rate of spread required to accomplish certain planned benefits to one or more natural or cultural resource objective.

Maximum Manageable Area (MMA) - Term used to designate the maximum allowable size of a prescribed natural fire. The MMA is a component of the Interagency Prescribed Natural Fire Burn Plan. Once established in the PNF Burn Plan and approved by the Agency Administrator, this fire size is fixed and not subject to change.

Multiple Resource Incident - A multiple resource incident involves the commitment of suppression resources and equipment in multiple increments; i.e., two crews, strike teams, two engines, two dozers for initial attack on fires in known high-risk areas, burning in highly volatile fuels, urban interfaces and generally in areas where final size exceeds 10 acres. Incidents of this nature should normally be identified in fire management

plans so that Dispatchers can mobilize the multiple resources required; normally an "Incident Commander-Multiple Resource" will be expected to manage the incident.

Burning Index (BI) - A number related to the contribution of fire behavior to the effort of containing a fire.

National Fire Danger Rating System (NFDRS) - A system that uses weather, fuel, lightning and human-caused fire occurrence to formulate several indices. It relates only to the potential of the initiating fire. Fire danger is rated from a worst-case approach. It provides guidance for short-range planning.

Prescribed Natural Fire - Any fire of natural origin, such as lightning, which is permitted to burn under specific environmental conditions in predesignated areas.

Timelag (TL) - The time necessary for a fuel particle to lose approximately 63 percent of the difference between its initial moisture content and its equilibrium moisture content.

Single Resource Incident - A single resource incident normally involves the majority of fires, less than 10 acres, and requires the dispatch of single resource increments; i.e., one crew, one engine, one squad. The response may be to naturally occurring fires within identified prescribed fire management units with specified actions outlined in the Fire Management Plan. Actions may be limited to monitoring, keeping within natural barriers (confinement), line construction between natural barriers (contain), or full control due to failure to meet environmental prescriptions. An Incident Commander-Single Resource (ICSR) would provide management direction.

Value - In terms of fire prevention, it is defined as natural or developed areas where loss or destruction by wildfire would be unacceptable.

APPENDIX 1 COOPERATIVE AGREEMENTS (LOCATED IN THE FIRE MANAGEMENT OFFICE)

**APPENDIX 2 WILDFIRE PREVENTION ANALYSIS AND WILDFIRE PREVENTION PLAN
(LOCATED IN THE FIRE MANAGEMENT OFFICE)**

NPS - PNF DECISION RECORD

[illegible]

FORM

(Instructions on reverse side)

NPS-PNF DECISION RECORD-INSTRUCTIONS

Directions: This form must be updated daily and signed by the Superintendent or Acting Superintendent when there are any ongoing prescribed natural fires in the park. It is intended to provide Management with a status report of all active PNFs being managed daily via Part I of the Fire Situation Analysis. Significant changes in management strategy of a PNF are reflected in Part II of the FSA which must be signed by the Superintendent on the FSA document itself. Management of wildfires is done via an approved EFSA.

Status must be indicated as: prescribed natural fire (PNF), wildfire (WF), out (O). If a fire has been declared a wildfire, it may be removed from this list if desired after being noted for 1 day. PNFs that have gone out may be removed from the list if desired after being noted for 1 day.

Based upon existing and forecasted fire weather, all the fires listed except those noted as wildfires are anticipated to remain within prescription in the forecast period of 24 hours. Local or regional personnel and resources are available to monitor the fires or suppress those fires which may exceed prescription, in accordance with the guidelines for fire suppression found in the area Fire Management Plan.

APPENDIX 4

LIMITED DELEGATION OF AUTHORITY

Memorandum

To: _____, Incident Commander

From: Superintendent, Great Smoky Mountains National Park

Subject: Limited Delegation of Authority

As of _____ hours, on this date _____, I have delegated limited authority to manage the _____ fire, number _____, in Great Smoky Mountains National Park.

As Superintendent I have the ultimate responsibility for protection of the park's resources and the lives of park visitors and employees. Your expertise in the area of wildfire incident management will assist me in fulfilling that responsibility during the present situation.

My considerations for management of this fire are:

1. Provide for firefighter, visitor, park resident and neighbor safety.
2. I would like the fire managed under a _____ strategy with the suppression actions done with as little environmental damage as possible. Attached are the NPS definitions of CONFINE, CONTAIN, and CONTROL strategies. Also attached are Minimum Impact Suppression Guidelines.
3. Key cultural features requiring priority protection are:

_____.
4. Key resource considerations are:

_____.
5. Restrictions for suppression actions are: no tracked or wheeled vehicles in the de facto wilderness except where roads exist that are identified for emergency use. Helicopters, powersaws, portable pumps, and leaf blowers may be used as required in the wilderness. Chemical retardant is authorized as stipulated in the park's Fire Management Plan.
6. My agency Advisor/Representative will be
_____.

