Great Smoky Mountains National Park

Fire Management Plan

Environmental Assessment

October 2009

Environmental Assessment

Executive Summary

Fire Management Plan

Great Smoky Mountains National Park

This Environmental Assessment (EA) addresses the proposal by the National Park Service (NPS) to update, develop and implement a Fire Management Plan (FMP) for Great Smoky Mountains National Park (Park or GRSM). The FMP addresses fire management operations for the entire Park and encompasses a five year program period of those operations.

Two alternatives are analyzed in this document. Alternative 1 is the No Action Alternative and Alternative 2 is the Implement National Fire Management Policy Alternative.

Alternative 1, No Action Alternative -. The No Action alternative is presented as a requirement of the National Environmental Policy Act, (NEPA) and is the baseline condition with which proposed activities are compared. This alternative represents a continuation of current management actions; it does not mean an absence of active management of fire and fuels. Under the no-action alternative, the Park would remain geographically divided into three fire management units (FMU), and park managers would develop an "appropriate management response" to all wildland fires. The appropriate management response is currently restricted to suppression actions for all wildfires in FMU 1, and for all human-caused fires throughout the park, regardless of FMU. Lightning-ignited fires may be managed for resource benefits in FMUs 2 and 3, a practice that has been called Wildland Fire Use. Finally, under the current plan, the Park may conduct prescribed burns and hazard fuel reduction projects in selected areas.

Alternative 2, Implement Fire Management Policy Alternative *(Environmentally Preferred and Preferred Alternative)* - Under Alternative 2, the Park would be divided into two fire management units, and a "strategic fire response" would replace the appropriate management response. Unlike adaptive management response, strategic fire response is more holistic and allows for a full range of management options and tactics to be considered and implemented on all wildland fires. Additionally, multiple objectives may be considered on each fire, and those objectives may change as the fire spreads across the landscape. Typically, strategic fire response will range across a spectrum of tactical options (from monitoring fire spread at a distance to intensive suppression actions). Beginning with the initial action to any wildfire, decisions will reflect the goal of using available firefighting resources to manage the fire for the safest, most effective, and most efficient means available while meeting identified fire management unit objectives. Under Alternative 2, the Park will continue to conduct prescribed burns and hazard fuel reduction projects in selected areas.

The environmental consequences of each alternative are very similar, given that Alternative 2 is a logical outgrowth of implementing appropriate management response policies over the years. It is not unexpected that the environmental consequences or impacts associated with each proposed alternative would be similar. Alternative 2 permits a bit more discretion in methods and thus may increase acres burned and therefore slightly increase potential for short –term impacts to air quality

and also an increased potential for extended response operations thereby slightly affecting park management and operations. Public access by visitors and the surrounding community would only see a negligible increase in disruption of their uses by fire operations extending.

Public Comment

If you wish to comment on the environmental assessment, you may mail comments to the name and address below. This environmental assessment will be on public review for 30 days. The EA has been posted and is available for public review on the NPS' Planning web site at http://parkplanning.nps.gov/grsm. Click on the "*Fire Management Plan EA*" link. The public can provide comments directly on the project site by clicking on "Comment on document" from the menu on the left. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so.

COMMENTS MUST BE RECEIVED BY October 9, 2009. Written comments may be received later if postmarked by November 10, 2009. Please address written comments to:

Superintendent
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

Comments may also be submitted on the NPS' Planning web site at http://parkplanning.nps.gov/grsm as described above.

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INTRODUCTION

Great Smoky Mountains National Park (GRSM or Park) proposes to update and improve its Fire Management Plan (FMP) as recent fire program management guidance and policy has changed. Fire management policy has evolved since the last FMP Environmental Assessment (EA), which was prepared in 1996. This document supersedes the earlier versions of Great Smoky Mountains National Park Fire Management Plan/EAs. This document describes the alternatives and their consequences relative to implementation of a comprehensive fire program including wildland fire response, fire prevention and fuels management utilizing prescribed fire and mechanical treatments.

The scope of the Fire Management Plan is confined to areas within the authorized boundaries of GRSM. Therefore, the Fire Management Plan would address the approximately 520,000 acres of federal land. However, this EA does consider impacts within the Park and adjacent areas that could reasonably be impacted by fire management actions.

1.1 Purpose and Need

1.1.1 Purpose

National Park Service (NPS) Management Policies (2006) direct individual parks to manage natural resources, and to maintain, rehabilitate, and perpetuate their inherent integrity. Fire management consists of a series of activities that protect resource values, life and property and where appropriate, are used as management tools to meet resource management objectives. The purpose of this planning effort is to effectively manage fire in order to meet those management goals and objectives.

The Park's fire management goals are to:

A. **Protect human life, communities, and resources from the adverse effects of wildfire without compromising safety**.

- Ensure that firefighter and public safety is the first priority in every fire management action.
- Manage an efficient wildland fire preparedness organization according to established plans, protocols, and guidelines to prevent, detect, and take effective management action on all wildland fires.
- Use pre-treatment and suppression-oriented actions to reduce risk from fire to identified resource values at risk, private lands, developed areas and infrastructure.
- Simulate the effects of natural fires and/or reduce fuel loading in areas of the park where a fire escape may threaten lives and/or property of employees, visitors and neighbors.

B. **Maintain and restore fire adapted ecosystems using appropriate tools and techniques in a manner that will provide sustainable environmental and social benefits**.

- Support the park's mission by providing fire management tools to restore and perpetuate fire-adapted vegetation characterized by a mosaic of forest structure and age classes. Mimic natural fire regimes as directed by resource management objectives.
- Restore and maintain fire-tolerant and drought-adapted vegetation on dry sites within the park, thereby reducing the probability of unusually large-scale disturbances such as disease and insect epidemics, drought-induced mortality or large, high severity fires.
- Manage fires using the full range of management strategies to protect, restore, or maintain resources and developments within and adjacent to the park.

C. **Integrate knowledge generated through fire and natural resource research into fire management priorities, decisions and action**s.

- Improve fire prescriptions for management ignited fires (through fire effects monitoring) that will be safe, capable of restoring and maintaining park ecosystems and meet resource objectives.
- Ensure fire management program activities are integrated into land and resource management planning alternatives, goals, and objectives to fully complement one another in support of an ecological approach to resource management.
- Insure the program is responsive to input from resource management research efforts, interagency partners and the public.

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

- Every wildland fire will be evaluated for strategic fire response. As appropriate within the guidance of this plan, wildfires which have been determined to be beneficial to the resource will be managed to achieve resource objectives. Fires may be managed to meet multiple objectives.
- Manage wildland fire as a dynamic ecosystem process to the maximum extent feasible.

E. **Communicate and coordinate with interagency organizations and other stakeholders to pursue common goals, programs and projects.**

- Maintain an interagency fire program that provides for safe, cost effective, efficient and ecologically sound fire management addressing resource goals and reducing threats to life, property and other resource values across boundaries.
- Foster understanding, appreciation and support among visitors and neighbors for the wildland fire, prescribed fire, fuels, and aviation programs through park interpretation, public information, media, and inviting the media, private landowners, public officials, park visitors, etc., to observe fire management operations.
- Conduct educational outreach programs.
- Conduct a fire prevention program in cooperation with other agencies to reduce risks to human life, physical facilities and cultural resources; decrease modification of park

ecosystems by excessive human-caused wildland fires.

F. **Build and promote organizational effectiveness by building program capacity, leadership, and effective management practices.**

- Implement a safe and objectives-oriented fire management program by identifying fire program skill requirements and responsibilities; actively recruiting, retaining, and training staff; and maintaining qualifications and developing employees through assignments.
- Promote teamwork and leadership development.
- Effectively manage fire actions commensurate with values at risk and meet incident objectives while employing fiscal responsibility.
- Reduce unnecessary financial burden to the park by managing fires using the full range of options to protect, enhance, and restore resources and developments within and adjacent to the park.

The management goals described above will be achieved through the Park's preparedness, wildfire response, prescribed fire, prevention, interpretive programs, and cooperative research efforts. These programs are briefly discussed within the EA as they relate to the goals; however, each will also be discussed in more detail in the FMP.

Concurrent with this EA, a Fire Management Plan (FMP) has been developed to direct fire management activities based on these goals. This plan formally identifies Fire Management Units, values to be protected and individual management actions in conformance with NPS fire management policies.

1.1.2 The Need

Natural systems contain communities that are fire adapted or fire dependent and may require periodic fire to retain their ecological integrity. Loss of fire (suppression) can result in diminished integrity including unnatural succession, loss of species, and vulnerability to intense wildland fire based on fuel loading. The National Park Service's *Management Policies* (2006) and Director's Order 18 – Wildland Fire Management – require that each park area with vegetation capable of sustaining fire, develop a plan to manage fire on its lands. To comply with NPS policy, GRSM needs to have a comprehensive fire management program that protects natural and cultural resources, the public, and employee and park facilities. This update is necessary due to recent changes in both national interagency fire policy and National Park Service fire policy.

1.2 Background

Relevant Laws, Policies, and Planning Documents

A multitude of laws, regulations, and policies influence development and implementation of a Fire Management Plan at GRSM. The following relate directly to preparation of a Fire Management Plan and Environmental Assessment for the Park.

NPS Organic Act of 1916 – Congress directed the U.S. Department of the Interior and NPS to manage units "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" (16 U.S.C. § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no "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" (16 U.S.C. § 1 a-1).

National Environmental Policy Act (NEPA) – The purpose of NEPA is to encourage productive and enjoyable harmony between man and his environment; to promote efforts which would prevent or eliminate damage to the environment and stimulate the health and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements are satisfied by successful completion of a NEPA document which would include a Categorical Exclusion (CE), EA or EIS and Memo to the File, in addition to a decision document.

National Historic Preservation Act (NHPA) – The purpose of NHPA is to ensure the consideration of historic properties in the planning and implementation of land use and development projects. Section 106 of NHPA requires federal agencies to assess the effects of their undertakings on historic properties and provides for review of those undertakings by the public and by the Advisory Council on Historic Preservation.

Director's Order-12 (DO-12) – DO-12 is the NPS guidance for Conservation Planning, Environmental Impact Analysis, and Decision Making. DO-12 states the guidelines for implementing NEPA according to NPS regulations. DO-12 meets all Council on Environmental Quality (CEQ) regulations for implementing NEPA. In some cases, NPS has added requirements under DO-12 that exceed the CEQ regulations.

Director's Order-18 (DO-18) – DO-18, the NPS guidance for Wildland Fire Management, states that "every NPS unit with burnable vegetation must have an approved Fire Management Plan." DO-18 defines what an approved FMP must include, stressing that "firefighter and public safety is the first priority" and promoting "an interagency approach to managing fires on an ecosystem basis across agency boundaries." Director's Order 18 also directs parks to identify, manage, and reduce,

where appropriate, accumulations of hazardous fuels. Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until an FMP is approved, NPS units must take aggressive suppression action on all wildland fires.

The Federal Wildland Fire Management Policy and Program Review (1995) and Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (1998) provide specific guidance on fire policy, planning and implementation. A more complete listing of relevant laws, Executive Orders, and policies is provided in Section 7.0 of this document.

The General Management Plan for GRSM was completed in 1982. It specifies that "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 (pp 25)." Each alternative was developed with consideration of that goal.

1.3 Draft Impact Topics Considered, But Dismissed From Further Analysis

NEPA and CEQ regulations direct agencies to "avoid useless bulk…and concentrate effort and attention on important issues" (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents for other kinds of proposed actions or projects have been judged not to be substantively affected by any of the Fire Management Plan alternatives considered in this EA.

The following is a discussion of several impact topics that have been analyzed and considered with regard to potential effects resulting from either of the alternative actions. The relationships of these topics to fire management are summarized as part of the impacts analysis based on a factual, objective review of potential effects that alternatives might have, or the lack thereof. The impact topics are discussed below, but will not be carried forward into the detailed analysis in this Draft EA. There will not be any changes to these resources resulting from the proposed FMP activities.

These topics are listed below and a rationale is provided for dismissing specific topics from further consideration.

- ***Geology*** **-** GRSM is host to a variety of outstanding geological features with unusual intrinsic value. Many of these geological features are regularly viewed and studied by a wide range of visitors, educators, and scientists and are considered a valuable natural resource. The proposed management options will not alter geologic features and resources at the park. Therefore, geological resources will not be carried forward into the detailed analysis portion of this EA.

- ***Floodplains -*** Floodplain or flood-prone areas include those low-lying areas that are flooded during 100 year storm events. These areas are generally mapped by the Federal Emergency Management Agency and those maps are made available to the general public. Local and some state governments implement the federal floodplain protection regulations, which at a minimum regulate construction of dwellings and other structures in the floodplain. The alternatives would not involve the filling or alterations of floodplain areas, and would not require the construction of any structures. Earthwork and construction activities that could adversely affect flood-prone areas are not part of the proposed alternatives. Given that the alternatives proposed will not affect floodplain values, this topic will not be carried forward into the detailed analysis.

- ***Wild and Scenic Rivers -*** Wild and scenic rivers are designated by the federal mandate and are provided with advance protection at the federal, state, and local levels. Wild and scenic rivers have not been designated within GRSM boundaries; therefore, this topic will not be carried forward into the detailed analysis.

- ***Transportation –*** GRSM does not have a public transportation system that operates and the proposed alternatives would not require or include any transportation services. The proposed alternatives will not affect transportation, and as such transportation will not be carried forward into the detailed analysis.

- ***Indian Trust Resources -*** Indian trust resources include those resources not on Native American owned property, but rather on DOI administered lands that are held in trust on behalf of Native American tribes. Secretarial Order 3175 requires that any anticipated impacts to Native American trust resources from a proposed project or action by DOI agencies be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable fiduciary obligation on the part of the United States to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to Native American and Alaska Native tribes. GRSM as a public holding is not considered a Native American trust resource and there are not any such designated resources at the park. The proposed alternatives do not conflict with any American Indian interests. Therefore, this topic will not be carried forward into the detailed analysis.

- ***Prime or Unique Farmland -*** The Natural Resource Conservation Service (1993) defines prime farmland as soil that produces general crops such as common foods, forage, fiber, and oil seed. Unique farmland is defined as soil that produces specialty crops such as fruits, vegetables, and nuts. The soil types in the GRSM area provide limited support for prime farmland and unique farmland based on these definitions. Areas of agricultural use on GRSM do not exist and as such the proposed alternatives do not involve alterations to any land-use or soil that involve farmlands. Therefore, prime or unique farmland will not be carried forward as an impact topic.

- ***Lightscape -*** In accordance with *NPS Management Policies, 2006* (2006), the NPS strives to preserve natural ambient lightscapes, which are resources and values that exist in the absence of human caused light. The proposed alternatives would not be expected to result in any changes to the existing lightscape conditions. Therefore, this topic will not be carried forward into the detailed analysis.

- ***Soundscape Management -*** In accordance with *NPS Management Policies, 2006* (2006) and *NPS Director's Order 47: Sound Preservation and Noise Management* (2001c), an important part of the NPS mission is preservation of natural soundscapes associated with Parks. Natural soundscapes exist in the absence of human-caused sound. The natural ambient soundscape is the aggregate of all the natural sounds that occur in Park units, together with the physical capacity for transmitting natural sounds. The frequencies, magnitudes, and durations of human-caused sound considered acceptable varies among NPS units, as well as potentially throughout each Park unit, are generally greater in developed areas and less in undeveloped areas. The proposed alternatives would not create additional noise other than short-term use of some equipment (i.e., chainsaw or leaf blowers). Therefore, this topic will not be carried forward into the detailed analysis.

- ***Environmental Justice –*** According to the United States Environmental Protection Agency (USEPA), environmental justice is the fair treatment and meaningful involvement of all people, regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including a racial, ethnic, or socioeconomic group, should bear a disproportionate share of the adverse environmental consequences resulting from industrial, municipal, and commercial operations or the execution of federal, state, local, and tribal programs and policies. Presidential Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing the disproportionately high and/or adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Any actions related to the proposed alternatives would not be expected to have health or environmental effects on minorities or low-income populations or communities as defined in the USEPA Environmental Justice Guidance (USEPA 1998). Therefore, this topic will not be carried forward into the detailed analysis.

- ***Non-Federal Lands Within GRSM - Private Residential and Commercial Properties and Municipal and State lands -*** Of the 522,000 acres within the park boundaries, the NPS owns all lands, with the exception of some 322 acres that constitute remnant private inholdings. The proposed alternatives are not seen as an issue that affects landownership or development and are not near any inholdings. The proposed alternatives will not hinder or alter in an adverse or beneficial way public and private access to any areas in the park; therefore, this topic will not be advanced into the detailed analysis. Any

discussion of fire impacts beyond Park boundaries will be adequately addressed within the ‘Surrounding Community” subject area.

2.0 ALTERNATIVES

There are two alternatives for the Fire Management Plan, a "No Action Alternative" and an "Implement National Fire Policy Alternative." Alternatives were framed through discussions among Great Smoky Mountains National Park personnel and Southeast Region fire management and compliance staff. The alternatives cover the range of what is physically possible, acceptable by policy, and feasible for local managers (i.e. all reasonable alternatives). Under Alternative 1, the park is sub-divided into three Fire Management Units (FMUs). Alternative 2 reduces the number of FMUs is reduced to two by combining FMU 2 and 3.

The alternatives were developed to:

- Identify changes in Fire Management Policy language and implementation;
- Compare current policy and procedures with existing practices;
- Communicate these differences in policy to the community.

The following table highlights differences between the two alternatives:

Table 1: Comparison of alternatives with regard to key changes

	Alternative 1	**Alternative 2**	**Difference**
Course	No Action	Preferred Alternative	
Effect	Retain Current FMP guidance	Implement National Fire Policy	
FMUs	FMU1 Suppression Unit FMU2 Conditional Fire Use Unit FMU3 Fire Use Unit	FMU1 Interface Unit FMU2 Natural Zone	Combines FMUs 2 and 3; every naturally occurring fire would be evaluated for suitability for management.
Terminology	Older, outdated terms	Current, accepted interagency terminology	Updated terms and concepts to conform to accepted interagency standards.
Fire Objectives	Each fire may only be managed for one objective.	Fires may be managed for multiple objectives spatially and temporally.	Under Alt. 2, a fire may be managed for resource benefit on one flank, while intense suppression activity is occurring on a different flank.
Management of Natural Ignitions	WFU conditionally permitted in FMU2 and generally permitted in FMU3	Use of fire to meet resource management objectives in FMU 2 if conditions favorable and objectives can be met.	Every naturally occurring fire would be evaluated for suitability for resource benefit.

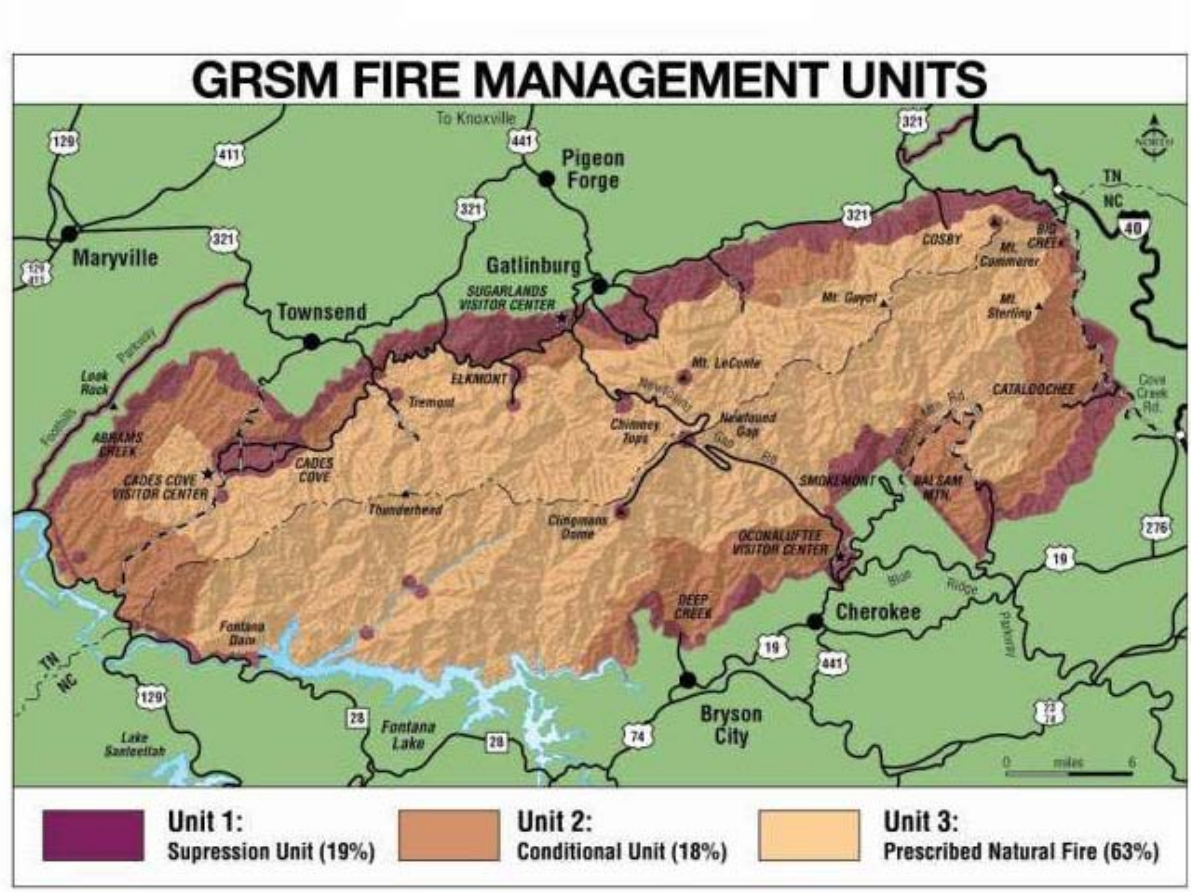
Human Caused Fire	suppressed	Initial action is suppression, may be managed under extended attack if initial action is unsuccessful.	Allows full range of tactical options to be considered under extended attack incidents.
Conversion of Prescribed Fires to wildfires	If escaped or not meeting objectives, prescribed fires will be converted to wildfires, may not go back to Prescribed status. (goal of suppression)	Upon conversion to a wildfire, full range of responses is available; cannot be reclassified as a prescribed fire.	Upon conversion, if fire is meeting resource management objectives, it may be managed for those objectives the same as any other wildfire.
Step Up Plan	Vague, no clear guidance based on fire staffing class	Establishes clear staffing step up and operational guidance based on fire staffing class	Conforms to RM18 requirements and clarifies staffing requirements as fire danger increases.
Prescribed Fire Planning	Vague, no real guidance on planning activities.	Establishes clear planning elements, timelines and responsibilities.	Formalizes planning process in an effort to enhance prescribed fire program.
Organization	Denotes current fire structure	Outlines desired future condition.	Clarifies organizational structure and future needs in order to meet objectives identified in the plan.

2.1 Alternative 1 - No-Action (continuation of current fire management)

Under Alternative 1, The No Action alternative is presented as a requirement of the National Environmental Policy Act, (NEPA) and is the baseline condition with which proposed activities are compared. The "No-Action" alternative for Great Smoky Mountains National Park becomes continuation of current fire management activities as outlined within the current Fire Management Plan.

This alternative represents a continuation of current management actions; it does not mean an absence of active management of fire and fuels. Under the no-action alternative, the Park would remain geographically divided into three fire management units (FMU), and park managers would develop an “appropriate management response” to all wildland fires. The appropriate management response is currently restricted to suppression actions for all wildfires in FMU 1, and for all human-caused fires throughout the park, regardless of FMU. Appropriate management response can include a range of strategies and tactics including direct attack, indirect attack, confine and contain, and monitoring. Lightning-ignited fires may be managed for resource benefits in FMUs 2 and 3, a practice that has been called Wildland Fire Use. Finally, under the current plan, the Park may conduct prescribed burns and hazard fuel reduction projects in selected areas.

Figure 1: GRSM Fire Management Units (Under Alternative A, No Action)



Suppressing wildland fires is accomplished by depriving a fire of additional fuels (e.g., building a fire line that is cleared down to mineral soil) or by cooling the fire sufficiently to prevent further combustion (e.g., applying water to the flaming front). Fire suppression in the park would emphasize direct action and keeping wildland fires to minimal sizes. Once a wildfire has been managed for suppression objectives it would not be managed for resource benefit objectives. Under this alternative, wildland fires are suppressed using an appropriate management response.

Management responses vary among a range of options from monitoring without on-the-ground disturbance to intense suppression actions on all perimeters of the fire.

Currently, GRSM uses a strategy of managing some naturally ignited wildland fires for resource benefits. The term used for this activity was wildland fire use (WFU) and is a strategy for allowing some lightning caused fires to burn as long as the fire meets predetermined resource management objectives in a predetermined geographic area, within prescribed weather and fire behavior parameters. Wildland fire use fires that do not meet predetermined prescriptions or fail to meet resource management objectives are suppressed using appropriate management response. This activity occurs in Management Units 2 and 3 (Figure 1).

Predicting the average annual acreage of unwanted wildland fire is quite uncertain, dependent as it is on climatic conditions, fuels conditions, locations and other factors. In the first years following establishment of the park, there were 25-30 fires, annually. In recent years, only 4-8 wildland fires have occurred, annually. The majority of the wildland fires have been limited to 10 acres or less although some have been over 6000 acres. The annual burned area under the no action alternative would probably be 500-1500 acres.

Prescribed fire is implemented to reduce the hazard of unplanned wildland fires and maintain a fuel level that ensures protection of life, property, cultural values and natural resources and can be conducted in any of the three FMUs. Prescribed fire is also used in support of ecosystem management to maintain and/or restore plant communities, cycle nutrients, reduce or remove exotic plants and for a variety of other resource management objectives. All prescribed fires are planned and approved consistent with the method and format required by RM-18.

Hazard fuel reduction is also accomplished with various non-fire treatments utilizing mechanical and/or chemical treatments in locations that are not suitable for prescribed fire activities. Each year the park conducts limited mechanical treatment of hazardous fuels. Projects are conducted at locations along the park boundary and adjacent to park infrastructure. The annual average for mechanically treated acres is typically less than 10. Director's Order 18 directs parks to identify, manage, and reduce where appropriate, accumulations of hazardous fuels. Mechanical treatment would be used to clear vegetation away from structures, cultural resources, and other high value resources to reduce spread potential and increase defensible space. Prescribed fire and mechanical treatments may be used individually or in combination to meet research objectives or maintain landscapes and habitat.

Thus a typical 5-year fire management program under the no action alternative would consist of:

- Aggressive suppression of unwanted wildland fires;
- Management of select naturally occurring fires;
- Prescribed fire;
- Limited non-fire fuels reduction.

This alternative was developed during the 1996 FMP planning process to give some flexibility in the management of fire for the purpose of enhancing natural resource values. This alternative allows the Park to suppress all wildfires and any fire that threatens structures, boundary areas, seasonally sensitive natural areas, or cultural areas. Prescribed fires are scheduled actions that reduce fuels at the most effective/least disruptive time. Hazardous fuel reduction activities are prioritized based on topography, aspect, fuel type and ecological value as well as relative risk to adjacent properties. These determinations are made within the FMP and annually reviewed.

Note: Current fire management guidance has replaced several terms used to describe the activities undertaken within the current FMP. The language used above to describe Alternative 1 (no action) utilizes the old language for consistency but will be replaced with current language under Alternative 2. The following terms are now changed under National Fire Policy:

Terminology	Potential Action or Definition
Appropriate Management Response (AMR)	**Replace with**: Response to Wildland Fire
Initial Attack	**Replace with:** Initial Action
Initial Response	**Replace with:** Initial Action
Long Term Implementation Plan (LTIP)	**Replace with:** Wildland Fire Decision Support System (WFDSS) if it will be used. Otherwise retain LTIP
Management Ignited Prescribed Fire (MIPF)	**Replace with:** Prescribed Fire, controlled burn, or planned ignition
Planned Ignition	**Definition:** The initiation of a wildland fire by hand-held, mechanical, or aerial device where the distance and timing between ignitions lines or points and the sequence of igniting them is determined by environmental conditions, firing technique, and other factors which influence fire behavior and fire effects and is prepared in advance
Prescribed Fire	**Definition:** Any wildland fire ignited by management actions to meet specific objectives. A written approved prescribed fire plan must exist and NEPA requirements (where applicable) must be met prior to ignition
Prescribed Natural Fire (PNF)	**Replace with:** Response to Wildland Fire
Response to Wildland Fire	**Definition:** The mobilization of the necessary services and responders to a fire based on ecological, social, and legal consequences, the circumstances under which a fire occurs, and the likely consequences on firefighter and public safety and welfare, natural and cultural resources, and values to be protected
Strategic Implementation Plan (SIP)	**Replace with:** Wildland Fire Decision Support System (WFDSS) if it will be used. Otherwise retain SIP
Suppression	**Definition:** The work of extinguishing or confining a fire beginning with its discovery
Unplanned Ignition	**Definition: The initiation of a wildland fire by lightning, volcanoes, unauthorized human-caused fires and escaped prescribed fires where the objective is to protect values at risk while meeting resource objectives specified in Land/Resource Management Plan**
Unwanted Ignition	**Definition: An ignition from any source that is unplanned and unwanted. Consider replacing with Unplanned Ignition**
Use of Wildland Fire	**Definition: Management of either wildfire or prescribed fire to meet objectives specified in Land/Resource Management Plans**
Wildland Fire Use (WFU)	**Replace with: Use of Wildland Fire**

Wildfire	**Definition: Unplanned ignition of a wildland fire or escaped prescribed fire where the objective is to protect values at risk while meeting resource objectives specified in the Land/Resource Management Plan**
Wildland fire	**Definition: Any non-structure fire that occurs in the wildland. Two distinct types of wildland fire have been defined and include wildfire (unplanned ignition) and prescribed fire (planned ignition)**
Wildland Fire Implementation Plan (WFIP)	**Replace with: Wildland Fire Decision Support System (WFDSS) if it will be used. Otherwise retain WFIP**
Wildland Fire Situation Analysis (WFSA)	**Replace with: Wildland Fire Decision Support System (WFDSS) if it will be used. Otherwise retain WFSA**

Source: Fire Management Plan Review Process for Revised Policy Implementation Guidance (Version 2/25/09)

2.2 Alternative 2 (Implement National Fire Policy Alternative)

(Environmentally Preferred and Preferred Alternative)

On February 13, 2009, the Fire Executive Council (FEC) approved Guidance for the Implementation of Federal Wildland Fire Management Policy. This Guidance provides for consistent implementation of the 1995/2001 Federal Fire Policy, as directed by the Wildland Fire Leadership Council. The following guidelines were followed in the development of this alternative to provide consistent implementation of federal wildland fire policy:

- Wildland fire management agencies will use common standards for all aspects of their fire management programs to facilitate effective collaboration among cooperating agencies.

- Agencies and bureaus will review, update, and develop agreements that clarify the jurisdictional inter-relationships and define the roles and responsibilities among local, state, tribal and federal fire protection entities.

- Responses to wildland fire will be coordinated across levels of government regardless of the jurisdiction at the ignition source.

- Fire management planning will be intergovernmental in scope and developed on a landscape scale.

- Wildland fire is a general term describing any non-structure fire that occurs in the wildland. Wildland fires are categorized into two distinct types:
    - Wildfires – Unplanned ignitions or prescribed fires that are declared wildfires
    - Prescribed Fires – Planned ignitions

- A wildland fire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance; and involvement of other governmental jurisdictions having different missions and objectives.

- Management response to a wildland fire on federal land is based on objectives established in the applicable Land/ Resource Management Plan and/or the Fire Management Plan.

- Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

- Managers will use a decision support process to guide and document wildfire management decisions. The process will provide situational assessment, analyze hazards and risk, define implementation actions, and document decisions and rationale for those decisions.

Under the Implement National Fire Policy Alternative, Alternative 2, multiple objectives may be considered for each fire event. A key change to the policy is the implementation of a wildland fire management strategic fire response within Alternative 2. Strategic fire response is similar to the adaptive management approach used in Alternative 1. Unlike adaptive management, strategic fire response is more holistic and allows for multiple management options and tactics to be implemented on a single fire still with the goal of meeting fire management unit objectives. Typically, fire response ranges across a spectrum of tactical options (from monitoring from a distance to intensive suppression actions). Beginning with the initial action to any wildfire, decisions will reflect the goal of using available firefighting resources to manage the fire for the safest, most effective, and most efficient means available while meeting identified fire management unit objectives.

The strategic response to the fire would be documented in a timely manner and relayed to the Incident Command (ICT5 or higher) on scene so that the appropriate tactics can be implemented. The acreage burned by wildland fire may increase slightly from Alternative 1 since fire managers would have the option of selecting from the full range of suppression strategies.

The strategic fire response strategies and tactics would consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and fire effects, values to be protected from fire, management priorities, resource availability, cumulative effects of the fire, and cost effectiveness. Direct assessment of resource benefits is allowed only for those fire management units (FMU2), where the use of wildland fire to achieve resource management objectives has been addressed in the FMP as an acceptable strategy.

The initial action to human caused wildfires will be with the objective of suppression as in Alternative 1. Even when suppression is the objective, wildfire managers may apply different

strategies and tactics as part of a strategic fire response. Full suppression may be the preferred strategy for a portion of the perimeter and on another portion of the perimeter; point protection or monitoring may be the desired strategy. Unlike Alternative 1, multiple suppression strategies can be employed rather than a single tactic. By taking into account the fire season, current and expected weather, burning conditions, fire managers apply the best tactics to mitigate risks to the public and firefighters, meet cultural/natural resource management objectives and meet protection priorities.

Every wildland fire will be assessed following a decision support process that examines the full range of potential responses. The decision support process currently being developed and used is known as Wildland Fire Decision Support System (WFDSS). The level of decision support documentation required will depend on the fire response level.

Prescribed fire would be used as a tool to restore and maintain fire-adapted natural communities and to reduce hazardous fuel accumulations in and around selected natural and cultural resources in areas of the Park. Some removal of hazardous fuels would be done to reduce the fire danger near structures and along the Park boundary where private homes are determined to be at risk from wildfires under normal weather conditions.

Each year the park conducts limited mechanical treatment of hazardous fuels. Projects are conducted at locations along the park boundary and adjacent to park infrastructure. The annual average for mechanically treated acres is typically less than 10. Hazard fuels projects would be conducted primarily near historic structures and visitor use areas. Director's Order 18 directs parks to identify, manage, and reduce where appropriate, accumulations of hazardous fuels. Mechanical treatment would be used to clear vegetation away from structures, cultural resources, and other high value resources to reduce spread potential and increase defensible space. Prescribed fire and mechanical treatments may be used individually or in combination to meet research objectives or maintain landscapes and habitats (see draft FMP in appendices for details).

Under this alternative, the park is divided into two fire management zones: FMU1 is the interface zone and is generally contiguous with the park boundary and Foothills Parkway, developed areas within the park are also included in this FMU. FMU2 is the natural zone, this FMU makes up the preponderance of park lands. Within FMU2, naturally occurring wildfires will generally be allowed to play their role in the ecosystem. Every naturally occurring fire within FMU2 will be evaluated for suitability for management for resource benefit. However, due to conditions and potential values at risk, some of these will be managed with suppression objectives.

FMU 1 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 90,595 acres in size within the Park proper, plus an additional 9,457 acres of the Foothills Parkway, totaling 100,052 acres. This represents approximately 19 percent of the area administered by the Park. The management objective of all wildfires regardless of cause in FMU 1 will be suppression. It should be noted that suppression may still include a range of options and tactics that include monitoring and confine/contain. Wildfires may not be managed solely for

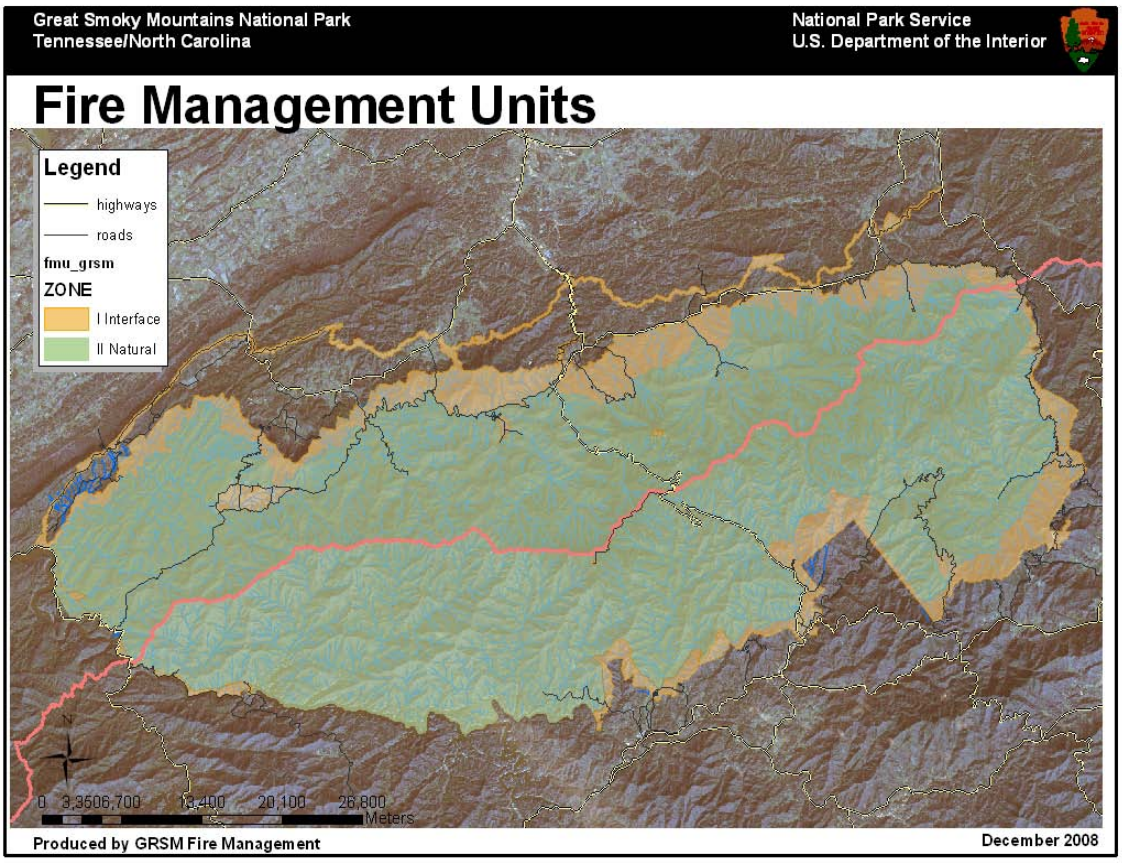
resource benefit within FMU1. A strategic fire response with supporting decision documentation will be initiated on each wildfire occurrence. Strategic fire response strategies and tactics will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and effects, values to be protected, resource availability, cumulative effects of fire and cost effectiveness. Mechanical fuel treatment methods may be used for hazard fuels reduction in areas where safe and effective prescribed fire treatment is precluded by fuel loads, or is otherwise unfeasible.