7. Managing the fire cost effectively for the values at risk is a significant concern.
8. Providing training opportunities for park personnel is requested to strengthen our organizational capabilities.
9. Minimum disruption of visitor access to the park consistent with public safety.

(signed)

Karen P. Wade
Superintendent, Great Smoky Mountains National Park

Date: _____

CONFINE, CONTAIN, CONTROL

The National Park Service recognizes three levels of suppression response: confine, contain, and control.

The differences among these strategies is subtle in many cases, but the consequences can be substantial. The basic definitions are as follows:

- Confine: To restrict the wildfire within determined boundaries, established either prior to, or during the fire. These identified boundaries will confine the fire, with no suppression action being taken on the ground until the fire is out.
- Contain: To restrict a wildfire to a defined area, using a combination of natural and constructed barriers that will stop the spread of the fire under the prevailing and forecasted weather conditions, until out.
- Control: A wildfire, aggressively fought through the skillful use of personnel, equipment, and aircraft to establish firelines around a fire to halt the spread and to extinguish all hot spots until out.

All three of the above strategies require continuous monitoring of fire behavior.

APPENDIX 5

INTERAGENCY PRESCRIBED NATURAL FIRE BURN PLAN

1. General Information (location map, fuel types, etc..)

The intent of this section is to provide simple applicable information about the location within the management unit and information related to the ignition point and area where the fire is expected to burn.

2. Fire Projections (expected and severe weather events)

Some form of analysis is needed to project fire size over time, whether it is FARSITE, RERAP, BEHAVE or other newer technology as it becomes available.

3. Identification of Maximum Manageable Area (MMA)

The identification of the maximum manageable area should include input from staff specialists as applicable. With larger fires that are expected to cover large areas it is recommended that an interdisciplinary approach be taken, so that appropriate interests are represented and concerns are known. As each interest identifies concerns a compromise is reached where all disciplines can eventually agree to the area where the fire will spread. For areas where rapid fire growth is the norm, and duration may be short, this area may need to be defined before ignitions occur.

The term, maximum management area (MMA), serves as the descriptor of the prescribed natural fire geographic or spatial prescription element.

- * the MMA will be developed as part of the initially approved burn plan,
- * all actions planned to reduce fire spread will be annotated by holding lines that are developed within the MMA and displayed in the approved planning document,
- * once established in the PNF Burn Plan and approved by the Agency Administrator, this fire size is fixed and not subject to change,
- * the MMA will define firm limits of management capability to accommodate the social, political, and resource impacts for all PNFs,

4. Statement of Objectives and Narrative Risk Assessment which may consider the following items:

Within this section there should be a list of items that management units must consider when authorizing a natural fire that may burn for many days or months. The list can be extensive or less so, depending on the management unit, the fire, but should include the following statement of objectives and evaluations:

- * firefighter safety,
- * natural/cultural resource objectives and constraints,
- * fire behavior,
- * fire history,
- * threat to life and property,
- * smoke management concerns and dispersion corridors,
- * resources available for current and expected needs,
- * effects on visitors, users, cooperators, local communities, etc...,
- * consideration of effect on other fire management activities,
- * weather/season/drought prognosis

5. Monitoring actions

The intent of this topic is to determine the intensity of monitoring needed and the time frame with which the fire is observed. This may also document when and why a fire will go from aerial reconnaissance to on the ground monitoring teams.

6. Holding actions

This section may act as a place to identify known holding actions that may be expected. If a weak section on the MMA will require line construction and burning out, and then mop-up and patrol, it should be mentioned here with a plan as to how and when this may be done. When executing these actions, it is recommended that clear direction and an action plan be developed to guide the tactical deployment of the manpower needed to accomplish the objectives of the holding action.

7. Estimates of qualified resource needs to manage the fire

Describe the number, type, and qualifications of fire management resources (overhead, crews, engines, helicopters, etc) which will be needed to implement the monitoring and holdings actions.

8. Cost estimate to manage the fire/are adequate funds available?

Calculate a total cost estimate for the managing the PNF, separating costs for planning, monitoring, holding, and evaluation.

9. Contingency actions

Describe the conditions which would result in conversion of the PNF to a wildfire, which may include exceedance of prescription parameters or escape of the fire beyond the MMA. Specify that an EFSA will be prepared which will evaluate a series of suppression options under an appropriate suppression response. Describe who would make the decision to convert the PNF to a wildfire and who would assume command of the wildfire. Describe how the resources assigned to the PNF would be organized to support the suppression effort.