FMU 2 is approximately 421,294 acres in size. This represents approximately 81 percent of the area administered by the Park. Within this zone**,** natural processes shall be allowed to function wherever and whenever possible. As such, strategic fire response will default to using naturally occurring wildfire to achieve resource benefit whenever conditions allow. The initial action to all human caused wildfires in FMU 2 will be with a goal of suppressing the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. Every naturally occurring fire will be evaluated for suitability for using wildfire to the benefit of the resource. Wildfires may have multiple objectives, where one portion of the perimeter is monitored for resource benefit, while another portion of the perimeter is actively suppressed to provide point protection to values at risk. Every wildfire will be assessed following a decision support process that examines the full range of responses. Wildland fire response strategies and tactics will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and effects, values to be protected, resource availability, cumulative effects of fire and cost effectiveness. Documentation of the decision process will be accomplished using the WFDSS program.

Both FMUs will consider opportunities for prescribed fires to reach natural and cultural resource management objectives and for hazard fuel reduction activities. Current policy has provided more options for managing unplanned ignitions thus in the purest sense, policy no longer requires specific designation of multiple FMUs. The Park has chosen to develop two FMUs under this alternative to enhance its ability to manage fires on the landscape.

Important improvements to this alternative include greater emphasis on planning, staffing and organizational structure. Under Alternative 2, desired conditions or objectives are better defined in planning the response to fire.

Figure 2: Alternative 2 – Fire Management Units



2.3 Alternative Considered But Rejected

The concept of an alternative that is a combination of suppression coupled with Fuels Management (i.e., prescribed fire and mechanical fuels reduction) was considered. While this alternative would seem viable and worthy of consideration, it would inconsistent with National Fire Policy as it does not provide the greatest opportunity to enhance ecological resource values.. For these reasons, the initial proposal for a separate, suppression and fuels management alternative was rejected.

The Park also considered the concept of an alternative geared toward delegation of fire management to mutual aid units adjacent to the Park. While the Park has mutual aid agreements in place with local fire departments, their training is not geared towards wildfire operations, the Park has staffing to address fire management already in place and the delegation of the operation to local fire departments would not alter the fire management strategies proposed within the two alternatives presented above. Thus, this alternative was considered but rejected.

The concept of an alternative geared toward truly no action was also considered but rejected. It is neither possible nor consistent with any NPS guidance or policy to allow fires to burn without any form of management or response. While the natural wildfires do occur in the park, management and monitoring is required on all wildfires to protect public safety, natural and cultural resources.

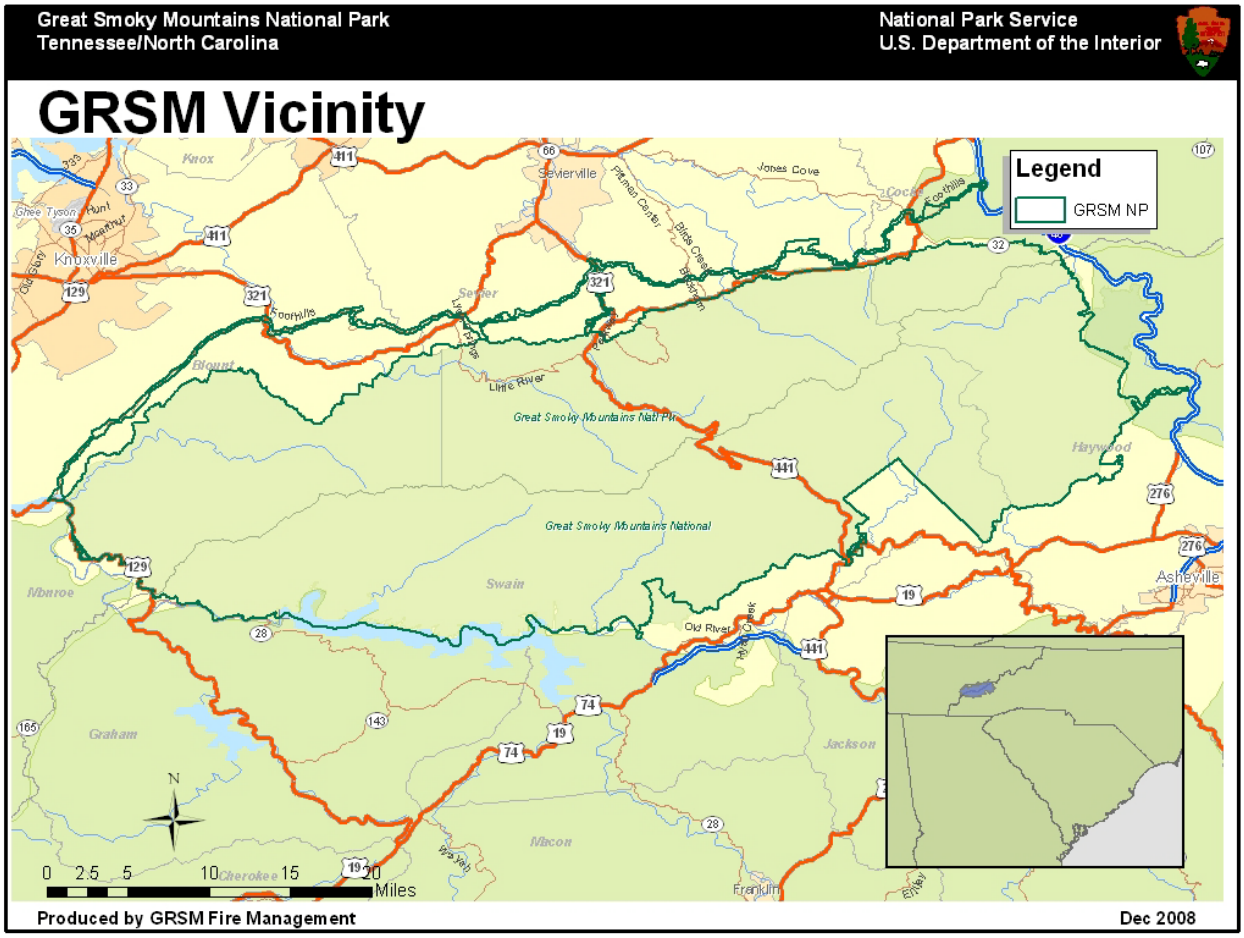
A full suppression alternative was also considered. Under a full suppression alternative all ignitions, including those of natural origin, would be suppressed, and no management ignited prescribed fires would be conducted. Full suppression does not necessarily mean that all Park fires would be small or have limited impacts. Some fires would burn with such intensity that suppression efforts could only attempt to lessen impacts until burning conditions changed enough to allow for effective suppression. The Park's General Management Plan calls for use of fire as a management tool in enhancing or restoring natural resources, thus full suppression is not consistent with that objective. Full suppression does not achieve National Fire Policy objectives relative to "Integrating fire as a natural process into Park biotic communities to the fullest extent possible." For these reasons, a full suppression alternative was also rejected.

3.0 AFFECTED ENVIRONMENT

3.1 Project area Description

GRSM contains more than 520,000 acres and lies almost equally in eastern Tennessee and western North Carolina (Figure 3). The Foothills Parkway is also administered by the Park. GRSM lies along a 71-mile segment of the lofty divide that forms the boundary between the two states.

Figure 3: Location and Vicinity of GRSM



3.2 Physical Environment

3.2.1 Topography and Soils

Topography. The Great Smoky Mountains are part of the large Appalachian mountain system, which consists of a series of mountain ridges trending northeast to southwest, which extends from New England to Alabama. According to U.S. Geological Survey (USGS) topographical maps, topography within GRSM dramatically ranges from steep mountainous terrain with significant slope relief (18 to 28 degrees) to rolling hills to alluvial floodplain valleys. The highest mountains rise more than 5,000 feet above the valley floors. The highest elevation in the park is atop Clingman's Dome, at 6,643 feet above mean sea level (msl), while the lowest elevations are encountered along the Little Tennessee River, averaging 1,000 feet msl. Interspersed between the valleys, ridges, and mountains are hollows, gaps, and coves.

GRSM contains more than 516,000 acres and lies almost equally in eastern Tennessee and western North Carolina. The Foothills Parkway is also administered by the Park. GRSM lies along a 71-mile segment of the lofty divide that forms the boundary between the two states.

The Unaka Range, a major unit of the Appalachians encompassing the mountains of the Park, lies wholly within the Mississippi drainage along the Tennessee-North Carolina state line. The Unaka Range is cut into segments by northwesterly flowing tributaries of the Tennessee River. The Great Smoky Mountains are located in one such segment separated from the rest of the Unaka Range by river gorges. The Pigeon River cuts the main ridge of the Unakas on the northeast and the Little Tennessee on the southwest.

The dominant topographic feature of the Park is a northeastward-trending ridgeline that forms the boundary between North Carolina and Tennessee. For 36 of its 71 miles, the main divide stands more than 5,000 feet above sea level, and 16 peaks along the ridge rise to elevations of more than 6,000 feet. Lower ridges form radiating spurs from the central ridgeline. The moderately sharp-crested, steep-sided ridges are separated by deep valleys that occasionally widen into sheltered recesses called coves. Slopes of 50 percent are common along the sides of higher ridges. The elevation ranges from 840 feet at the mouth of Abrams Creek, near the west entrance to the Park, to 6,642 feet at Clingmans Dome, near the center of the Park. Many of the mountain ridges branch and subdivide, creating a complex drainage system that abounds in fast-flowing mountain streams.

Soils*:* From a geologic perspective, erosion has been very important in shaping the topography of GRSM. Valley bottoms have become collection points for eroded soils, which are well-drained and of high quality. In contrast, the higher soils are rocky and thin. The parent materials of the primary soils are the noncalcareous shales, quartzites, and sandstones of the Ocoee series. Soils are found in six associations: Jeffrey-Brookshire-Ditney, Sylco-Ranger-Cataska, Allen-

Jefferson, Sylco-Talladega, Evard-Saluda, and Porters-Edneyville-Ashe. (Final Environmental Impact Statement, General Management Plan, Great Smoky Mountains National Park, 1982.) The most common soil series within the park is the Soco series, a residual soil found over the park's widespread sandstone.

3.2.2 Air Resources

The name of the mountain range, Great Smoky, refers to the haze often blanketing parts of the mountains, particularly during the morning hours. For the most part, this haze is natural and is simply water vapor condensed into clouds mixed with volatile terpenes and other gaseous products of the heavy vegetation cover.

The Park has been designated as a Class I area by the Clean Air Act of 1963 and amendments. The Clean Air Act of 1973 (as amended) and associated NPS policies require the NPS to protect air quality in Parks and other holdings. This is the highest air quality class in the nation and, thus, air quality in terms of chemical pollutants as well as visibility levels must be of major concern. Three primary air quality problems threaten Park resources: visibility degradation, ozone effects on vegetation, and acidic deposition effects on terrestrial and aquatic ecosystems.
Many of the issues influencing air quality in the Park are far reaching as well as local, many of which are out of the control of the NPS. For example, GRSM is downwind from large urban and industrial areas in states to the north and west, and prevailing winds often carry potential pollutants that are deposited in the Park. Acid precipitation is a major influence on stream water quality at the park, and could cause excessive nutrient enrichment in soils, and affect sensitive vegetation. GRSM is designated a Class I area per the Clean Air Act of 1973, which provides the highest level of air-quality protection.

Stations either within 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 (SO_2), nitrogen dioxide (NO_2), 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.

Visibility. Visibility is currently seriously degraded and very little research is being conducted into visibility effects at the Park. The Department of Interior (DOI) and EPA agree that visibility is an important air quality related value to the Park (Federal Register 44-FR 69122, Nov. 30, 1979). A 1988 NPS study of visitor attitudes reported that Park visitors rank air quality higher than any other Park attribute, and that viewing scenery was the most common visitor activity. In a November 14, 1985, letter, the DOI informed the EPA that with respect to uniform haze, the NPS visibility monitoring program has shown that scenic views at GRSM (and other Class I areas) are impaired by anthropogenic pollution more than 90 percent of the time.

Visibility is strongly affected by light scattering and absorption by fine particle matter (< 2.5 microns in diameter). Among the constituents of the fine particle matter, fine sulfate particles (which result from the conversion of gaseous sulfur dioxide emissions) are currently responsible for most of the visibility impairment throughout the East. Recent analysis (from Interagency Monitoring of Protected Visual Environments [IMPROVE] program) of data collected at GRSM have shown that sulfates are responsible for 70-85 percent of the visibility impairment. The summer average sulfate concentration ranged from 1.9 to 8.3 ug/m^3, a 10- to 42-fold increase in natural background.

The DOI's finding of significant existing visibility impairment at GRSM is supported by studies of historic and current visibility conditions. The National Acid Precipitation Assessment Program (NAPAP) states that under natural conditions, without the influence of air pollution, visual range in the eastern United States is estimated to be 93 miles. Visual range in rural areas of the East currently averages 12-22 miles. Median visual range at GRSM is 24 miles, with a median summertime visual range of 12 miles. In other words, the "average" visibility day at GRSM has experienced degradation through time to one-fourth of estimated natural conditions. This degradation is likely attributable to increases in man-made sulfur dioxide emissions. Visibility conditions at the Park show a strong seasonal pattern, with the worst visibility occurring during the summer, when visitation at GRSM is highest. During the summer months the average visibility ranges from 14-27 miles, or less than one-third of the estimated natural visual range.

Ozone. Surface level ozone in the Park may be one of the most significant and pervasive pollutants facing the Park. Nitrogen oxides and volatile organic compounds in the presence of sunlight produce ozone. High levels of ozone are transported long distances from urban sources to rural, forested areas. Not only do high levels of ozone cause breathing problems in people, but ozone levels below the National Ambient Air Quality Standard (NAAQS) of 120 parts per billion (ppb) also affects vegetation in the Park. Currently, the Park is monitoring ozone at four locations on the Tennessee side of the Park and two locations on the North Carolina side of the Park. Ozone levels sufficient to cause injury can range as low as 60-80 ppb. The ridge tops of the Park exhibit chronic, sustained exposures of ozone with little to no diurnal fluctuations and peak delays into the evening unlike low-elevation urban areas.

Acid Deposition. The burning of fossil fuels--coal, oil, and natural gas--by electric and other industrial sources produces sulfur dioxide (SO_2) and nitrogen oxides (NO_x). Nitrogen oxides also come from motor vehicles. Sulfur dioxide and nitrogen oxides can transform into weak acids in the atmosphere and return to earth as acid deposition in the form of rain, fog, cloud and dry particles.

According to Source Assessment: Prescribed Burning, State of the Art, (USDA 1979), important wildland fire emissions include particulates, gaseous hydrocarbons, and carbon monoxide. Nitrogen found within the fuel and from the atmosphere enters the combustion product formation process to result in, among other emissions, nitrogen oxides.

The Park has the largest remaining area of red spruce (Picea rubens)- Fraser fir (Abies fraseri) ecosystem in the world and the 1989 NAPAP Annual Report (1990) cited the high elevation red spruce forests of the eastern U.S. as the only instance of apparent evidence of forest damage in North America related to the direct effects of acidic deposition. Atmospheric pollutants are causing nutrition-mediated changes in forest productivity and in this way may be related to a possible decline in the high-elevation spruce forests of the Park. Johnson et al. (1991) studied nutrient cycling in the Park and concluded that above ground cycling of nutrients was dominated by atmospheric deposition rather than by litter fall. Their study found that the soils are so acidic that they are essentially nitrogen-saturated, and that further acidification by "acid rain" may be impossible. Pulses of nitrate and sulfate in soil solution caused aluminum to occasionally reach levels shown to inhibit root growth and calcium and magnesium uptake in red spruce seedlings in solution culture studies performed in the laboratory. Other key findings from this work are (1) that nitrogen and sulfur fluxes are high at all levels from the atmosphere down to the lowest soil horizons, (2) that very little absorption of these pollutant inputs occur, (3) that nitrogen is actually being exported from the sites in greater quantities than the atmospheric inputs, presumably due to large pools of organic matter, and (4) that deposition by dry processes and by cloud water account for greater inputs of many elements than the inputs due to rainwater.

The Park receives some of the highest deposition rates of nitrate and sulfate of all monitored national parks. Rainfall in GRSM is more than five times as acidic as normal rainfall, with an average pH of 4.3, and cloud water acidity is even more severe. Acid deposition can affect streams and other aquatic resources in GRSM. In the southern Appalachian watersheds, the low buffering capacity of underlying geologic formations causes streams to be extremely sensitive to acid inputs. Over the last 20 years, average stream ph in the sensitive streams has dropped by almost a half unit of pH. Studies have shown that high-elevation streams exhibit near-zero alkalinity and have linked acid deposition to changes in the species composition of insect and fish populations in sensitive streams.

Maintaining acceptable air quality in the Park and its boundary communities is mandated by law and is important, considering the tourist-based economy of the area. Air quality is an important issue when considering how Park fire management policies may affect Park/urban interface.

3.3 Natural Resources

3.3.1 Water Resources

The aquatic ecosystem in the Park is comprised of 45 hydrologically distinct watersheds which contain approximately 2,115 miles of free-flowing streams. Water quality in the Park streams is generally good. In most streams the water is cold, fast flowing, slightly acidic, and low in dissolved solids. During normal and low flows the water is clear, although streams become turbid following storms. It is likely that small amounts of sediment, from trails and the surrounding forest may end up in Park streams due to normal sediment transport.

The Park is located in one of the highest precipitation regions in the nation. Precipitation throughout the Park averages 64 inches annually, the equivalent of some 890 billion gallons. Of this, about 500 billion gallons are discharged as runoff by the many streams that drain the Park. The remaining 390 billion gallons are evaporated, transpired by plants, or seep into the ground (General Management Plan, 1982).

Surface Water. All streams within the Park are small with none draining more than 200 square miles. Stream flow usually is lowest during late summer and early fall, when rainfall is somewhat lower than usual and evapotranspiration rates are high. This is also a time when the demands on the water supply for human use are greatest. Springs are common throughout the Park, and they occasionally occur on the upper slopes and in the gaps of the mountains. There are 333 streams (+/- 1,000 miles) in the Park large enough to be classified as fishable. The average drop for each mile of stream channel is 400 feet. Headwater slopes are steep, increasing as much as 2,000 feet per mile. Historically, water samples from most of the Park streams indicate a low level of coliform bacteria indicating the presence of organic matter and possibly fecal contamination. Upland swamps, wetlands and ponds also exist in the Park, but locations are not well known or documented. Little to no information exists on the fauna of these unique areas. The locations of Gum Swamp, Chambers Pond and wetlands in Cades Cove are well documented, but virtually nothing is known about the fauna of these resources.

Surface water quality in the Park is considered good but slightly acidic (pH range from 5.9 to 7.5) and low in dissolved solids. Exceptions to this are streams associated with the Anakeesta geologic formation, which have a pH of about 4.5. The streams have a low natural buffering capacity and are therefore sensitive to acid precipitation. Surface water is clear during normal and low flow but turbid during storm events. This pH condition is associated with the presence of Anakeesta formation, a deposit containing pyrite (iron sulfide). Disturbance of the rock and its exposure to air and water, either naturally or more often in connection with road construction, result in the formation of sulfuric acid and elevated concentrations of several elements including aluminum, manganese, and zinc. The combination of increased acidity and increased concentrations of metals can be toxic to fish, salamanders, and other aquatic species. Some upper reaches of the Walker Camp Prong of the Little Pigeon River and the Beech Flat Prong of the Oconaluftee River are affected (Huckabee 1972; Huckabee et al., 1975; Mathews et al., 1975).

The park has many streams listed as High-quality waters. Tier III waters are also referred to as Outstanding National Resource Waters (ONRWs). The outstanding remarkable values (ORVs) listed for both creeks are scenic, recreational, geological, and wildlife. Under a 1979 Presidential Directive and Council on Environmental Quality (CEQ) directives, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments. Abrams Creek and Anthony Creek have been listed by the National Park Service on the Nationwide Rivers Inventory (NRI) List. Additionally within the park, the state has designated the following streams located in the Park as Trout Streams (TS): Wilson Branch, Stony Branch, Arbutus Branch, Tater Branch, McCaulley Branch, Rowans Branch, West Prong Little River, Laurel Creek, and Meadow Branch.

Groundwater. Sites with thick layers of weathered material overlying highly fractured bedrock are likely to contain the best supplies of ground water. The best locations for ground water development coincide with the floors of valleys and the gentle slopes surrounding them, because that is where weathered material is deepest and fractured bedrock is most likely to occur. Yields of wells drilled in the Park range from less than 1 gallon per minute (gpm) to as much as 135 gpm (USDI Geological Survey 1970). Like stream water, ground water of the Park generally is low in dissolved solids and slightly acidic.

The U.S. Environmental Protection Agency (USEPA) protects waters designated as sole-source aquifers. The designation is given to waters that are the only source, or one of few sources, of drinking water for an area. If sole-source aquifer waters are contaminated, use of an alternative source of drinking water would be extremely expensive. To ensure the protection of these waters, any proposed project within a designated area receiving federal funding must be reviewed by USEPA. No sole-source aquifer areas are designated by the USEPA within the Park.

Sinkholes, springs, disappearing streams, and caves characterize karst topography, where the dissolution of underlying soluble rocks by surface water or groundwater occurs. Carbonate rocks, such as limestone, are soluble in groundwater, leading to the formation of limestone caverns and sinkholes, such as those present in Cades Cove and nearby White Oak Sink, Bull Cave, and Tuckaleechee Caverns. In karst areas, the groundwater flows through solution-enlarged channels, bedding planes, and microfractures within the rock. Characteristic landforms in karst regions include closed depressions of various size and arrangement, disrupted surface drainage, caves, and underground drainage systems. Gum Swamp and two small ponds northeast of Carter Shields Place are considered to be water-filled sinkholes. The water levels in the cove sinkholes and Gregory's Cave are directly related to rainfall amounts.

Groundwater recharge occurs when water moving into the groundwater system arrives at the top of the saturated zone. Climate, vegetation, land use, and soil characteristics are factors that affect the rate of recharge. Groundwater recharge for most of the park is estimated at 600,000 gallons per day/square mile.

Wetlands. The National Wetland Inventory (NWI) identifies both riverine and palustrine wetland habitats in the Park. The riverine system includes all wetlands and deepwater habitats contained in natural or artificial channels, and periodically or continuously containing flowing water or forming a connecting link between two bodies of standing water. The upper perennial system is characterized by a high gradient and fast water velocity. "Unconsolidated bottom" includes all wetlands and deep-water habitats having at least a 25 percent cover of particles smaller than stones (less than 6 cm to 7 cm) and a vegetative cover less than 30 percent, although finer or coarser sediments may be intermixed. "Permanently flooded" indicates that water covers the land surface throughout the year in all years. The NWI characterizes these wetland areas as palustrine temporarily, seasonal, or semi-permanently flooded. NWI maps are incomplete for the Park. Wetland mapping has been historically impeded by dense vegetation and the ephemeral nature of some wetland systems in the Park.

3.3.2 Vegetation Resources.

The Park is world-famous for its vascular flora, including over 100 species of trees. The forests of GRSM have been described as the most complex and diverse in North America. Due to its topographical relief, complex soils, and position in the continent, GRSM supports an enormous diversity of vegetation. Almost 95 percent of the park is forested. The park has more vascular plant species than any other unit in the national park system, while the number of nonvascular plant species ranks among the highest of any area in North America north of Mexico (Rock and Langdon 1991). More than 1,600 species of vascular plants have been identified in the park, including over 100 native tree species. Of these, 160 species are considered rare and over 350 species are nonnative. More than 4,000 non-flowering plant species are present including 2,250 species of fungi, and 302 species of lichens. About 10 plant taxa new to the park are discovered each year. Approximately 100,000 acres of old-growth forest are found in the park. This is one of the largest blocks of virgin temperate deciduous forest in North America.

Whittaker (1956) identified 15 vegetation types along complex gradients of moisture and elevation. However, eight vegetation types are considered dominant; these are:

- Pastures and cultivated fields
- Heath and grassy balds (above 4,000 feet in elevation)
- Spruce / fir forest (above 4,500 feet in elevation)
- Northern hardwood forest (3,500 to 5,000 feet in elevation)
- Cove hardwood forest (below 4,500 feet in elevation)
- Hemlock forest (3,500 to 4,000 feet in elevation)
- Closed oak forest (predominantly below 4,500 feet in elevation)
- Open pine / oak forest (found along dry ridges)

There are several classifications of the Park's vegetation, the including one by MacKenzie (1991), which includes a map based on LANDSAT imagery. The descriptions of vegetation associations below generally follow MacKenzie.

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 (Cornus florida), several species of blueberries, mid-height to tall grasses and many summer-blooming wildflowers.

TABLE MOUNTAIN PINE (TMP).

Table Mountain pine (*Pinus pungens*) 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 TMP study conducted during the late 1990s documented 60 stands of this species, 5 acres and larger, in the Park. Most are located above 2,500 feet in elevation.

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.

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 northern 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 eastern hemlock (Tsuga canadensis), American beech (Fagus grandifolia), and maples. The youngest oaks are often 60-80 years old

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, small 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 tulip tree (Liriodendron tulipifera), magnolias, hemlocks, silverbell (Halesia tetraptera), and a number of other species are usually present.

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 occurs in this "catch-all" category: black walnut (Juglans nigra), sycamore (Platanus occidentalis), ironwood (Carpinus caroliniana), hemlock, tuliptree, elm, and sweetgum (Liquidambar styraciflua), among many others. These are moist sites in which a portion may be periodically disturbed by flooding.

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.

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 firs (Abies fraseri) have 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 and have contributed significantly to the dead fuel loading (Nicholas et al., 1985). This forest type contains many endemic species of plants and animals, and also natural vegetation communities many of which are globally imperiled.

Threatened and Endangered Plant Species: Under Section 7 of the Endangered Species Act (ESA) of 1973, as amended, any action likely to adversely affect a species classified as federally protected is subject to review by the USFWS. Under Tennessee law, any action likely to adversely affect a species classified as protected by the state of Tennessee is subject to review by the TWRA. Species of plants that are listed by the state of Tennessee or the USFWS as endangered or threatened are few. The number of species that are listed as being of management concern by the NPS and state of Tennessee is much larger.

Specific surveys for protected species have not been conducted solely for the determination of presence or absence in association with the fire management program but are conducted as part of Park monitoring. Investigations regarding these species are determined in consultation with NPS, USFWS, and TWRA. Species potentially found within GRSM based on previous survey information include:

Rock gnome lichen. Rock gnome lichen is the only member of this genus occurring in North America. Its closest relatives – two other species – occur in the mountains of Japan and Eastern Asia. It is a "squamulose" lichen in the reindeer moss family and grows in rather dense colonies of narrow straps or lobes (i.e. squamules). Rock gnome lichen occurs only in areas of high humidity, either at high elevations where it is frequently bathed in fog, or at middle elevations in deep river gorges. The high-elevation coniferous forests adjacent to the rock outcrops and cliffs upon which this species grows are dominated by red spruce (*Picea rubens*), Fraser fir (*Abies fraseri*), along with northern hardwood species such as sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), mountain maple (*Acer spicata*), mountain ash (*Sorbus americana*), and beech (*Fagus grandifolia*). Most populations occur at elevations above 1524 m (5,000 ft), though some populations in GSMNP are lower (~1300 m).

Spreading Avens. Spreading Avens is a rare perennial herbaceous plant endemic to a few mountaintops in North Carolina and eastern Tennessee. Spreading avens grows in "pioneer" perennial herb communities at high-elevation rocky sites, from approximately 1400 m (~ 4500 ft) to 1900 m (~ 6200 ft). Aspects range from west-southwest to north-northeast, where it receives at least some direct sunlight each day. Spreading avens sites at the highest elevations are surrounded by spruce-fir forest or northern-hardwood forest that contains at least some spruce. Other sites are situated within red-oak forest, still others in heath or grassy balds.

Virginia spiraea. It is a perennial shrub, and plants grow in dense clumps. The species is clonal, and its root system and vegetative characteristics allow it to thrive under appropriate disturbance regimes. Virginia spiraea typically is found in "disturbed" sites along rivers or streams. It needs ample sunlight, so disturbance events (such as scouring

of its habitat from flooding) are important because such events limit tree growth and concomitant shading by the tree canopy as well as competition from other herbaceous species.

In addition to the federally listed species, GRSM maintains a database of 320 plant and animal species listed by the states of North Carolina and Tennessee. Management of these plant and animal species will be according to the guidance established by the respective state. The park has 14 Federal Species of Concern, and 25 state listed animals and 68 state listed plants (from both NC and TN). Additionally, there are non-listed species and some communities mapped park-wide that are ranked by NatureServe as G1"critically globally imperiled" and G2 "globally imperiled."

3.3.3 Fish and Wildlife Resources

The wildlife resources in the Park include common large mammals (e.g., black bear (*Ursus americanus*) and white-tailed deer (*Odocoileus virginianus*), medium-sized mammals (e.g., eastern cottontail rabbit (*Syvilagus floridanus*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginiana*), woodchuck or groundhog (*Marmota monax*), red fox (*Vulpes vulva*), gray fox (*Urocyon cinereoargenteus*), and raccoon (*Procyon lotor*), and several species of small mammals (e.g., various species of shrews, mice, and voles).

GRSM is a premier place for birds. From the high, exposed peaks, to the warmer, sheltered lowlands, some 240 species of birds have been found in the park. Sixty species are year-round residents. Nearly 120 species of birds breed in the park, including 52 species from the neo-tropics. Many other species use the park as an important stopover and foraging area during their semiannual migration. More birds will be heard than seen in the park's dense, tall forests, where more than 100 species of birds a day can be found during peak migration (late April and early May).

Migratory and resident bird species are well documented in Cades Cove. Some common species sighted in the cove include juncos, mourning doves, chimney swifts, eastern phoebes, barn swallows, blue jays, indigo buntings, cardinals, towhees, sparrows, eastern bluebirds, eastern meadowlarks, field sparrows, red-winged blackbirds, crows, chickadees, wild turkeys, and warblers. Golden eagles have been sighted flying over the cove in autumn. The pileated woodpecker requires stands of dead and dying pines for its habitat, and has been found nesting in some portions of the cove where pines are prevalent. The barred owl, screech owl, and Chuck Will's widow are the most common birds heard in the cove at night. Open fields in the park provide habitat for red-tailed hawks, American kestrels, northern bobwhite quail, wild turkeys, killdeer, eastern bluebirds, field sparrows, and eastern meadowlarks. In the summer, Cades Cove is visited by barn swallows, downy woodpeckers, ruby-throated hummingbirds, common yellowthroat, blue grosbeak, Acadian flycatchers, eastern wood pewees, blue-gray gnatcatchers, eastern kingbirds, barn swallows, yellow warblers, indigo buntings, and orchard orioles.

Three major groups of reptiles are found in the park: turtles, lizards, and snakes. The most common snakes in the Park are the northern ring-neck snake (*Diadophis punctatus edwardsii*), black rat snake (*Elaphe obsoleta*), eastern garter snake (*Thamnophis sirtalis*), northern water snake (*Nerodia sipedon*), eastern milk snake (*Lampropeltis triangulum trian*gulum), and northern copperhead. Timber rattlesnakes can be found on the dry ridges.

GRSM is the "Salamander Capital of the World." Climatic and geologic factors have combined to spur the development of 31 salamander species in five families, making this one of the most diverse areas on earth for this order. In fact, lungless salamanders have undergone an extraordinary level of evolutionary diversification in the park, accounting for 24 of the salamander species in the park and making it the center of diversity for the family. In total, 31 salamanders and 13 frogs are known to inhabit GRSM.

Insects make up the bulk of the non-microbial diversity in GRSM. Estimates of the number and type of species found in the park are, at best, educated guesses, and only through further research will the total number that inhabit the Smokies be approached. Many insects are beneficial to the environment and the park's ecosystem, performing key tasks, such as plant pollination and organic decomposition and recycling, and serving as food for birds, fish, and other animals. Without insects performing these services, hundreds of plants and other animals would disappear from the park. Some insects, however, are agricultural pests or serve as disease vectors that can affect plants and other animals, including humans. Some of these insect pests are responsible for the decline in eastern hemlock and Fraser fir within the park and in the surrounding areas.

Threatened and Endangered Species. Under Section 7 of the Endangered Species Act (ESA) of 1973, as amended, any action likely to adversely affect a species classified as federally protected is subject to review by the USFWS. Under Tennessee law, any action likely to adversely affect a species classified as protected by the state of Tennessee is subject to review by the TWRA. Species of animals that are listed by the state of Tennessee or the USFWS as endangered or threatened are few. The number of species that are listed as being of management concern by the NPS and state of Tennessee is much larger.

Specific surveys for protected species have not been conducted solely for the determination of presence or absence in association with the fire management program but are conducted as part of Park monitoring. Investigations regarding these species are determined in consultation with NPS, USFWS, and TWRA. Species potentially found within GRSM based on previous survey information include:

> Threatened and Endangered Animal Species. There are 16 animals (vertebrates and invertebrates) indigenous to the GRSM listed under the authority of the Endangered Species Act of 1973 as federally endangered or threatened; these are: Northern Flying Squirrel (*Glaucomys sabrinus coloratus)*; Indiana Bat (*Myotis sodalis*) – Endangered; Spotfin Chub (*Hybopsis monacha*) – Threatened; Duskytail Darter (*Etheostoma percnurum*) – Endangered; Smoky Madtom (*Noturus baileyi*) – Endangered; Yellowfin Madtom (*Noturus flavipinnis*) – Endangered and Spruce- Fir Moss Spider (*Microhexura montivaga*) - Endangered. The Red-Cocked Woodpecker (*Picoides borealis*) while believed to be extirpated from the Park is listed below because of its importance in fire management objectives. The Bald Eagle (*Haliaeetus leucocephalus*) has been recently down listed from Threatened but is still protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c). The following descriptions provide a brief overview of the species utilization of the Park.
>
> Indiana Bat. The Indiana bat (*Myotis sodalis*) is a federal- and state-listed endangered species that utilizes cave habitats for winter hibernation. Indiana bats mate in the fall, but

the female Indiana bats do not actually become pregnant until spring. Indiana bats migrate to tree roost sites in the spring, where they form maternity colonies consisting of 20 to 100 members. The bats roost beneath the shedding bark of live or dead trees, bearing only one young per female. The female may relocate their young to warmer spots on the tree where the tree is exposed to sunlight, as temperature affects the length of time required for the young to mature (Britzke et al. 2003 and 2006; USFWS 2004; Humphrey et al. 1977). According to Dr. Susan Loeb, project leader of the USDA Forest Service Southern Research Station (SRS) Threatened and Endangered Species Unit, it is common for Indiana bats to move from roost to roost, carrying their young with them (Loeb 2002; USFWS 2004).

Northern Carolina Flying Squirrel. Northern flying squirrel (*Glaucomys sabrinus coloratus*) distribution is limited to the central and southern Appalachians. Within the southern Appalachians, and within Great Smoky Mountains National Park (GSMNP), this subspecies is confined to disjunct "islands" of suitable habitat consisting of high-elevation ridges and peaks of limited size separated from each other by deep valleys or small ridges of xeric forest. Much natural history information is lacking because the northern flying squirrel is rare, extremely mobile, and occupies remote areas. The species does not occur in defined, predictable localities, making planning and protection measures difficult to undertake both within, and outside.

Red-Cockaded Woodpecker. This woodpecker is a permanent resident in pinelands and was formerly known from scattered colonies throughout the west end of the Park. This species excavates nest cavities only in living old pines with heart rot and will stay in the colony only if underbrush stays below a height of 9 to 15 feet. The Park has lost all known nesting pairs, and the last confirmed sighting was in 1982. Concern over this decline and unconfirmed sightings at the last known colony prompted the Park to undertake a restoration of this site in 1990. It is probable that the Park's wildfire suppression program has caused the decline and possible extirpation of this rare species from the Park. Without the return of prescribed fire to keep undergrowth low, it is very doubtful that the red-cockaded woodpecker will ever be successfully reintroduced.

Duskytail Darter, Smoky Madtom, Yellowfin Madtom, and Spotfin Chub. Efforts to reintroduce native fish species to Abrams Creek were begun by the USFWS in 1986. Although there are no confirmed historical records, four federal-listed fish species — the endangered duskytail darter (*Etheostoma percnurum*), the endangered smoky madtom (*Noturus baileyi*), the threatened yellowfin madtom (*Noturus flavipinnis*), and the threatened spotfin chub (*Cyprinella monacha*) — likely inhabited Abrams Creek below Abrams Falls in the past. To date, the reintroduction of three of the four federally protected fish species to lower Abrams Creek below Abrams Falls has shown moderate success, whereas one species has shown no success.

Spruce-fir moss spider. This is an extremely rare invertebrate endemic to the southern Appalachians. Its long-term viability is unknown. The typical habitat consists of moss growing on rocks and boulders in *shaded* situations. They have occasionally been found in moss mats growing on logs and in moss-litter mats at the base of large rocks. Specifically, the microhabitat of the spruce-fir moss spider appears to be associated with

moderately thick and humid, but well-drained, moss and liverwort mats growing in sheltered spots on surfaces of rock outcrops and boulders in mature high-elevation forests dominated by the Fraser fir (*Abies fraseri*). Only six populations are currently known to exist, four of which occur in Great Smoky Mountains National Park (GSMNP). Habitats at all six extant sites have been both severely limited and degraded by loss of Fraser fir trees.

In addition to the federally listed species, GRSM maintains a database of 320 plant and animal species listed by the states of North Carolina and Tennessee. Management of these plant and animal species will be according to the guidance established by the respective state. The park has 14 Federal Species of Concern, and 25 state listed animals and 68 state listed plants (from both NC and TN). Additionally, there are non-listed species and some communities mapped park-wide that are ranked by NatureServe as G1"critically globally imperiled" and G2 "globally imperiled."