10. Information plan

Describe the provisions to keep the public, cooperators, users, and internal personnel informed of the PNF and its subsequent growth.

11. Decision criteria for routine revalidation

Describe the process and criteria by which the PNF is evaluated to determine if the fire is still burning within prescription parameters and is predicted to remain so for the next 24 hours.

12. Evaluation process

Describe how the fire will be evaluated from both a managerial and resource effect perspective. This may include financial, operational, ecological or similar type assessments.

13. Summary Statement

Describe the relationship of the risk assessment and fire projections to the implementation actions and MMA. This summary statement combines the elements of the PNF Burn Plan and provides a rationale for establishing the MMA based on mitigation of identified risks.

14. Required Signatures

**INTERAGENCY
PRESCRIBED NATURAL FIRE BURN PLAN**

1. General Information

Administrative Unit: _____
Fire Name: _____
Administrative #: _____
Start Date/Time: _____
Discovery Date/Time: _____
Present Size: _____
Location
 Legal/Lat/Long//UTM: _____
 Geographical Location: _____
Fuel Model: _____
Vegetation Type: _____
Slope: _____ Aspect: _____ Elevation: _____

2. Fire Projections and map:

Projected fire area under expected weather conditions: _____ acres on: _____

Projected fire area under severe weather conditions: _____ acres on: _____

3. Maximum Manageable Area (MMA). See attached map _____ acres.

4. Objectives and Risk Assessment Considerations

- a. Threat to MMA
- b. Threat to public use and firefighter safety
- c. Natural/cultural resource objectives and constraints/considerations
- d. Smoke dispersion and effects
- e. Weather/season/drought prognosis
- f. Other

5. Monitoring Actions
6. Holding Actions
7. Resources Needed to Manage the Fire
8. Estimated Costs of Managing the Fire
9. Contingency Actions
10. Information Plan
11. Decision Criteria for Routine Validation
12. Post Burn Evaluation
13. Summary Statement
14. Required Signatures.

Recommended by:

Fire Management Officer
Great Smoky Mountains National Park

Date

Rescommended by:

Chairperson, Prescribed Fire Committee

Date

Approved by:

Superintendent
Great Smoky Mountains National Park

Date

WILDLIFE FIRE MANAGEMENT
NPS-18

Guideline
Section III
Chapter 8
Exhibit 2
Page 1

USDI NATIONAL PARK SERVICE

ESCAPED FIRE SITUATION ANALYSIS

REGION		PARK	
DATE	TIME	EFSA NUMBER	OF

I. FIRE SITUATION

FIRE NAME	CURRENT SIZE
FUEL	FIRE BEHAVIOR
NARRATIVE (attach description of the existing fire situation):	

ALTERNATIVE APPROVED FOR IMPLEMENTATION:

SIGNATURE	TITLE	DATE	TIME
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II. FOLLOW UP

The selected alternative shall be reviewed prior to each operational period to determine if still valid. If not, new EFSA will be developed.

OPERATIONAL PERIOD REVIEW

[illegible]

III. EVALUATION CRITERIA

For each category develop the Agency Administrator decisions on specific objectives, expressed as measurable criteria, to be used in the selection of the preferred alternatives.

CRITERIA (Check those criteria which MUST be met)	MUST
ECONOMIC:	
ENVIRONMENTAL :	
SOCIAL :	
OTHER :	
APPROVED BY: (Agency Administrator)	Date & Time

IV. ALTERNATIVES

	A	B	C	D
GENERAL PLAN OF CONTROL (STRATEGIC)				
SPECIFIC PLAN OF OPERATION (TACTICAL)				
PROBABILITY OF SUCCESS				
ESTIMATED CONTROL TIME				
ATTACH MAPS OF ALTERNATIVES				

V. EFFECTS

	A	B	C	D
SIZE (Predicted final size in acres)				
MARKET ELEMENTS Improvements Recreation Concessions Fees enhancement Special use permits Water Other (Specify)				
SUM OF RESOURCE DAMAGE	\$	\$	\$	\$
NON-MARKET ELEMENTS Smoke Visual Vegetation Threatened & Endangered Species Other (Specify)				
SUM OF RESOURCE DAMAGE	\$	\$	\$	\$
SOCIAL ELEMENTS Firefighter Safety Public Concern Public Safety Cultural Archaeology Other (Specify)				
SUM OF SOCIAL DAMAGE	\$	\$	\$	\$
SUM OF LOSSES	\$	\$	\$	\$
SUPPRESSION COSTS	\$	\$	\$	\$
COST PLUS LOSS	\$	\$	\$	\$

VI EVALUATION

ALTERNATIVES

CRITERIA (From Section III)	A	B	C	D
<u>ECONOMIC</u>				
<u>ENVIRONMENTAL</u>				
<u>SOCIAL</u>				
<u>OTHER</u>				
TOTAL				

KEY: 0 = Does not meet criteria
1 = Partially meets criteria
2 = Fully meets criteria

VIL DECISION TREE

Include Decision Tree Analysis.