3.4 Cultural Resources

3.4.1 Cultural Summary

Archeological evidence of people utilizing the abundant natural resources of the Smokies begins 12,000 years ago and continues until the formation of the Great Smoky Mountains National Park in 1934. In the Smokies, archeological resources consist of prehistoric and aboriginal sites that represent several southeastern cultural periods, as well as historic sites related to mountain culture and the Park development period. While over 500 sites have been found within the Park boundary, the total remains unknown.

Prehistoric occupation of the Great Smoky Mountains probably occurred shortly after the arrival of humans to the New World more than 12,000 years ago. However, evidence for the Paleoindian Period (12,000-8,000 B.C.) is rare within the park. Noted for the manufacture of large ovate projectile points, the Paleoindians are thought to have focused subsistence on the extinct large mammals present in the terminal Ice Age. It is generally believed these people followed the large mammals as they migrated in small highly mobile groups.

As the climate warmed to temperatures comparable to today, the fauna associated with the Ice Age began to disappear. Known to archeologists as the Archaic Period (8,000-1000 B.C.), the people's subsistence focused on the gathering of wild plants and the hunting of modern game, such as whitetail deer. Evidence for this shift in the subsistence economy is noted by the appearance of tools related to the processing of wild plants and the occurrence of smaller more expedient types of weaponry. These groups of peoples were still highly mobile and some archeologist's suggest that the Archaic people traveled seasonally to favored spots, where plants would ripen at differing times of the year or game would congregate.

The Woodland Period (1000 B.C.-1000 A.D.) was marked by the first appearance of intentional cultivation of wild plants. People began to settle in favored areas. The appearance of the bow and arrow, the occurrence of pottery, and mound-building all have their roots in the Woodland period. Ceremony and social stratification became apparent. Mounds were utilized for the internment of a select few during this cultural period.

The Mississippian Period (1000- 1540 A.D.) is marked by the appearance of full blown cultivation, the development of long-distance trade networks, the appearance of craft specialists and social elites. People during this period built large mound complexes enclosed by palisade walls. Large open plazas around the mounds provided space for the traditional stick ball game. With the arrival of the Spanish in the New World in 1540, the Mississippian way of life was gradually eroded.

Among the first Europeans to encounter and document the Cherokee was the Spanish conquistador Hernando De Soto in 1540. The Cherokee were already well established in towns and villages along major waterways and it is likely that the Cherokee Indians were residents of the area as early as the 15th century.

Known as the Qualla Phase, it is represented archeologically to some extent as a continuation of the Mississippian tradition. However, large declines in the population of the Cherokee from the introduction of European diseases and European expansionism, created major social changes. The large population centers and social elites of the preceding Mississippian period gradually declined and were supplanted with social structures focused at the familial and community level.

By the early 19th century European expansionism culminated in the forced removal of Cherokees west to the Oklahoma territory. However remnants of the Cherokee, their lands, and their culture remained in western North Carolina and today are represented as the Eastern Band of Cherokee Indians.

The first Europeans to settle in the Smokies arrived in the early 19th century. Following in the footsteps of the Cherokee, they established small farmsteads in the valleys and floodplains of the Smokies. They cleared the land and constructed many of log cabins and associated outbuildings park visitors enjoy today. Gradually flat arable agricultural land grew scarce as the population increased and people settled further up the mountains drainages.

At the end of the 19th century and beginning of the 20th century, large scale industries began to recognize and exploit the geologic and natural resources of the Smokies. Places along Eagle Creek, Hazel Creek, Forney Creek, Big Creek, Little River, and the Oconaluftee and Raven's Fork Rivers, became hubs of industrial activity. Industrial activity was centered on the clear-cutting of timber, but mining and metallurgy played a significant role in the industry of the park.

Processing mills were constructed to efficiently process the timber or ore. Networks of rail systems, roads, and trails were constructed to access the timber stands and to transport the processed goods to the national market. In some watersheds, company towns sprung up to support the workers. Vestiges of these towns and transportation networks are still visible today.

By the 1920's, as lumber company profit margins sank and the scars on the landscape from clear-cutting grew, a grassroots push for National Park began in earnest. Beginning in 1923, the Great Smoky Mountains Conservation Association (GSMCA) was formed with the support of prominent businessman and naturalists. Their aim was to found a park in the east that would prohibit logging, in contrast to the new system of national forests.

In 1926, President Calvin Coolidge signed into legislation a bill authorizing the establishment of the Great Smoky Mountains National Park. The lands were privately held at the time, and only through the combined efforts of the States of North Carolina and Tennessee was it possible to purchase the lands. Through the fundraising efforts of both states, by the GSMCA, and a private donation by the Rockefellers', over 6600 tracts were purchase and donated to the Federal government for incorporation into a park. By 1934, the acquisition of private lands had reached the acreage threshold denoted in the enabling legislation and the park was officially born.

By 1933, park management staff was in place and planning for needed visitor infrastructure was underway. A new program initiated in response to the Great Depression, provided the manpower for the implementation of park plans. Over 30 camps of 200 men and boys were dispatched to the Great Smoky Mountains National Park from 1933 to 1942. Known as the Civilian Conservation Corps (CCC), much of the work they completed remains in use today, while only remnants of their camps are found. Roads, bridges, trails, camp grounds, park buildings and fire towers are among some of their contributions to the Park.

3.4.2 Archeological Resources

Archeological evidence of people utilizing the abundant natural resources of the Smokies begins 12,000 years ago and continues until the formation of the Great Smoky Mountains National Park in 1934. In the Smokies, archeological resources consist of prehistoric and aboriginal sites that represent several southeastern cultural periods, as well as historic sites related to mountain culture and the Park development period.

While over 500 archeological sites have been found within the Park boundary, the total remains unknown Archeological sites have been identified in virtually all the park's biotic zones and in various geomorphic settings. For instance, rock art or shelters have been identified on slopes exceeding 10 %. Both buried and above ground ruins are considered to have archeological significance. Archeological significance is further dependent on the context or placement of archeological objects and/or features within a soil matrix or across geographic space. A registry of known archeological sites in maintained in the park service wide Archeological Sites Management System (ASMIS).

3.4.3 Historic Structures

Over 197 structures are listed on the park's List of Classified Structures (LCS). These structures include historic buildings and early park infrastructure including roads, bridges, and visitor centers.

3.4.4 Cultural Landscapes

The National Park Service maintains a database of historically significant landscapes in the National Park Service known as the Cultural Landscape Inventory (CLI). The park contains 42 landscapes and component landscapes currently listed on the CLI. These include both landscapes that are documented or certified as cultural landscapes and those that have been identified for further study as cultural landscapes (D. Flaugh, GRSM Landscape Architect, personal communication).

3.4.5 Other Cultural Resources

Over 150 known cemeteries are located within the park's boundaries. Most of these cemeteries are bounded by forest cover.

3.5 Surrounding Community

Eight counties encompass or lie close to boundaries of GRSM: Blount, Sevier, Cocke and Monroe counties in Tennessee are situated on the northern end, and Graham, Jackson, Swain and Haywood counties in North Carolina occupy the southern vicinity of the park. The area surrounding the park is comprised of two national parkways, three national forests, a Cherokee Indian reservation, an extensive system of lakes developed by the Tennessee Valley Authority (TVA) and the Aluminum Company of America (ALCOA), and land belonging to private individuals and organizations. Land surrounding the park is mostly rural, consisting primarily of forested foothills and mountains. Approximately 84 percent of the land within a six-mile radius of GRSM boundary is forested. The remaining areas consist mostly of agricultural land (10 percent) and urban development (2 percent). Small towns and communities, some adjacent to the park, are scattered throughout the region. The mean human population density of the eight county region is +/- 80 individuals / square mile. The majority of the people in the eight county region are employed in retail trade, manufacturing, and personal services. Much of the economy is tourism-related and land traditionally used for forests and agriculture is increasingly being replaced by resort communities, vacation homes, and retail business (GRSM 2004).

The broad management goals of the Park are to preserve the Park's diverse resources while providing for public benefit and enjoyment. GRSM is the most heavily visited park of the national park system, drawing between 9 and 10 million visitors annually (10,283,600 for 1999). Most visitors to the region travel in private automobiles. In addition to roads providing access to and within the Park, numerous foot and horse trails provide access to the Park's backcountry. The principal use of GRSM is recreational. Activities include viewing wildlife and scenery from motor vehicles, hiking, biking, camping, horseback riding, kayaking, and fishing. Hunting is not allowed within GRSM, but bear, deer, and smaller game species are hunted outside its boundaries on both national forest and private land. Park visitation rates vary seasonally, peaking between June and October (USDI, NPS, GRSM 2000). Visitation tends to be heavier during weekends and holidays, and backcountry use is high during college breaks. The Park's natural features are the main attraction for visitors, with most activities restricted to driving through the Park, or picnicking, rather than backcountry camping and hiking. The Park's backcountry contains approximately 850 miles of trail with 102 campsites and 18 shelters. While hundreds of thousands of people came to the Smokies in 1999, it is evident that larger numbers do not spend their time camping. When compared to 1998, a 2 percent decline was recorded at the front country campgrounds. Camper nights numbered 350,589 at the 10 developed campgrounds, just under the 357,623 that was reported in 1998. Just about the same number of campers utilized the 102 backcountry campsites registering 92,994 in 1999 compared to 92,522 in 1998. Additionally, data collected suggest there are over 80,000 private horse rides and 450,000 day hikes annually (USDI NPS GRSM 2000, USDI NPS 1982).

The GRSM has an annual budget of $16 million and provides an economic hub generating over $1 billion a year for surrounding tourist communities (USDI NPS GRSM 2000).

Wildland-urban interface refers to geographical areas where wildland and residential areas meet and affect each other. The urban part refers to homes and all of the man-made structures that accompany them, such as storage sheds, commercial buildings, schools, churches, and recreation structures. About 25 percent of the 346 miles of Park boundary interfaces with urban development.

The wildland-urban interface presents a sprawling tangle of developments, scattered individual summer and year-round homes, and resort areas. A systematic assessment of the Park boundary to identify specific structures at risk from wildfire has been conducted; over 300 structures have been identified to date. The areas of Gatlinburg, Townsend, and the Top-of-the-World are primary wildland-urban interface areas and continued development will be evaluated relative to proximity, topography, and fuel composition. 173 in-park structures have been identified as being at risk.

The trend toward development adjacent to the Park has accelerated in recent years, resulting in diminished amounts of privately owned open space surrounding the Park. Development dictates to a large degree the kinds of management programs, policies, and hazards that the Park must address. The fact that the Park lies in two states and numerous counties means that it must coordinate its fire program with many agencies, each of which has somewhat different charges, goals, and resources.

3.6 Public Use

The broad management goals of the park are to preserve the park's diverse resources while providing for public benefit and enjoyment. GRSM is the most heavily visited park of the national park system with over 9 million visitors annually. Most visitors to the region travel in private automobiles. In addition to roads providing access to and within the park, numerous foot and horse trails provide access to the park's backcountry. The principal use of GRSM is recreational. Activities include; viewing wildlife and scenery from motor vehicles, hiking, biking, camping, horseback riding, kayaking, and fishing.

Park visitation rates vary seasonally, peaking between June and October. Visitation tends to be heavier during weekends and holidays, and backcountry use is high during college breaks. The park's natural features are the main attraction for visitors, with most activities restricted to driving through the park, or picnicking, rather than backcountry camping and hiking (USDI NPS 1982). The park's backcountry contains approximately 850 miles of trail with 102 campsites and 18 shelters. Camper nights numbered 276,468 at the 10 developed campgrounds (GRSM 2005) The park had 73,786 camper nights at backcountry campsites in 2004 (GRSM 2005). In 2004, GRSM had an annual budget of $15.4 million (GRSM 2005).

The GRSM is noted for its outstanding vistas. These vistas include:

- Forest resources
- Mountain streams
- Wildlife
- Flowering plants

- Historical resources
- Scenic roads
- Scenic trails

3.7 Park Management and Operations

Great Smoky Mountains National Park has 312 onsite Park staff that provides the full scope of functions and activities to accomplish management objectives in law enforcement, emergency services, public health and safety, science, resource protection and management, visitor services, interpretation and education, community services, utilities, and housing.

The Fire Management Program at GRSM is composed of two work elements, the staffing associated with Resource and Visitor Protection and the staff associated within Fire Management within the Division of Resource Management and Science. Fire Management consists of a Fire Management Officer, Fire Cache Operation, and two regionally supported modules/teams, the Fire Effects Team (lead by a Fire Ecologist) and a Wildland Fire Module. The Wildland Fire Module provides skilled and mobile personnel for wildland fire or prescribed fire management. The module is self-contained and normally consists of 7 fire fighters. The module is a national resource assigned to support prescribed fire and fire use activities within the Southeast Region. The Fire Effects Team supports prescribed fire and WFU efforts at a cluster of parks throughout the region. The team monitors vegetative change associated with fire over time as well as fuel and weather conditions during the burns.

In fire operations, Resource and Visitor Protection (RVP) Rangers are responsible for initial action (previously referred to as initial attack) to wildfires in GRSM and adjacent mutual response zones. Currently, there are approximately 32 ranger staff with fire qualifications in place. Of that number, approximately 3-4 individuals have training in managing fire incidents (Incident Command System). While that number changes relative to staffing, it is the Park's goal to continue to support fire credentials in staffing vacancies in order to operate fire management programs.

In addition to RVP rangers and fire management staff, approximately 26 Park staff from other divisions (Facilities Management, Resource Management, Resource Education and Administration) are fire qualified.

4.0 ENVIRONMENTAL CONSEQUENCES

NEPA requires that a range of reasonable alternatives and the unavoidable environmental consequences associated with implementation of the alternatives be revealed prior to undertaking proposed federal actions. This chapter provides a summary of the analysis of the environmental consequences associated with implementation of the No Action Alternative and the proposed implementation of the National Fire Management Policy under Alternative B.

The goals of NPS management for all resources are achieved through consideration of the potential resource impacts associated with each alternative and identification of an

alternative that balances unavoidable impacts with the goals and objectives for the project. Resource impacts associated with each alternative differ greatly in their context, intensity and duration and this balanced approach considers the merit of all resources equally.

Impact topics are the resources of concern that could be affected by the range of alternatives. Specific impact topics were developed to ensure that alternatives were compared on the basis of the most relevant topics. The following impact topics were evaluated: natural resources, cultural resources, surrounding community, public use and experience, and park management and operations. Other impacts categories were dismissed due to the nature of the project and the lack of direct relevance to the project yet are briefly discussed in Section 1.3.

4.1 Determination of Impairment to Park Resources

Management Policies 2006 (NPS 2006) require analysis of potential effects to determine whether or not actions would impair national park resources or values. The fundamental purpose of the national park system, established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, actions that would adversely affect park resources and values. These laws give the National Park Service the management discretion to allow impacts on park resources and values when necessary and appropriate to fulfill the purposes of a park, so long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement (enforceable by the federal courts) that the National Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Impairment may result from NPS activities in managing the park, from visitor activities, or from activities undertaken by concessionaires, contractors, and others operating in the park. An impact on any park resource or value may constitute impairment. However, an impact would be most likely to constitute impairment if it affected a resource or value whose conservation was:

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

The intent of this project is to improve procedures associated with Fire Management consistent with National Fire Management policies in order to preserve, protect and enhance park resources.

4.2 Environmental Impact Definitions

***Type of Impact*:** Impacts are categorized in two different and contrasting types: adverse and beneficial. Adverse impacts are considered contrary to the goals, objectives, management policies, and practices of the NPS and the public interest or welfare. These impacts are of a kind likely to be damaging, harmful, or unfavorable to one or more of the various impact topics. Beneficial impacts are believed to promote favorable conditions for the impact topics.

Levels of Intensity: Levels of intensity refers to severity of the impact, whether it is negligible or major, or somewhere in between. The gradient of this grading system can be general or very detailed, but ultimately the assumptions and subjectivity of the system affect its sensitivity. A simple and subjective rating system is used in this Draft EA, which includes a rating scale of "no effect, negligible, minor, moderate, and major effects." The authors of this Draft EA based the rating system score on studies completed, data and information obtained from scientific and administrative sources, discussions with relevant individuals, public comments, common sense, and professional opinion. For example, consideration was given as to whether or not an action affects any natural resource parameters. The definition of "no effect" would be the same for each of the general impact topics, natural resources, cultural resources etc. No effect would mean that no measurable effects could be recorded or surmised. Each of these gradient levels are further defined below.

- For natural resource impacts including wildlife and vegetation:
  - *Negligible:* Impacts would be barely detectable, measurable, or observable.
  - *Minor:* Adverse Impacts would be detectable, but not expected to have an overall effect on the natural community. Impacts generally affect less than one-half acre vegetation or would not be expected to influence the population of any wildlife species, or may influence a small number of individuals of a species. Beneficial impacts would enhance the ecology for a small number of individuals.
  - *Moderate:* Impacts would be clearly detectable, but could have short-term appreciable effects on the local ecology. Impacts may affect up to one-acre of vegetation, but would not threaten the continued existence of any natural community. Impacts would have short-term effects. Beneficial impacts would enhance the population of any species at the park.
  - *Major:* Long-term or permanent, highly noticeable effects on the population of a species, natural community, community ecology, or natural processes. Impacts may affect over one-acre of vegetation or may affect the continued existence of any natural community or species. Beneficial impacts would enhance the population of more than one species over the long-term.

- For cultural resource impacts including cultural heritage:
  - *Negligible:* Impact to the resource is barely perceptible and not measurable and is confined to a very small local area. The Section 106 determination of effect would be no adverse effect.
  - *Minor:* Adverse impact – Impact(s) would not affect a character-defining pattern, behaviors of individuals, and features of the local heritage. The Section 106 determination of effect would be no adverse effect. Beneficial impacts would include maintaining and making slight improvements, having a positive influence on the use

and behavior patterns of visitors on a small-scale, local level (Section 106 effect would be no adverse effect).

- *Moderate*: Adverse impacts would alter a character-defining pattern or features of the local heritage, but would not diminish the integrity of the local heritage. The Section 106 determination would be adverse effect. Beneficial impacts would include improving the character and features of the local heritage and the Section 106 effect would be no adverse effect.
- *Major:* Adverse impacts would alter a character-defining pattern or features of the local heritage and diminishing the integrity of the local heritage. The Section 106 effect would be adverse effect. Beneficial impacts would include improving the character-defining patterns and features of the local heritage by including an increase in the number of people involved with heritage defining patterns (the Section 106 effect would be no adverse effect).

- For aesthetic resources and visitor experience:
  - *Negligible:* Impact to aesthetic resources and visitor experience would be barely perceptible and, hence visitors would not be aware of any changes to aesthetic resources. There would be no noticeable change in the visitor experience or any indicators of changes in visitor satisfaction.
  - *Minor:* For adverse impacts, visitors would be aware of effects, but this would not appreciably limit critical characteristics of the major of visitors. For beneficial impacts, public satisfaction would be enhanced for a small number of visitors.
  - *Moderate:* Adverse impacts would result in a change of a few critical characteristics of the desired public experience and/or the number of visitor complaints would increase. Public satisfaction would begin to either decline as a result of the effect. Beneficial impacts would improve a few critical characteristics of the public experience and/or the number of positive visitor comments would increase.
  - *Major:* Multiple critical characteristics of the desired public experience would change and/or the number of visitor complaints would greatly increase. The public would be aware of the effects associated with implementing the alternative and public satisfaction would markedly decline or increase. Beneficial impacts would improve multiple characteristics of the public experience and/or the number of positive visitor comments would increase, substantially.

- For public use and recreation - public use and experience impacts:
  - *Negligible:* Impacts would be barely detectable, hence visitors would not be aware of any effects or changes to the concession operation. There would be no noticeable change in public use and experience or in any indicators of visitor satisfaction or behavior.
  - *Minor:* For adverse impacts, visitors would be aware of effects, but this would not appreciably limit critical characteristics of a majority of the visitors. For beneficial impacts, public satisfaction would be enhanced for a small number of visitors.
  - *Moderate:* Adverse impacts would result in a change of a few critical characteristics of the desired public experience and/or the number of participants engaging in an activity would decrease. Public satisfaction would begin to decline as a result of the effect. Beneficial impacts would improve a few critical characteristics of the public experience and/or the number of visitors would increase.

- *Major:* Multiple critical characteristics of the desired public experience would change and/or the number of participants engaging in an activity would be greatly reduced or increased. The public would be aware of the effects associated with implementing the alternative and public satisfaction would markedly decline or increase. Beneficial impacts would improve multiple characteristics of the public experience and/or the number of visitors would increase, substantially.

- For Park Management and Operations:
  - *Negligible:* Park operations would not be affected or the effect would be at or low a level of detection.
  - *Minor:* The effects on NPS operations would be detectable and likely short-term, but would be of a magnitude that would not have an appreciable effect on existing operations or management.
  - *Moderate:* The effects on NPS operations would be apparent and long-term, and would result in a substantial change in Park operations or management in a manner noticeable to staff and the public.
  - *Major:* The effects on NPS operations would be readily apparent and long-term, and would result in a substantial change in Park operations or management in a manner noticeable to staff and the public. The effects would create a condition considerably different than the existing condition and would require changes in Park staff, funding or other resources.

Duration: Duration describes how long an impact would be expected to last. In this EA, impacts are described as either being short-term or long-term. Short-term is an impact that would last no more than two years. Long-term would be an impact that would last for more than two years.

Context: Context is the setting within which an impact is analyzed, such as the affected region or locality and the affected interests. In this EA, the intensity of impacts is evaluated within a local context, primarily considering effects to the park area itself. The intensity of cumulative impacts is evaluated in a regional context, and considers effects further in time and effects from other projects.

Direct and Indirect Impacts: Direct impacts include effects on the resource actually caused by the proposed action, generally at the immediate site of the action and at the time of the action. Direct impacts can extend into the future and are often permanent, but can be temporary. A direct effect is an effect that is caused by an action and occurs at the same time and place. An example of a direct impact would be the filling of a portion of a stream, which immediately causes habitat loss at that location.

Indirect impacts generally occur as a result of a “side-effect” of a direct impact, but occur later in time or further in distance than the action. For example, an indirect impact could result from silt flowing downstream, creating turbid conditions, and adversely affecting water quality.

Cumulative Impacts: The CEQ regulations, which implement the NEPA (42 USC 4321 *et seq*.), require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as "the impact on the environment which results from the

incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 CFR 1508.7). Cumulative impacts are considered for all alternatives and focus on a regional area well beyond the park boundary.

Cumulative impacts were determined by combining the impacts of each alternative with other past, present, and reasonably foreseeable future actions within the park and the vicinity. These impacts are assessed on a regional basis. These projects include development within the region, long-term population trends, cultural and social changes.

Fire management has both planned and unplanned elements and thus impacts occur incrementally. Prescribed fire is specifically initiated to have long-term cumulative net beneficial impacts to Park lands. Thus, that element will not be specifically addressed with this EA as both Alternatives have prescribed fire components and both are consistent with National Policy related to using fire to enhance or restore resources. It is possible that future actions may alter that view but at this time, reasonably foreseeable future actions related to prescribed fire do not appear to contribute to any notable cumulative impacts.

4.3 Cultural Resource Analysis

Impacts to cultural resources are described in terms of type, context, duration, and intensity, as described above, which is consistent with the regulations of the Council on Environmental Quality (1978) that implement the National Environmental Policy Act. These impact analyses also are intended to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA). In accordance with the Advisory Council on Historic Preservation's regulations implementing Section 106 of the National Historic Preservation Act (36 *Code of Federal Regulations* Part 800, Protection of Historic Properties), impacts on cultural resources were identified and evaluated by:

- Determining the area of potential effects;
- Identifying cultural resources present in the area of potential effects that are either listed in or eligible to be listed in the National Register of Historic Places;
- Applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register; and
- Considering ways to avoid, minimize, or mitigate adverse effects.

Under the Advisory Council's regulations, a determination of either adverse effect or no adverse effect must also be made for affected cultural resources. An adverse effect occurs whenever an impact alters, directly or indirectly, any characteristic of a cultural resource that qualifies it for inclusion in the National Register. For example, this could include diminishing the integrity of the resource's location, design, setting, materials, workmanship, feeling, or association. Adverse effects also include reasonably foreseeable effects caused by the alternative that would occur later in time, be farther removed in distance, or be cumulative (36 *Code of Federal Regulations* Part 800.5, Assessment of Adverse Effects). A determination of no adverse effect means there is an effect, but the effect would not diminish in any way the characteristics of the cultural resource that qualify it for inclusion in the National Register.

The Council on Environmental Quality (1978) regulations and *Director's Order #12 and Handbook: Conservation Planning, Environmental Impact Analysis, and Decision Making* (NPS 2001a) call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, such as reducing the intensity of an impact from major to moderate or minor. Any resulting reduction in intensity of impact because of mitigation, however, is an estimate of the effectiveness of mitigation under the National Environmental Policy Act only. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse effects under Section 106 may be mitigated, the effect remains adverse. A Section 106 summary is included in the impact analysis for cultural resources. The summary is intended to meet the requirements of Section 106 of the National Historic Preservation Act and is an assessment of the effect of implementing the alternatives on cultural resources, based on the criterion of effect and criteria of adverse effect found in the Advisory Council's regulations. It should also be noted that not all cultural resources of concern in the park are listed resources but are still evaluated as part of this assessment.

4.4 Alternative 1 – Current Fire Management Plan (No Action Alternative)

4.4.1 Physical Environment

4.4.1.1 Soils

Impact Analysis: This alternative would result in negligible to minor impacts to the soil. Wildfires and wildfire suppression activities pose the greatest risk to soil degradation. Minimum impact suppression tactics (MIST, NPS 2008b) would be used to further minimize the impacts. Prescribed fire is predicted to have little negative effect on the soil. High-intensity fire with its corresponding removal of forest litter and duff is actually desirable in some areas of the Park. In areas of concern with regard to erosion, best management practices for erosion control are implemented to reduce impacts.

Cumulative Effects: Numerous ground disturbing activities occur throughout the park as part of natural processes (i.e., landslides, erosion) or as part of park operations (i.e., facility/grounds maintenance, sampling). Most are minimal in their impact and would have little interaction with areas that are affected by fire. Thus, cumulative impacts are considered localized, short-term and negligible.

4.4.1.2 Air Quality

***Impact Analysis*:** Wildland fires would be suppressed using an appropriate management response (i.e., strategies and tactics that include direct attack, indirect attack, confine and contain and monitoring). Some additional smoke would be generated from utilization of the appropriate management response, though the additional acres burned would likely be small. Although it is not possible to accurately predict the number of acres burned and amount of smoke generated, recent history suggests that less than 50-150 acres would burn in an average year. Direct adverse impacts to air quality from wildland fire under this alternative would include release of

particulates and smoke into the airshed and the potential for a slight (not measurable) increase in fugitive dust from suppression activities. Smoke, particulate and dust emissions impact visibility in the park and surrounding area. Inversions are common and smoke from fires may linger in the valleys for a period of time. There may be an intermittent and short-term exceedance of air quality standards (especially particulates) resulting in short-term, localized, and negligible to minor adverse impacts to air quality and visibility. Mitigation would include rapid suppression and extinguishing of remaining smoke from heavy fuels. On a regional basis, effects to air quality would generally include minor short-term adverse impacts, as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond park boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive receptors, such as residents and visitors. These adverse indirect effects would be short-term, localized, and minor.

Prescribed fire for research and wildlife management would likely burn only about 1200-3500 acres per year during the initial 5-year period. Prescribed burns tend to leave a mosaic of burned and unburned patches within a burn unit. The acres noted above are for the burn units; actual burned acreage would be smaller. Smoke events associated with the burns would be short-lived – in the order of hours to a few days. Ignition design and timing can minimize smoke production and avoid periods where inversions are likely, though burning in these fuel models will not generate much smoke. Pile burning in the mechanical fuels treatment area would be scheduled for the winter or spring and conducted on days of good smoke dispersion. The park will coordinate with the State programs to ensure all applicable smoke management practices are implemented and to alert the State that a prescribed burn will be occurring. The direct adverse impacts of the preferred alternative on air quality include short episodes of increased particulates and decreased visibility. These direct adverse impacts would be short-term, localized, and negligible to minor. Indirect and longer-term adverse impacts include contributions to regional haze and the possibility of wind-blown dust (e.g., from dust devils) near the burned areas. The indirect long-term adverse impacts on air quality are regarded as short-term and negligible in a regional context.

Some air pollutants would be generated by use of gasoline-powered equipment in mechanical fuel reduction projects. The direct adverse effect of these pollutants on air quality, given the small size of the projects and infrequency of activity, would be localized, short-term, and negligible to minor. The indirect and longer-term adverse impacts would be negligible.

The park would comply with all federal, state, and local air quality laws and regulations, specifically the U.S. Clean Air Act and Tennessee and North Carolina air quality regulations. Smoke modeling using SASSEM or similar models will be completed to ensure sensitive receptors are not unduly impacted. Permits would be obtained, as required, for all prescribed burning. Park staff would notify the North Carolina or Tennessee state programs regarding the date and location of the proposed burn and comply with any state burning restrictions. If the state suspends burning because of poor air quality on the scheduled burn date, the park would not ignite any fuels. The influence of smoke on health and safety and the scenic viewshed would be kept to a minimum by following smoke management prescriptions listed in the Fire Management Plan or Prescribed Fire Plan.

The adverse impact of the no action alternative to air quality would be temporary, localized, and negligible to minor. Mitigation could be applied in the form of altered ignition design on prescribed fires.

Air Quality Cumulative Effects*:* The emission sources mentioned above contribute to cumulative effects on air quality at the Park. Local sources such as current and expected future visitor and employee vehicle use patterns and levels as well as external sources such as traffic on highways, recreational user traffic, aircraft overflights, grazing, adjacent farming, highway development, and wildland fires would continue to impact air quality in the park. The Park would also continue to be impacted from regional transport of air pollutants from utilities and industrial facilities. The direct impacts of this alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The indirect impacts of the preferred alternative would be negligible. The cumulative effects on air quality would be localized and minor.

Physical Resource Conclusion**:** Physical resources (soil and air quality) would not be unduly impacted by actions associated with Alternative 1. The program has been in place for many years and data collected does not support any adverse effects to soil or air quality. Limited localized air quality issues may exist in the short-term but are negligible in comparison to regional impacts on air quality.

Physical Resource Impairment Determination: While fire does contribute to localized short-term air quality impacts, these are negligible in comparison to regional impacts and the net benefit to the health of the ecosystem. The proposed activities are consistent with Park planning documents (GMP and others) in achieving resource goals and are key to achieving the natural or cultural integrity of the park. Alternative 1 would result in no impairment to Park physical resources because fire is an inherent part of the ecosystem, the impacts are negligible compared to the broader contributions of the region to air quality and there are net benefits associated with fire in enhancing natural resources values.

4.4.2 Natural Resources

This alternative was developed during the 1996 FMP planning process to give some flexibility in the management of fire for the purpose of enhancing natural resource values. This alternative allows the Park to suppress all wildfires and any fire that threatens structures, boundary areas, seasonally sensitive natural areas, or cultural areas. Management ignited fires are scheduled actions that reduce fuels at the most effective/least disruptive time. Hazardous accumulations of fuels near facilities and along boundaries are reduced in a timely manner. Additionally, management ignited fires are monitored so as to evaluate the impacts of fire on vegetation using scientifically/statistically developed plots and transects that area compared with baseline measurements. Wildfire or lightning-ignited fires; however, are not monitored given baseline cannot be anticipated for these fires. Such fires are evaluated and treated should fire disturbance result in exotic plant control needs or in other restoration prescriptions.

Under the current management practice (no action), lightning-ignited fires are allowed to burn in more remote sections of the Park's natural zones and only if a series of resource management

criteria are met. These fires do not occur every year but do provide for the development of natural vegetation patterns, at any scale in the Park.

4.4.2.1 Water Resources

***Impact Analysis**:* Alternative 1, in employing an appropriate management response to unwanted wildland fire, may result in a slight increase in acres burned than would have occurred with traditional suppression but less surface disturbance since managers may choose to utilize natural and man-made barriers rather than aggressive suppression of fires. Little of this acreage would be immediately adjacent to rivers and streams so there would be no increase in potential runoff as a result of the appropriate management response. The direct adverse effects of fire itself on water resources would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased stream flow since there would be less vegetation and thus less transpiration on the burned areas. These indirect impacts would be localized, short-term, and minor.

Depending on the location and intensity of the fire, there could be some soil erosion, but significant increases in run-off are not likely. The amount of sediment entering the stream would not be unnatural and would help maintain the natural diversity of aquatic insects in these streams. Prescribed natural fire in or adjacent to areas designated as sensitive brook trout habitat, upland swamps, wetlands and ponds would serve to maintain these areas as part of a naturally functioning ecosystem. In addition, prescribed fire may be a viable alternative to reducing fuel loads adjacent to swamps and ponds in areas containing cultural resources.

In fire suppression, engines are often driven off-road to control the fire perimeter. With an appropriate management response, there would be less fireline constructed and a lowered likelihood of off-road use of engines, as natural barriers are more likely to be used to confine wildland fires than under a full suppression. The direct adverse effect of fire suppression efforts would be negligible unless water was drawn from spring and streams for firefighting. If this occurred, the direct adverse effects of reduced flow would be localized, short-term (hours), and minor. Indirect adverse effects could include destabilizing stream banks or pond shores due to off-road travel with fire engines and other equipment. They would be mitigated by reduced off-road travel and rehabilitation of any damaged stream banks. Retardant use should remain at least 300 feet from surface water resources; if retardant did get into water courses it could have a localized, short-term effect of changing water chemistry. The indirect adverse effects would also be localized, short-term, and minor.

Prescribed burning will not occur in areas immediately adjacent to rivers and streams, and associated control lines can be quickly rehabilitated as part of the prescribed burn plan implementation. The direct adverse effects of prescribed burning would be negligible; fire would not itself affect water resources. The potential indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased streamflow since there would be less vegetation and thus less transpiration on the burned areas. Prescribed fire would be managed to avoid or minimize the potential indirect impacts by maintaining,

wherever possible, an unburned strip along the water source. These indirect adverse impacts would be localized, short-term, and negligible to minor.

Mechanical reduction of hazardous fuels would likely treat less than 50 acres during a typical 5-year period. Most mechanical reductions of hazard fuels would not be conducted adjacent to water resources. Where they may be near water sources, the potential direct adverse impacts of mechanical fuel reductions include trampling of stream banks or similar disturbances by felled and/or dragged trees. These effects can be mitigated by avoidance, where possible, and immediate rehabilitation as part of the project. These direct adverse impacts would be localized, short-term, and negligible to minor. The indirect adverse effects of this type of project may be slightly increased streamflow since there would be less vegetation and thus less transpiration on the treated area. These indirect adverse impacts would be localized, short-term, and negligible.

The direct adverse impacts of the no action alternative on water resources would be localized, short-term, and negligible. The indirect adverse impacts would be short-term, localized, and negligible to minor.

Cumulative Effects*:* Activities within and adjacent to GRSM that contribute to cumulative effects on water resources include sewage/septic pollution, agricultural runoff and hazardous waste spills. Although all of these have the potential to degrade water quality, improper sewage/septic disposal, both within and outside park boundaries, results in bacterial and nutrient contamination of park waters and may present health risks to park users and employees. The direct effects of this alternative would be localized, short-term, and negligible to minor. The potential indirect effects of the preferred alternative would be localized, short-term, and minor. The cumulative effects are localized and minor.

Conclusion*:* Direct adverse effects of the no action alternative would be localized, short-term, and negligible to minor. Indirect adverse effects would be short-term, localized, and minor. The preferred alternative would not produce any major adverse impacts or impairment of water resources or values whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the parks, or that are actions identified as a management goal of the park.

4.4.2.2 Vegetation (including threatened and endangered species)

***Impact Analysis*:** This alternative would allow the Park to suppress all wildfires and any fire that threatened structures, boundary areas, seasonally sensitive natural areas, or cultural areas. Management ignited fires would allow the Park staff to schedule actions to reduce fuels at the most effective/least disruptive time. Hazardous accumulation of fuels near facilities and along boundaries would be reduced in a timely manner. Additionally, the impacts of fire on all elements of the vegetation can only be scientifically measured in a comprehensive manner when plots and transects are set up and baseline measurements taken some time before the burn. This is not possible in most cases with either wildfire or lightning-ignited fires. The Park's Fire Management staff would also be able improve their ability to measure the effects of fire to the landscape with regular management ignited burns.

In more remote sections of the Park's natural zones, lightning-ignited fires would be allowed to burn only if an imposing array of criteria was met. These fires would not occur every year but would create the most natural vegetation patterns, at any scale in the Park.

Fire-dependent natural communities in the Park, regardless of the intensity or frequency of fire required, could be restored and kept vigorous under this alternative. Prescribed fire would also be used to achieve other resource management objectives.

The descriptions of vegetation associations and the impacts of fire on each community are described below:

PINE, PINE-OAK and OAK-PINE. As stated earlier in the document, the natural role of fire in the Park is believed to be one of frequent, low- to occasionally moderate-intensity fires. The low-ridge topography of these forests is often oriented southwest to northeast. High-intensity fires may have been 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.

A pollen analysis study in Cades Cove indicated that pines and charcoal increased dramatically about 2,000 years ago at this low-elevation site (Davidson 1983). Harmon (1980), in a dendrochronology study of the pre-park era, found a return interval of 12 years in these forest types, but this was during Euro-American settlement. Despite the low elevations, more remote ridges often are dominated by old-growth, short-leaf pines (Pinus echinata) that are 200 to 360-plus years old. Invariably, 50- to 70-year-old thickets of Virginia pine (Pinus virginiana), a species very intolerant of fire, and thin-barked hardwood tree species, such as red maple (Acer rubrum), dominate the understory. It is believed that these latter species were found naturally in these areas but in much fewer numbers. Frequent fires would have kept fire intensities low so that longer-lived pines and some fire-resistant hardwoods (oaks) would eventually dominate. The result may have been an open forest with little understory, containing low shrubs, with grasses and forbs common.