Preferred Alternative _____

APPENDIX 7

FIRE COMPLEXITY ANALYSIS

The following questions are presented as a guide to assist the Superintendent and staff in analyzing the complexity or predicted complexity of a fire situation. Because of the time required to assemble to move an Incident Management Team to a fire, this checklist should be completed when a fire escapes initial attack and be kept as part of the fire records. This document is prepared concurrently with the preparation of a new or revised Escaped Fire Situation Analysis.

USE OF THE GUIDE

Analyze each element and determine if it is true for your fire.

1. If there are more positive responses than negative, the fire is predicted to become more complex.
2. If any two of the major headings are totally positive, the fire is predicted to become more complex.
3. If a review of the factors caused you to become uncertain as to the current management of the fire.

If any of the above is true, you should call for assistance.

FIRE COMPLEXITY ANALYSIS GUIDE

<u>FIRE BEHAVIOR:</u>	Observed or Predicted	Yes/No
1. Burning Index (From on-site measurement of weather conditions). Predicted to be above the 90% level using the major fuel model in which the fire is burning.		___/___
2. Potential exists for "blowup" conditions (fuel moisture, winds, etc).		___/___
3. Crowning, profuse or long range spotting.		___/___
4. Weather forecast indicating no significant relief or worsening conditions.		___/___
TOTAL.....		___/___

RESOURCES COMMITTED

1. 200 or more personnel assigned. ___/___
2. Increasing number and variety of support personnel and/or equipment. ___/___
3. Substantial air operation which is not properly staffed. ___/___

4. Majority of park initial attack resources are committed. /
- TOTAL..... /

PARK RESOURCES THREATENED

1. Urban interface. /
2. Park developments and facilities. /
3. Cultural sites. /
4. Restricted, threatened or endangered species habitat. /
5. Unique natural resources, special designation zones, wilderness. /
- TOTAL..... /

SAFETY

Yes/No

1. Unusually hazardous fireline conditions. /
2. Serious accidents or fatalities. /
3. Threat to safety of park visitors from fire and related operations. /
4. Park restrictions and/or closures in effect or being considered. /
5. No night operations in place for safety reasons. /
- TOTAL..... /

JURISDICTION

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..... /

EXTERNAL INFLUENCES

1. Controversial fire policy. _/_
2. Pre-existing controversies/relationships. _/_
3. Sensitive media relationships. _/_
4. Smoke management problems. _/_
5. Sensitive political interests. _/_
- TOTAL..... _/_

CHANGE IN STRATEGY

1. Change in strategy to control from confine or contain. _/_
2. Large amounts of unburned fuel within planned perimeter. _/_
3. EFSA invalid or requires updating. _/_
- TOTAL..... _/_

EXISTING OVERHEAD

1. Worked two operational periods without achieving initial objectives. _/_
2. Existing management organization ineffective. _/_
3. Overhead over extended themselves mentally and/or physically. _/_
4. Incident action plans, briefings, etc. missing or poorly prepared. _/_
- TOTAL..... _/_

APPENDIX 8

NPS SOUTHEAST REGION WILDLAND FIRE MONITORING GUIDE

WILDLAND FIRE MONITORING POLICY SOUTHEAST REGION October, 1992

I. INTRODUCTION

Departmental Manual Part 910 and NPS Fire Management Guidelines (NPS-18) address the need to monitor and document environmental conditions, (including drought and severity) and fire behavior, and to assess and document the effects of fire on park resources for all fires, whether prescribed or a wildfire. NPS 18 also requires that local monitoring protocol be specified in the park Fire Management Plans (FMP). The degree of monitoring required varies considerably depending on the overall goals and objectives of the park Resources Management Plan (RMP).

Specific monitoring techniques are highly variable and will not be addressed in this guide. The monitoring/documentation standards listed in this document are the minimum for the Southeast Region and are in addition to those required by the Individual Fire Report (DI-1202), Escaped Fire Situation Analysis (NPS-18, Section III, Chapter 8, Exhibits 2 and 3), Fire Situation Analysis (NPS-18, Section III, Chapter 5, Exhibit 1).

NPS policy requires all fires to be monitored until declared out.

II. OBJECTIVES

1. To ensure that all park areas required to have a FMP adequately monitor drought conditions, and that parks with an active fire program have a severity monitoring procedure in operation prior to and during the wildfire and prescribed fire seasons.
2. To ensure that all fires within the Region are adequately monitored and documented.

III. MONITORING REQUIREMENTS

A. WILDFIRE

1. Parks without a full-time FMO:

These parks will be responsible for obtaining the following information and for maintaining it in their files along with the Individual Fire Report. The frequency of collecting the information specified will vary with each fire situation. For fires which do not go beyond the initial attack stage, one map and one set of weather observations along with the fire activity and fire effects reports are required. For fires going beyond initial attack, the frequency of mapping and collecting weather observations increases.

Required Minimum Documentation:

- a. Map of the burned area.
- b. Preceding and current drought indicator readings. (For acceptable drought indicators, refer to NPS-18, Section III, Chapter 5, page 15 1.b.)

c. Fire weather conditions

- Maximum temperature during burning period(s)
- Average wind speed and direction during burning period(s)
- Minimum relative humidity during burning period(s)
- State of weather, e.g., cloud cover, type of rain, snow, lightning activity.

d. Fire activity narrative:

This section may be highly subjective. Address as many of the items listed below as you can, and any additional items you feel are appropriate. Specify the degree of accuracy of the values recorded. For example, "rates of spread and days since rain were simply guessed at". Or, "rates of spread were determined by actual measurements and days since rain was determined from weather records".

- Fuel/vegetation type
- How did the fire behavior (rate of spread and flame length) affect your selection of suppression strategy. Note any extreme fire behavior such as torching or crowning.
- Fire type (e.g. smoldering, creeping, running and crowning)
- Photo documentation required.
- Estimated or exact days since last rainfall and amount. Specify if estimated or actual value.
- How did the smoke disperse? Did any columns develop? Any traffic problems?

e. Fire effects narrative:

This section is also highly subjective. Address the appropriate items listed below, and any additional items you feel should be included in the narrative. Specify the degree of accuracy of the values recorded. For example, "percent of tree canopies which were totally consumed was estimated at 10% after simply walking through the burn area". Or, "after walking along the hottest part of the fire, which was at the west edge, I estimated that about 50% of the trees were charred about 3' high".

- Were tree canopies partially or completely consumed (scorched)?
- Was the duff or soil burning after the fire passed?
- Did you notice any effects on animals?
- Was there a lot of unburned area within the fire perimeter?
- How high up the tree was the bark blackened (charred) by the fire?

- Photo documentation required.
- Were any rare, threatened, or endangered species affected?
- Did suppression tactics such as handlines or plowlines significantly affect any resources?
- Were any cultural resources impacted?
- What affect, if any, did the fire have on visitor use?

2. Parks with a full-time FMO:

At a minimum, all items in the preceding section must be addressed by park areas within this category. Additional weather, fuel, and fire effects documentation may be warranted based on requirements outlined in the park's RMP and FMP. For example, more in depth weather, fuel, and fire behavior data may be needed to verify fire behavior model predictions. In addition, suppression strategies such as contain and confine warrant special documentation to complete Escaped Fire Situation Analysis and Fire Situation Analysis.

B. PRESCRIBED FIRE

1. Prescribed Burns:

Required Minimum Documentation:

- Primary fuel type
- 1 and 10 hour fuel moistures at burn site at time of ignition. Note how values were obtained, e.g. actual measurement of fuels, from moisture module of behave, relative humidity and temperature tables, etc.
- Standard weather observations as listed above in the section pertaining to "Wildfire".
- Local method of determining drought (e.g. soil moisture, Burning Index, Emergency Release component, 1,000 Time Lag Fuel Moisture Content, or accepted drought index) and current reading.
- Fire behavior; either estimate or take actual measurements of the range of rate of spread and flame length.
- Smoke duration, direction of movement, and amount.
- Standards specified in respective RMP, FMP, and burn plan.

2. Prescribed Natural Fires:

Monitoring requirements for park areas with prescribed natural fire programs will be governed by their RMP and FMP documents. Issues related to drought condition monitoring, air quality, cultural resource and threatened and endangered species protection will be addressed specifically in the FMP and burn plans.

V. WILDFIRE SEVERITY MONITORING

Parks identified below which have active fire programs must establish a method for analyzing present and future fire danger so that potential wildfire severity can be forecasted and prescribed fire prescriptions developed. Examples of these indicators include water levels, soil moisture, drought indices, and Energy Release Component.