TABLE MOUNTAIN PINE (TMP). Table Mountain pine (*Pinus pungens*) 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. Studies by Sanders (1992) in the Park and in other sites in eastern Tennessee suggest that high-intensity fire is necessary to regenerate TMP, though more recent research suggests that moderate intensity fires may actually provide better conditions for sustained development of regeneration (Waldrop 2002). Park stands are old and decadent; the only significant regeneration found in the Park was in a small stand that was part of a 1986 wildfire. In 1992 and 1993 and again around 1999 and 2000, there were major losses in TMP stands due to SPB. Park Managers are concerned that some stands have lost most of their trees in the last two cycles of SPB, and that there may not be enough live trees to reproduce a stand even if fire is reintroduced.

HEATH BALDS. These tall shrublands are often found in association with Table Mountain pine. 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. 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 northern 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 eastern 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. For example, Regelbrugge (1988) suggests that oaks are capable of replacing themselves on medium quality sites following wildfire-induced canopy removal in 55- to 60-year-old stands.

The gypsy moth (Lymantria dispar) is well known for its ability to build high, defoliating populations in oak stands. Infestations have occurred all around the Park boundary but not in it. The Park will probably not become generally infested for another 10 to 15 years. The Park's old-growth oak stands are some of the most extensive left in eastern North America. The moth will not eliminate oaks in the Park, but mortality will probably be high in dense stands. The impacts of reintroducing fire into old-growth mesic oak stands need to be studied. If fire can reduce competition and increase vigor, it may minimize degradation of the stands by the moth.

In mesic oak and several other forest associations, flowering dogwoods 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*). Past research has shown that the fungus does not survive well in drier, windier microclimates, and more current research conducted in the park suggests that dogwoods have preferentially survived on sites that have burned (Holzmueller et. al., 2008). 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, small 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 tulip tree (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 occurs in this "catch-all" category: black walnut (Juglans nigra), sycamore (Platanus occidentalis), ironwood (Carpinus caroliniana), hemlock, tuliptree, elm, 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 naturally have an infrequent fire interval.

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. No lasting impact resulted.

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 firs (Abies fraseri) have 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 and have contributed significantly to the dead fuel loading (Nicholas et al., 1985). This has led to much speculation about the temporary flammability of these dead stands. Following corporate logging in the 1920s, highly cured, highly resinous slash was left on the ground. In the fall of 1925, large wildfires broke out at several locations. The fires were intensive and caused some soil erosion. Tree invasions back into these burned sites have been minimal in the intervening 70 years or so. 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. Their vegetative structure is much like the western spruce-fir forests, some of which burn every summer. The southern Appalachian climate is different, resulting in high fuel moistures year-round. In the unprecedented droughts of 1984-88, several small wildfires occurred near or ran into spruce-fir stands, and all were self-extinguished. This forest type contains many endemic species of plants and animals, and also natural vegetation communities many of which are globally imperiled. Fire can be destructive to this these communities, and recovery can be on the order of decades to centuries (e.g. Mt. Buckley).

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.

Cardamine flagellifera (Bittercress) – A southern Appalachian endemic, bittercress grows near streams and on steep moist slopes. A certain level of disturbance seems to be required to maintain populations. The Park has experimented with a late summer/early fall burn resulting in an increase in plants at the site.

Helianthus glaucophyllus (Whiteleaf sunflower) – This perennial is a southern Appalachian endemic. It is usually found on steep slopes in hardwood communities. Low intensity fire could stimulate growth.

Botrychium matricariifolium (Daisy-leaved moonwort) – A small fern at the southern limit of its range. This plant requires mineral soil to establish. An experiment with fire and raking showed both to be beneficial.

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).

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. 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.

Threatened and Endangered Species:

The fire management program at GSMNP calls for prescribed burns on 3,500 acres per year, or 17,500 acres over a 5-year period. To date, however, only 2,000 acres of prescribed burns are

conducted each year. Therefore, over the next five-year period, between 10,000 and 17,500 acres will be burned. Most of the acreage burned to data has been grassland habitat in Cades Cove.

As such, prescribed burning would affect only between 0.004% to 0.008% of all available habitat within the Park each year (0.02% to 0.04% over a 5-year period). We therefore believe that any adverse effect to any federally threatened or endangered species would be negligible. Specific burn plans will be provided to U.S. Fish and Wildlife Service that would provide details of each prescribed fire operation and mitigations/avoidance options to address any sensitive species.

Rock gnome lichen. Rock gnome lichen is the only member of this genus occurring in North America. It is a "squamulose" lichen in the reindeer moss family and grows in rather dense colonies of narrow straps or lobes (i.e. squamules). Rock gnome lichen occurs only in areas of high humidity, either at high elevations where it is frequently bathed in fog, or at middle elevations in deep river gorges. Because Rock Gnome Lichen occurs in seeps and on boulders in streams, prescribed fire is not thought to be a threat to this species.

However, a wildfire in the vicinity of Cliff Top on Mount LeConte should receive priority for suppression. A very hot fire in this area could have the potential to burn or desiccate the lichen at this location.

Spreading Avens. Spreading Avens is a rare perennial herbaceous plant endemic to a few mountaintops in North Carolina and eastern Tennessee. Spreading avens grows in "pioneer" perennial herb communities at high-elevation rocky sites, from approximately 1400 m (~ 4500 ft) to 1900 m (~ 6200 ft). A single population of this species is known from Mount LeConte; prescribed fire is not thought to be a threat to this species. However, a wildfire in the vicinity should be suppressed; a very hot fire below this location could have the potential to burn or desiccate the plants.

Virginia spiraea. It is a perennial shrub, and plants grow in dense clumps. The species is clonal, and its root system and vegetative characteristics allow it to thrive under appropriate disturbance regimes. Virginia spiraea typically is found in "disturbed" sites along rivers or streams. The species would probably not be affected by fireline construction due to its occurrence only in a single location adjacent to Abrams Creek.

In the event of a wildfire and fireline construction along Abrams Creek, fire management personnel will consult with Resource Management and Science staff to make sure any construction would not impact the exact location. Fireline construction near or adjacent to Abrams Creek, upstream from the Virginia spiraea site, would be accomplished with caution in order to minimize any siltation of Abrams Creek. Waterbars would be placed on lines in steep areas, near creeks.

***Cumulative Impacts*:** Exotic plant control activities would work in concert with fire management operations to both treat for exotics in disturbed areas where fire has occurred or in the use of fire to control exotic plants. Monitoring of fire effects would capture alterations to listed plant species both positive and negative. Thus, the activities encompassed by this

alternative have already been addressed within other planning and monitoring programs and thus there would be no added cumulative impacts under this alternative.

4.4.2.3 Fish and Wildlife (including threatened and endangered species)

***Impact Analysis*:** This alternative would, in the long-term, provide for wildlife species in the Park. While lightning ignited fires would result in a more natural mosaic of vegetative types, management ignited prescribed fires could be utilized to reduce heavy fuels, thus returning more areas to a natural condition.

This alternative would create favorable conditions for hard and soft mast-producing vegetation species in the Park. Currently the lack of fire has caused many hard mast-producing trees to be replaced with non-mast producers. Again, hard and soft mast are the most important food sources for mammal species in the Park.

This alternative would create a mixture of results for amphibian populations. Prescribed fires may reduce current population numbers and bring them more in line with those believed to have been here during the pre-European fire regime. This would be most likely to occur in the more xeric areas as fire frequency increases and vegetation begins to take on the more open characteristics that were present during the pre-European fire regime.

Except on rare occasions on small acreage, minimal changes to the amphibian populations would probably occur in the mesic forests, those areas where it is believed that most of the amphibian species diversity exists. This is believed due to the fact that even under some extreme conditions these forests have proven that they are relatively fireproof. In addition, the resource management objectives that warrant the use of prescribed fire are tied to relatively xeric areas, those areas that used to burn relatively frequently.

Increased fire frequency resulting in a more open forest would probably result in an increase in reptilian populations. Some rare species may increase in numbers.

The Park's bat population has long been a consideration in fire planning and is only amplified due to current threats associated with white nose syndrome. The park has initiated a cooperative study with Clemson University and the U.S. Forest Service in order to get a better handle on how bats, both listed and non-listed species utilize the Park. This study, initiated in 2009, has already yielded important information that will assist GRSM in refining its designation of burn units and potentially the need to leave peripheral dead trees standing adjacent to burn units. We will provide the results of this study to U.S. Fish and Wildlife Service (FWS) during consultation on specific burn units in order to ensure the most up to date information is available to minimize harm to listed bat species. In addition, as a result of ongoing consultation with FWS, the Park has adopted timelines that block periods of disturbance where tree removal is prohibited so as to avoid any potential for impacts to roosting bats.

In all cases before a prescribed fire occurs, the Park would check with its heritage database and/or do a field check to ensure that sensitive species are not adversely affected within the burn unit.

This program would give Park Managers the flexibility to help prevent further loss of rare species by using site-specific fires to recover them in a relatively short time. Full suppression of unplanned fires that threaten some rare species under certain seasonal, weather, and fuel conditions would still be an option. The use of lightning-ignited fires may eventually restore large areas of habitat in the interior of the Park to a more natural condition. This would benefit all species there and decrease the likelihood of a high-intensity, large fire which would be detrimental to most rare species.

Prescribed natural fires would have little, if any, impact on native brook trout streams or the section of Abrams Creek that contains federally listed fish species. Historically, fires in the Park burn themselves out in moist streamside areas, resulting in natural buffer strips which filter out products of erosion before they enter the stream.

Threatened and Endangered Species:

The fire management program at GSMNP calls for prescribed burns on 3,500 acres per year, or 17,500 acres over a 5-year period. To date, however, only 2,000 acres of prescribed burns are conducted each year. Therefore, over the next five-year period, between 10,000 and 17,500 acres will be burned. Most of the acreage burned to data has been grassland habitat in Cades Cove.

As such, prescribed burning would affect only between 0.004% to 0.008% of all available habitat within the Park each year (0.02% to 0.04% over a 5-year period). We therefore believe that any adverse effect to any federally threatened or endangered species would be negligible. Specific burn plans will be provided to U.S. Fish and Wildlife Service that would provide details of each fire operation and mitigations/avoidance options to address any sensitive species.

Indiana Bat. The Indiana bat (*Myotis sodalis*) is a federal- and state-listed endangered species that utilizes cave habitats for winter hibernation. Indiana bats mate in the fall, but the female Indiana bats do not actually become pregnant until spring. Indiana bats migrate to tree roost sites in the spring, where they form maternity colonies consisting of 20 to 100 members. The bats roost beneath the shedding bark of live or dead trees, bearing only one young per female. U.S. Fish and Wildlife Service has been consulted on multiple individual burn plans relative to Indiana Bat over the years and has established procedures according to recommendations to protect the species. These procedures include: when removing large trees (greater than 6 inches DBH) that have characteristics for Indiana Bat summer roosts (i.e., dead trees with exfoliating bark, tree cavities, and crevices) then follow the decision process: 1). Remove potential roost trees only between Oct 15 and April 15 or 2). Have a qualified individual observe for bats existing in the trees for 20 minutes before and after sunset. If bats are observed, use mist netting to determine species or resurvey tree at a later date. Specific details associated with this procedure are outlined as part of each burn plan.

Northern Carolina Flying Squirrel. Northern flying squirrel (*Glaucomys sabrinus coloratus*) distribution is limited to the central and southern Appalachians. Within the southern Appalachians, and within Great Smoky Mountains National Park (GSMNP), this subspecies is confined to disjunct “islands” of suitable habitat consisting of high-elevation ridges and peaks of limited size separated from each other by deep valleys or small ridges of xeric forest. Each year,

monitoring for the presence of Northern Flying Squirrels, using presence/absence in erected nest boxes is conducted. The species major forest type is usually referred to as "northern hardwood." A conifer component of any kind (spruce, fir, hemlock) must be present, even a single tree. In theory, prescribed burns may enhance snag and dead stem density, important components of northern flying squirrel habitat. If burn was too hot, it could remove preferred vegetation and fungal understory. Also, a hot burn would encourage growth of xeric oak species, potentially creating a corridor of habitat type that would allow invasion by its competitor, the southern flying squirrel (*Glaucomys volans*). However, at present no "northern hardwood" burns are planned within Park. Should a prescribed burn be planned above 4000 ft. elevation any time in the future, or if further research reveals additional elevation/habitat requirements not currently described, a separate consultation would be initiated with U.S. Fish and Wildlife Service, along with consultation with Northern flying squirrel experts to determine effect. In addition, fire staff should avoid removal of any large snags or any beech, fir, or spruce trees near or within Northern flying squirrel habitat. In general, staff should not cut any yellow birch (*Betula alleghaniensis*).

Red-Cockaded Woodpecker. This woodpecker is a permanent resident in pinelands and was formerly known from scattered colonies throughout the west end of the Park. This species excavates nest cavities only in living old pines with heart rot and will stay in the colony only if underbrush stays below a height of 9 to 15 feet. The Park has lost all known nesting pairs, and the last confirmed sighting was in 1982. Concern over this decline and unconfirmed sightings at the last known colony prompted the Park to undertake a restoration of this site in 1990. It is probable that the Park's wildfire suppression program has caused the decline and possible extirpation of this rare species from the Park. Without the return of prescribed fire to keep undergrowth low, it is very doubtful that the red-cockaded woodpecker will ever be successfully reintroduced.

Duskytail Darter, Smoky Madtom, Yellowfin Madtom, and Spotfin Chub. Efforts to reintroduce native fish species to Abrams Creek were begun by the USFWS in 1986. Although there are no confirmed historical records, four federal-listed fish species — the endangered duskytail darter (*Etheostoma percnurum*), the endangered smoky madtom (*Noturus baileyi*), the threatened yellowfin madtom (*Noturus flavipinnis*), and the threatened spotfin chub (*Cyprinella monacha*) — likely inhabited Abrams Creek below Abrams Falls in the past. To date, the reintroduction of three of the four federally protected fish species to lower Abrams Creek below Abrams Falls has shown moderate success, whereas one species has shown no success. Prescribed burning is not thought to be a threat to these four fish species. Prescribed burns may present some increased risk due to possible mobilization of silt-laden runoff from prescribed burn sites. Care will be taken to avoid erosion adjacent to streams.

Spruce-fir moss spider. The typical habitat consists of moss growing on rocks and boulders in *shaded* situations. They have occasionally been found in moss mats growing on logs and in moss-litter mats at the base of large rocks. Specifically, the microhabitat of the spruce-fir moss spider appears to be associated with moderately thick and humid, but well-drained, moss and liverwort mats growing in sheltered spots on surfaces of rock outcrops and boulders in mature high-elevation forests dominated by the Fraser fir (*Abies fraseri*). Only six populations are currently known to exist, four of which occur in Great Smoky Mountains National Park (GSMNP). Habitats at all six extant sites have been both severely limited and degraded by loss of Fraser fir trees. Spruce-fir Moss Spider habitat has been defined as occurring within fir and fir-dominated spruce-fir forests above 5400' elevation. Currently, no burns are planned in that forest type but the Park would consult with U.S. Fish and Wildlife Service on specific burn plans should they involve this habitat in the future. A fire necessitating fireline construction is not anticipated in spruce-fir forest. However, in the event of such a wildfire emergency and fireline construction was proposed; it is believed that the fire would pose a more serious threat to spiders and spider habitat if allowed to burn uncontrolled than the installation of the fireline.

***Cumulative Impacts*:** There would be no additional cumulative impacts identified associated with this alternative.

***Natural Resource Conclusion*:** Alternative 1 would result in minor adverse short-term impact on amphibian populations in peripheral habitats but over all would have a net moderate beneficial impact to natural resources by enhancing habitats.

***Natural Resources Impairment*:** Alternative 1 would result in no impairment to Park natural resources because of the inherent ecosystem benefits of fire in enhancing natural resources values.

4.4.3 Cultural Resources

***Impacts Analysis*:** The effects of fire on cultural resources are largely focused on two aspects, protection of historic structures and on protection of archeological resources. In addition, fire can be both a positive and negative influence on cultural landscapes. With regard to archeological resources, on surface and subsurface artifacts effect of fire vary with fuel loading and fire behavior. More intense fire on surface artifacts may cause scorching, fracturing, charring, and spalling. The effects are far less if artifacts are buried under as little as 1 cm of soil. Head fires generate a smaller downward heat pulse than do backing fires. With prescribed burning, use of head fires can reduce any potential impact on unknown surface archeological resources. Fire suppression and prescribed fire activities include construction of "scratch" lines, handlines, blacklining, use of flappers and other hand tools, and direct attack with water. These suppression and fire control line tactics have the potential to displace archeological materials.

With use of appropriate management responses to wildland fires, acreage may increase slightly as natural and man-made barriers are used in lieu of constructed firelines. Fire prescriptions would be designed to minimize soil heating and thus avoid impacts to buried archeological resources. Prescribed fires would generally be designed to avoid historic resources. If prescribed

burning was proposed near the historic resources, the prescribed burn plan would specify actions to avoid or mitigate potential adverse impacts to known structures or features.

Mechanical reduction of hazardous wildland fuels would be conducted near park facilities, visitor use areas, and historic structures. Woody material would be hand-piled for later removal.

Archeological Resources. Known archaeological resources would receive protection from prescribed fire. Light-hand tactics would reduce the probability that unknown resources would be damaged. Reasonable efforts will be made to identify and locate archeological resources in advance and protect them from the effects of prescribed fire. Heat from typical surface fires would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at the Park would generally be negligible. Fire may also expose archeological resources as vegetation is removed.

The direct adverse impacts of fire suppression on archeological resources under the no-action alternative would be to displace surface materials, expose buried archeological materials during handline construction, or disturb materials immediately below the surface with vehicle use due to earth moving or compaction. The indirect effects include exposure of artifacts to erosion. Given the very infrequent fire occurrence, the small fire size, and implementation of identified mitigations and management constraints, the direct and indirect adverse effects of the no-action alternative on archeological resources would be localized and minor.

The direct adverse impact of mechanical hazard fuel reductions would be exposure of materials due to ground disturbance associated with the activities. Indirect adverse impacts would include exposure of artifacts to erosion. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard fuel reductions would be localized, short-term, and minor.

In implementing prescribed burns, known archeological sites could be avoided during preparation of control lines. The direct adverse impacts of prescribed burning would be to damage stone or ceramic resources by scorching, fracturing, charring, and spalling if fire severity is quite high. However, fire severity in surface fires would usually elevate temperatures at the ground surface only slightly. Prescribed fires would be designed to avoid known archeological sites with surface organic material. Indirect adverse impacts include exposure of surface artifacts to erosion. Most burned areas would “green up” within the same season or, at the latest, the next spring. Regrowth would then diminish the possibility of artifacts being eroded or stolen. Thus the direct and indirect adverse impacts of prescribed burning would be localized, short-term, and minor.

Historic Structures. Protection of historic and nonhistoric structures would be accomplished by the creation of defensible zones adjacent to those determined to be at high risk. The direct adverse impact of wildland fire on historic buildings could be destruction or damage to the structures if fire contacts the structures directly. The indirect impacts would include smoke impacts. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with firefighting equipment. Indirect adverse impacts include the possibility of damaging the historic integrity of sites.

Given the proposed hazard fuel reduction projects near historic structures, the direct and indirect adverse effects of fire suppression on historic structures under the preferred alternative would be localized and negligible to minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts on historic structures.

Most prescribed burning would not be conducted near historic structures. When prescribed burning is proposed near historic structures, one or more of the mitigations would be included in the prescribed fire plan and implemented prior to ignition. With mitigations in place, there should be no direct adverse impacts to historic structures. Indirect adverse impacts would include smoke drifting into structures. Prescriptions using wind directions that move smoke away from structures would reduce or eliminate this effect. Given the location of prescribed fires and typically small burn block size, the direct and indirect adverse impacts of prescribed burning on historic structures would be localized, short-term, and negligible to minor.