Big Cypress NP, Big South Fork NRRRA, Cape Hatteras NS,
Congaree Swamp NM, Cumberland Island NS, Everglades NP, Great Smoky
Mountains NP, and Natchez Trace Parkway.

The indicator(s) chosen should be compared to fire occurrence. More specifically, the number of fires occurring under a specified set of criteria should be determined. Examples could be fires that burned for more than one day or where crowning was observed or fires which smoldered for a number of hours after the fire front passed. This occurrence information should be compared to the severity indicator values recorded on those days when the fires identified by the chosen criteria burned. Refer to Attachments A, B, and C for additional discussion and examples.

The comparison of fire occurrence and monitoring values can be completed using several methods. For example, by simple inspection of the data one may be able to determine some critical values. Or, more sophisticated statistical, graphic, or computer program methods may be used. A PC computer program developed by Andrews and Bradshaw is available to identify most appropriate severity indicators.

VI. NEAR AND LONG TERM MONITORING

Monitoring requirements and capabilities for a particular fire (prescribed or wild) is dependent on many factors. For example, personnel constraints, burn objectives, fuel model verification needs, status of vegetation and wildlife fire effects knowledge, etc. all impact the scope of monitoring.

General goals for fire monitoring should be identified in the RMP. Specific standards for each prescribed burn or prescribed natural fires must be clearly articulated in either the FMP or a specific burn plan or both.

The decision to conduct long term monitoring, and the level of monitoring intensity, will be based upon the requirements of the FMP, the RMP, and the near term monitoring results. Long term monitoring is defined as that monitoring which takes place beyond one year of the date that the fire is declared out.

Guidelines for initiating post-wildfire long term monitoring are specifically identified in NPS-18, Section III, Chapter 6 FIRE RESEARCH. If you have questions concerning long term monitoring, contact the Regional Fire Coordinator.

REFERENCES

Management Policies of National Park Service

NPS-18 Fire Management Policy (June 1990)

* Publication by Andrews and Bradshaw

Southwest Region Standard Operating Procedure 90-15, Wildland Fire Monitoring,
(November 1990)

Special Directive 89-7, Fire Management Review Team Report

Western Region Fire Monitoring Handbook (February 1990)

EXAMPLE #1 OF USING "ENVIRONMENTAL MONITORING PROCEDURE"

Step 1. Select drought or environmental indicator for the park.

More than likely your choices will be either the Keetch Byram Drought Index (KBDI) or the Palmer Drought Index (PDI).

Given the choices mentioned above, the one that would reflect the drought condition of your area the best would be a KBDI calculated with weather data (only maximum temperature and rainfall is needed for this index) from your park area. The second best choice would be to get a KBDI that was calculated for a location near your park. A local state or national forest office could well be calculating it already.

The third choice would be to use the palmer drought index. This index is calculated by the National Weather Service and should be available from the fire weather forecaster at your state office.

As will be pointed out later in this analysis, you will need the selected severity monitoring indicator for the dates of historical fires which are selected.

For the sake of working through an example exercise, we have selected the KBDI for a hypothetical park.

Step 2. Develop the criteria which will determine which historical fires were important from the suppression standpoint.

By looking over historical records, you may be able to determine what criteria would be important for your area. For example, should this analysis include all fires which occur under normal conditions, those which burned over 5 acres, those which burned more than one day, or those which appeared to meet some environmental objective? Normal conditions are defined as the average fuel and weather conditions that you have during the fire season. In addition, in terms of initial attack capability, only consider your normal type and number of resources (firefighters, engines, etc.).

If your area does not have any historical fires documented (or only a couple), it may be worthwhile to contact a local state or county forestry office to see if they have any fire information that you can use for this analysis. Borrow only fire information from fires that have burned in fuel types similar to yours. For example, if you have hardwood forests don't borrow data from grass or pine fuel type fires. Try to come up with at least ten fires to analyses. Fewer than five may not be worthwhile using the graphical method shown below whereas the more fires over ten that you have, the better. For our hypothetical park, we have chosen to consider all fires that have occurred under normal weather conditions within the past 10 years.

Step 3. Go through fire records and determine dates of the fires that meet the above criteria.

For our hypothetical park, we recorded the dates of each of the 17 fires we are going to consider.

Step 4. Determine the drought or severity indicator values for those dates when fires occurred.

For our hypothetical park, determine the KBDI for the 17 dates that our fires were started.

<u>Date</u>	<u>KBDI</u>
2/25/81	348
2/26/81	300
3/14/81	402
3/01/82	425
3/30/82	506
11/02/82	634
3/17/83	483
2/26/84	387
3/26/85	492
4/15/85	537
5/03/86	482
3/03/87	420
3/25/88	554
4/20/88	640
11/23/88	367
5/02/89	401
4/10/90	573

Summary of number of fires by KBDI in units of 50:

<u>KBDI Ranges</u>	<u>Number of Fires</u>
0 - 250	0
250 - 300	1
300 - 350	1
350 - 400	2
400 - 450	4
450 - 500	3
500 - 550	2
550 - 600	2
600 - 650	<u>2</u>
Total	17

Step 5. Plot the number of fires that occurred over the KBDI on a graph. For our hypothetical park example, see ATTACHMENT B.

Step 6. Draw a representative line through the data points.

For our hypothetical park example, see ATTACHMENT B.

Step 7. The point at which the line intersects the lower axis is important. A range on either side of this point can be estimated for drought condition monitoring.

For our hypothetical park example, under the normal conditions considered, it can be estimated that at about at KBDI of 300 might begin having some ignitions. Also, on a relative basis at about 400 or higher it appears that the probability of ignition is quite high.

Based on this information, some crude preparedness levels could be inferred. Between 0 and 300 could be considered low fire danger. Between 300 - 400 could be considered moderate fire danger. And, 400+ could be considered a high fire danger.

Summary:

This analysis should help correlate future weather conditions with past environmental conditions so that you can be aware of increased fire danger. It is important to remember those assumptions that you made when selecting the fires for this analysis, especially what you considered normal weather.

It is important to note that under similar weather and topographic conditions one should expect more intense fires the higher your KBDI or PDI, (due to increased available fuels). However, even at low indexes, fires could be difficult to control depending on wind speed and moisture content of the smaller diameter fuels. Don't drop your guard just because your severity (drought) indicator is low.

EXAMPLE #2 OF USING "ENVIRONMENTAL MONITORING PROCEDURE"

Step 1. The KBDI was chosen as a drought index, as in Example 1.

Step 2. Develop the criteria which will determine which historical fires were important from the suppression standpoint.

In Example 1, we chose to use all of the fires which occurred under normal conditions. We were not more selective because there were relatively few fires to analyze. However, in Example 2. we have more fire records to choose from so we want to have a narrower set of criteria from which to decide which fires are significant.

The objective in this example is more specific. We will determine at about what KBDI that we can expect to have problems in making our initial attack in our most troublesome fuel type.

First, decide which of the historical fires posed control problems for your normal firefighting resources. As in the example above, do not consider those fires which occurred under some atypical conditions. If you cannot determine from the narratives or by some other way which fires posed control problems, try to make the determination by using size of fire as a criteria.

For this example we have three criteria: (1) Fires must have posed some type of control problem such as the intensity was so hot that firefighters had a difficult time making a direct attack; (2) The fires had to have occurred under normal weather conditions; (3) The type and number of suppression resources assigned to the fire were your normal complement.

Step 3. Go through fire records and determine dates of the fires that meet the above criteria.

For our hypothetical park, of the 30 fires within the period of review, we recorded the dates of each of the 17 which met our criteria in Step #2. Most of the fires not included were eliminated because they did not amount to much; they were easily suppressed.

Step 4. Determine the drought or severity indicator values for those dates which have been identified as "significant" fires.

For our hypothetical park, determine the KBDI for the 17 dates that we had fires which posed some control problems.

<u>Date</u>	<u>KBDI</u>
2/25/81	348
2/26/81	300
3/14/81	402
3/01/82	425
3/30/82	506
11/02/82	634
3/17/83	483
2/26/84	387
3/26/85	492
4/15/85	537
5/03/86	482
3/03/87	420
3/25/88	554
4/20/88	640
11/23/88	367
5/02/89	401
4/10/90	573

Summary of number of fires by KBDI in units of 50:

<u>KBDI Ranges</u>	<u>Number of Fires</u>
0 - 250	0
250 - 300	1
300 - 350	1
350 - 400	2
400 - 450	4
450 - 500	3
500 - 550	2
550 - 600	2
600 - 650	<u>2</u>
Total	17

Step 5. Plot the number of fires that occurred over the KBDI on a graph. For our hypothetical park example, see ATTACHMENT C.

Step 6. Draw a representative line through the data points.

For our hypothetical park example, see ATTACHMENT C.

Step 7. The point at which the line intersects the lower axis is important! A range on either side of this point can be estimated for drought condition monitoring.

In Example 1, it was estimated that at about a KBDI of 300 we might begin having some ignitions and at about 400 or higher it appeared that the probability of ignition was quite high. Based on the information some preparedness levels were inferred.

In Example 2. our selection criteria was narrower. We were not just interested in ignitions, but fires with control problems. Thus we excluded numerous fires of low intensity.

As a result of the narrower criteria, even though the same number of fires were graphed and the fires had the same KBDI indexes, the inferences are much different.

In this example, it appears that when an index of 250 is reached one had best already be prepared for challenging suppression action, not simply just ignitions. And by the time you get to 400 - 450, resources should be in a high state of readiness.

Summary:

This analysis should help correlate future weather conditions with past environmental conditions so that you can be aware of increased fire danger. It is important to remember the assumptions that you made when selecting the fires for this analysis, especially what you considered normal weather.

It is also important to note that under similar weather and topographic conditions one should expect more intense fires, the higher your KBDI or PDI (due to increased available fuels). However, even at low indexes fires could be difficult to control depending on wind speed and moisture content of the smaller diameter fuels. Don't drop your guard just because your severity (drought) indicator is low.

APPENDIX 9

PRESCRIBED FIRE NOTIFICATION LIST

NPS Notifications

Field Area FMO	(404) 331-4290
Superintendent, GRSM	(423) 436-1201
Communications, GRSM	(423) 436-1230
Chief Ranger, GRSM	(423) 436-1225
Chief RM & Science, GRSM	(423) 436-1205
Little River District Ranger	(423) 436-1267
Cades Cove District Ranger	(423) 436-2472
Oconaluftee District Ranger	(704) 497-9147
Abrams Creek Ranger	(423) 856-2445
Big Creek Ranger	(704) 486-5910
Cataloochee Ranger, Radio Only	215
East District Ranger	(423) 487-5418
Information Officer	(423) 436-1207
Knoxville Tanker Base	(423) 982-1372
Sugarlands Visitor Center	(423) 436-1290
Luftee Visitor Center	(704) 497-9146

Interagency Notifications

Tennessee Interagency Coordination Center (Cherokee National Forest)	(423) 476-9762
Tennessee State Department of Forestry	
Sevier County	(423) 984-2399
Blount County	(423) 982-6264
Cocke County	(423) 623-3602
NC Interagency Coordination Center (National Forests in North Carolina)	(704) 257-4264
Nantahala NF Dispatch Office	(704) 524-6441
Pisgah NF Dispatch Office	(704) 877-3350
Cherokee Indian Reservation	(704) 497-9131
NC State, Graham County	(704) 479-6341
NC State, Swain County	(704) 488-3932
NC State, Jackson County	(704) 586-4007
NC State, Haywood County	(704) 627-2474
TN Division of Air Pollution Control	(615) 594-6035

Fire Departments

Tennessee

Blount County Fire Department	(423) 983-2133
Cosby Volunteer.	(423) 623-8777
Gatlinburg Fire Department	911 or (423) 436-4984
Pigeon Forge	(423) 453-4044
Pittman Center Volunteer	(423) 436-9684
Sevierville/Sevier County	(423) 453-4633
Walden Creek Volunteer	(423) 453-3123
Wears Valley Volunteer	(423) 428-4232

North Carolina

Bryson City Fire Department	(704)	488-3435
Cherokee	(704)	497-3051
Haywood County	(704)	456-8611
		456-5363
Maggie Valley	(704)	456-6600
Swain County	(704)	488-3463
Waynesville	(704)	456-8611
NC Division of Environmental Management		
Air Quality	(704)	251-6208
FAA McGee Tyson Airport	(423)	970-3066

Police Departments

Tennessee

Gatlinburg Police Department	911 or (423)	436-4212
		436-5181
Pigeon Forge	911 or (423)	453-9063
		453-4044
Sevierville	911 or (423)	453-5507
Maryville	(423)	984-7900
Townsend	(423)	448-6072
Newport	(423)	623-8777
Blount County Sheriff's Office	(423)	982-5263
		983-3620
Cocke County Sheriff's Office	(423)	623-3064
		623-3065
Sevier County Sheriff's Office	(423)	453-4668

North Carolina

Waynesville Police Department	(704)	456-5363
Sylva	(704)	586-2916
Franklin	(704)	524-2864
Bryson City	(704)	488-3050
Cherokee	(704)	497-4131
Graham County Sheriff's Department	(704)	479-3352
Jackson County	(704)	586-2459
Macon County	(704)	524-6421
Swain County	(704)	488-2197
Landowners		As Appropriate
Inholders		As Appropriate