Mechanical hazardous fuels reduction would occur near historic structures. There would be no direct adverse impacts of mechanical hazardous fuels reduction actions (ensuring that fuels reduction does not include removal of vegetation from cultural landscape) to such resources. Indirect beneficial impacts would include reducing the threat of wildland fire near the historic structures, reducing the potential damage of vegetation encroachment on the resources, and, in the case of historic structures associated with farm communities, preserving more of the open character field associated with these types of sites. The indirect impacts would be localized, short-term to long-term, negligible to minor, and beneficial.

The direct and indirect adverse impacts of the preferred alternative on historic structures would be localized, short-term, and negligible to minor. Long-term indirect impacts would be beneficial.

Cultural Landscapes.

The no action alternative, Alternative 1 would involve minor changes to cultural landscapes. Cades Cove is the only landscape currently considered within planned burn operation and the impact is moderately beneficial. No other changes to cultural landscapes are anticipated. As a result, there would be no adverse but a minor beneficial impact to cultural landscape resources. This alternative would permit hazard fuel reduction burns in the urban interface areas. Even in the short term, when size and duration of wildfires are not significantly affected, protection of values at risk would be enhanced by this alternative. Since all known cultural landscapes are associated with historic structures, the potential adverse impacts of the preferred alternative would be the same as those described for archeological resources and historic structures. Cultural landscapes could be disrupted by equipment use in fire suppression associated with soil compaction and ground disturbance but equipment use is limited given minimum tool requirements other Park use restrictions. Thus construction of a trace road could alter landscapes more dramatically but Park policy would not support that activity. Fire lines could also alter a landscape but generally fire lines area not ground disturbing and involve only the surficial removal of leaf litter. The direct and indirect

adverse effects of fire and fire suppression activities on cultural landscapes under the preferred alternative would be localized and negligible to minor.

Cultural Resources Cumulative Impacts: Both within and outside the park, natural erosion, and exposure over time contribute to cumulative effects on archeological resources, historic structures and cultural landscapes. Vandalism or theft may also diminish their values. Other activities outside the park that contribute to cumulative effects include grazing, wildland fire and collecting. The direct adverse impacts of the preferred alternative would be localized and negligible to minor. The indirect adverse impacts would be localized and negligible to minor. No projects or activities are proposed in the park in the foreseeable future that would contribute to cumulative effects. The cumulative effects of the preferred alternative are regarded as adverse, localized, and minor.

Cultural Resources Conclusion: Alternative 1 would result in localized, short-term, and minor effects with regard to archeology and historic structures. Cultural landscapes would receive a net localized moderate beneficial impact at Cades Cove due to the enhancement of fields and a overall minor beneficial impacts on the landscapes in general across the Park. The indirect adverse impacts would be localized, short-term, and negligible to minor.

Cultural Resources Impairment: This alternative would not produce any major adverse impacts or impairment of archeological resources, historic resources, and cultural landscapes whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park because MIST principles will be utilized and thus cultural resources will not be disturbed. Under the FMP, each proposed burn plan specifically addresses mitigations and avoidance techniques to protect cultural resources.

4.4.4 Surrounding Community

***Impact Analysis*:** Alternative 1 would have negligible short-term adverse impacts since there would be limited disruption of surrounding community area during a prescribed or managed fire. Under this alternative, it is expected that there would still be only occasional, temporary impact to scenic views, day and overnight hikes, camping, picnicking, and fishing opportunities or to the adjacent community due to wildland fires and prescribed fires. Therefore, the direct adverse impacts of Alternative 1 would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial by improving the environmental quality of the Park thus making it initially disturbed but ultimately more natural in setting and viewscape to our Park neighbors.

There is a national trend of people are moving away from crowded urban areas to rural homes. In many instances these homes are built in the wildland environment. This situation is referred to as the "Wildland-Urban Interface" (WUI). WUI programs are pursued under this alternative, developed to reduce fuels adjacent to urban areas and communicate fire program objectives to the surrounding community. Wildfires that occur in the WUI also threaten and sometimes destroy homes and other improvements. The Park and the TN and NC Division of Forestry are actively working with communities and local fire departments to educate and inform homeowners about how they can mitigate this risk through active programs like FireWise. These

programs may mitigate for any potential impact to the surrounding community from fire and certainly will communicate the importance of a balanced and active fire program.

Cumulative Impacts: The direct and indirect adverse impacts of this alternative would be localized, short-term, and minor. Other activities which contribute to cumulative impacts on visitor experiences and park use include recreational uses, grazing, residential development, wildland fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from adjacent land owners or businesses. In some cases, these activities (e.g. grazing) may contribute to historic scenes and community/visitor experiences. The paved park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are currently proposed within the park that would contribute to cumulative impacts on the surrounding community other than several repaving projects that are all short-term and localized with minor adverse impacts to access. The cumulative effect of this alternative would be localized and minor.

***Surrounding Community Conclusion*:** Alternative 1 would have localized, short-term, and minor direct adverse impacts on the surrounding community. The indirect adverse impacts would be localized, short-term, and minor. The long-term direct effect would be minor beneficial in promoting FireWise communities and reducing fuels adjacent to the surrounding communities.

4.4.5 Public Use and Access

***Impact Analysis*:** Alternative 1 would have negligible short-term adverse impacts since there would be limited disruption of public use of this area during a prescribed or managed fire. Under this alternative, it is expected that there would still be only occasional, temporary impact to scenic views, day and overnight hikes, camping, picnicking, and fishing opportunities due to wildland fires and prescribed fires. Therefore, the direct adverse impacts of Alternative 1 would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial by improving the environmental quality of the Park thus making it initially disturbed but ultimately more natural in setting and viewscape.

There would be a minor increase in smoke and/or odor production and temporarily blackened acres from potential small increases in burned acreage by wildland fires managed under an appropriate management response and prescribed burns. Smoke production would be of limited in duration, usually lasting a few hours to a few days in most communities. Exceptions may occur when meteorological conditions, such as an inversion exist and smoke may linger for a longer period of time. Blackened areas usually green up within weeks to months (and no later than the following spring).

Direct adverse impacts may include minor displacement of some visitor activities during prescribed burn operations, but that would be limited to a few hours over the course of a year in total. Other direct adverse impacts of increased burning on visitor experiences and aesthetic resources would include smoke in scenic views, odors, temporary restrictions in access to some areas, and the presence of blacked areas within natural vistas. The potential direct adverse impact

to visitor experiences and aesthetic resources is localized, short-term, and negligible to minor. The low frequency and small size of these fires further reduces the potential adverse impacts. The indirect effect of the preferred alternative would be the presence of blackened areas for the remainder of the growing season. Some visitors might find this displeasing; others may find the presence of burned areas pleasing. The presence of fire, smoke, and blackened areas presents an opportunity for education and interpretation of natural values and processes which may provide a minor, long-term, beneficial impact. The indirect effects of this alternative would be localized, short-term, minor, and adverse or beneficial based on the effect noted by the specific fire in the localized area.

Mechanical removal of hazardous fuels would be conducted during periods of low visitation or in areas of restricted public access and managed to create little visual impact or change in scenic vistas. Visitor access to the park would not be curtailed; consequently there would be no direct adverse impacts to visitors. Indirect adverse effects would include the sound of chainsaws and/or leaf blowers for very short periods of time and a somewhat changed scene as fuels near park facilities and historic structures are reduced. Therefore, the adverse direct impacts of the no action alternative on visitor experiences would be short-term, localized, and minor. Longer-term indirect impacts would include a reduced potential for large fires and subsequent reduced potential for substantive modifications of scenic vistas; these indirect impacts would be minor and beneficial.

Some of the visitors' diminished park experience would probably be offset as they realize the beneficial aspects of the prescribed fire through educational programs.

Because of the relatively small size of most of these fire programs discussed within this alternative and the overall acreage of the Park as a whole, the vast majority of visitors to the Park on any given day would not be aware that a fire was burning. And, on days when smoke could be detected, chances are that the fire originated on lands outside the Park.

Park files do record wildfires of several thousand acres that have lasted multiple days, and it is believed that lightning-caused fires could on rare occasions, burn for days or weeks covering hundreds or thousands of acres.

Cumulative Impacts: The direct and indirect adverse impacts of this alternative would be localized, short-term, and minor. Other activities which contribute to cumulative impacts on visitor experiences and park use include recreational uses, grazing, residential development, wildland fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from visitor use activities. In some cases, these activities (e.g. grazing) may contribute to historic scenes and visitor experiences. The paved park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are currently proposed within the park that would contribute to cumulative impacts on public use and access other than several repaving projects that are all short-term and localized with minor adverse impacts to access. The cumulative effect of this alternative would be localized and minor.

***Public Use and Access Conclusion*:** Alternative 1 would have localized, short-term, negligible to minor direct adverse impacts on public use and access. Long-term effects would be negligible beneficial. The indirect adverse impacts would be localized, short-term, and minor.

4.4.6 Park Management/Operations and Safety

Impact Analysis: Under Alternative 1, District Rangers are responsible for initial attack (now termed initial action) to wildfires in GRSM and adjacent mutual response zones. District Rangers ensure a qualified incident commander (ICT5 or higher) responds to each reported incident. If a qualified Incident Commander Type 5 (ICT5) is not available within the district, one would be requested through Park Dispatch. The incident commander is responsible for performing a strategic fire size-up, including fire cause and relaying that information via Park Dispatch to the Fire Management Officer and District Ranger. The Fire Management Officer and District Ranger ensure a complexity analysis has been performed and that the appropriately qualified incident commander is assigned to each incident.

If initial attack (action) is unsuccessful and requires extended attack, then the incident commander requests additional resources including an ICT3. The ICT3 is then responsible for ensuring completion of a WFSA (Suppression) or WFIP (Fire Use). The ICT3 would also develop planning, logistics and operations for each fire. Under this alternative if a fire threatens to exceed the initial attack and extended attack capabilities of the Park and local cooperating agencies, additional resources would be ordered through ROSS.

Under Alternative 1, a natural ignition fire may be considered a Wildland Fire Use after an initial size up and completion (and signature) of the Wildland Fire Implementation Plan (WFIP). Initial size up is conducted by an ICT5 or higher and conveys information to the FMO who is responsible for the initial evaluation and WFIP. The Incident Commander along with the FMO will be responsible for completing the Stage I: Initial Fire Assessment that provides the decision framework for selecting the appropriate management response. Operational management decisions are described in the WFIP. Specific WFIP requirements are outlined in Chapter 4 of the Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide.

Under Alternative 1, prescribed fire is a management action tool used to mimic and recreate the natural mosaic and composition of ecological communities. The FMO is responsible for planning and implementation of all prescribed fires with assistance from GRSM staff including R&VP rangers. Fire effects' monitoring is also an integral component to all prescribed fire operations to ensure management objectives are being achieved.

Fuel reduction is also accomplished under this alternative. Common practices include cutting and piling, thinning, and mastication. This task is usually conducted by Fire Management staff or contract labor.

The direct effects on park operations and management are related to the magnitude of the fire suppression efforts. Most direct effects on staffing can be mitigated by requesting additional resources, which would normally transition within extended attack. Indirect effect on park operations would be largely short-term in nature and potentially involve drawing staff from daily

duties to focus on the fire operation until additional resources are available or until the fire is resolved.

> ***Safety:*** The direct adverse effect of the no-action alternative is exposure of fire management personnel to the hazards typically associated with wildland fire suppression: burns, cuts, and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include long-term effects of smoke inhalation. Exposure to direct and indirect effects of fire suppression would be greatest with this alternative since direct attack is emphasized.
>
> Although there have been several injuries and fatalities nationally, direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, 18 watch out situations, LCES, and other risk mitigation actions. Temporary closures would be used to reduce exposure to park visitors and neighbors. The direct and indirect adverse impacts to firefighters and the public would be localized, short-term to long-term, and minor.

Park Management/Operations and Safety Cumulative Effects*:* Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of the no-action alternative include a slightly longer duration of exposure to hazards associated with fire suppression activities. The regional resources that are hosted at GRSM are not solely dedicated to the Park and thus may be unavailable when committed to other parks but can also backfill for GRSM staffing during extended fire operations. The cumulative effects on wildland firefighter and public safety are localized and minor. Operations associated with fire are always intertwined with Resource and Visitor Protection Ranger collateral duties associated with general law enforcement within the Park.

Park Management/Operations and Safety Conclusion*:* The direct and indirect adverse impacts to firefighters and the public would be localized, short-term and minor. Long-term effects would be considered negligible as the likelihood of extended fire operations is low.

Park Management/Operations and Safety Impairment: Alternative 1 would not produce any impairment of park operation and safety as this operation is an action identified as a management goal of the park and is key in protecting park natural and cultural resources.

4.5 ALTERNATIVE 2 (Action Alternative) *(Environmentally Preferred and Preferred Alternative)*

4.5.1 Physical Resources

4.5.1.1 Soils

Impact Analysis: The impacts associated with this alternative would be similar as those associated with the no action alternative. Acreage of disturbance may slightly increase as the opportunity to manage wildfire under this alternative may increase the average number of acres burned, annually. However, the added acreage would be mitigated by the use of less invasive methods, which would result from evaluating the suitability for resource benefit in naturally occurring fires and the ability to implement a full range of tactical options under extended attack incidents on human caused fires. Impacts to soils would still be considered negligible to minor. Wildfires and wildfire suppression activities pose the greatest risk to soil degradation; however, under this alternative the range of suppression tactics is broader and may include less invasive methods than those required under the no action alternative. Prescribed fire is predicted to have little negative effect on the soil. High-intensity fire with its corresponding removal of forest litter and duff is actually desirable in some areas of the Park. In areas of concern with regard to erosion, best management practices for erosion control are implemented to reduce impacts.

Cumulative Effects: Numerous ground disturbing activities occur throughout the park as part of natural processes (i.e., landslides, erosion) or as part of park operations (i.e., facility/grounds maintenance, sampling). Most are minimal in their impact and would have little interaction with areas that are affected by fire. Thus, cumulative impacts are considered localized, short-term and negligible.

4.5.1.2 Air Quality

Impact Analysis: Air quality impacts will be largely the same as those described under the no action alternative. Direct adverse impacts to air quality from wildland fire under this alternative would include release of particulates and smoke into the airshed and the potential for a slight (not measurable) increase in fugitive dust from fire activities. Smoke, particulate and dust emissions will impact visibility in the park and surrounding area. Inversions are common and smoke from fires may linger in the valleys for a period of time. There may be an intermittent and short-term exceedance of air quality standards (especially particulates) resulting in short-term, localized, and negligible to minor adverse impacts to air quality and visibility. Mitigation would include rapid suppression and extinguishing of remaining smoke from heavy fuels. On a regional basis, effects to air quality would generally include minor short-term adverse impacts, as quantities of pollutants, primarily particulates, are released to the atmosphere and travel beyond park boundaries. Indirect adverse effects from these air emissions would include reduced visibility along roadways, reductions in recreation values due to visibility limitations, smoke and odors, and possible health effects to sensitive receptors, such as residents and visitors. These adverse indirect effects would be short-term, localized, and minor.

The Park has an air pollution advisory system in place during days that exceed the National Ambient Air Quality Standards for ozone and/or particulate matter. These advisories must be taken into consideration when planning and implementing each prescribed fire. Under some advisories, large landscape-sized fires may be unacceptable while those of a smaller size might be allowed. Some fires may be remotely located and exposure to visitors and employees mitigated.

The governors of NC and TN have recommended that the Great Smoky Mountains National Park be a CAA non-attainment area for the current 8-hour ozone standard (>75 ppb) . EPA will make a final determination on the designation recommendations in the near future. Both states will be required to monitor ozone, develop a State Implementation Plan to mitigate and reduce the sources of air pollution if the park continues to exceed the standard. Each plan could lead to increased monitoring of smoke and more stringent regulations.

Air Quality Cumulative Effects*:* The cumulative impacts are the same as those discussed under alternative 1 (no action); however, if we consistently manage wildfires using methods other than direct attack, the potential impacts of this alternative are actually higher than the no action - specifically to local populations. No additional effects associated with other planning efforts would impact this alternative cumulatively. The direct impacts of this alternative would be short-term and minor on a local scale and nearly negligible on a regional scale. The indirect impacts of the preferred alternative would be negligible. The cumulative effects on air quality would be localized and minor.

Physical Resource Conclusion**:** Physical resources (soil and air quality) would not be unduly impacted by actions associated with Alternative 2. The fire management program elements have been in place for many years and data collected does not indicate any adverse effects to soil or air quality. Limited localized air quality issues may exist in the short-term but are negligible in comparison to regional impacts on air quality.

Physical Resource Impairment Determination: While fire does contribute to localized short-term air quality impacts, these are negligible in comparison to regional impacts and the net benefit to the health of the ecosystem. The proposed activities are consistent with Park planning documents (GMP and others) in achieving resource goals and are key to restoring and maintaining the natural or cultural integrity of the park.

4.5.2 Natural Resources

Under Alternative 2, every naturally occurring fire in FMU 2 would be evaluated for suitability for resource benefit. Thus in general, alternative 2 is inherently geared towards benefiting natural resources. Strategic fire response (SFR) is a holistic approach to managing wildfires with the goal of meeting fire management unit objectives. Typically, fire response ranges across a spectrum of tactical options (from monitoring from a distance to intensive suppression actions). Beginning with the initial action to any wildfire, decisions will reflect the goal of using available firefighting resources to manage the fire for the safest, most effective, and most efficient means available while meeting identified fire management unit objectives.

4.5.2.1 Water Resources

***Impact Analysis**:* The impacts associated with Alternative 2 parallel those described under the no action alternative. Employing a SFR to all unplanned wildland fires may result in a slight increase in acres burned than would have occurred with traditional suppression, but less surface disturbance since managers may chose to utilize natural and man-made barriers rather than aggressive suppression of fires. The direct adverse effects of fire itself on water resources would be negligible. Indirect adverse effects may include slight increases in water temperature if shading vegetation is burned, slight increases in sediment if fire removes vegetation immediately adjacent to water sources, and slightly increased streamflow since there would be less vegetation and thus less transpiration on the burned areas. These indirect impacts would be localized, short-term, and minor.

***Cumulative Effects**:* Activities within and adjacent to GRSM that contribute to cumulative effects on water resources include sewage/septic pollution, agricultural runoff and hazardous waste spills. Although all of these have the potential to degrade water quality, improper sewage/septic disposal, both within and outside park boundaries, results in bacterial and nutrient contamination of park waters and may present health risks to park users and employees. The direct effects of this alternative would be localized, short-term, and negligible to minor. The potential indirect effects of the preferred alternative would be localized, short-term, and minor. The cumulative effects are localized and minor.

***Conclusion**:* Direct adverse effects of the preferred alternative would be localized, short-term, and negligible to minor. Indirect adverse effects would be short-term, localized, and minor. The preferred alternative would not produce any major adverse impacts or impairment of water resources. Likewise, the preferred alternative would not produce any major adverse impacts to values whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

4.5.2.2 Vegetation (including threatened and endangered species)

***Impact Analysis*:** The impacts associated with this alternative would be similar to those evaluated under the no action alternative. The Park would suppress all wildfires and any fire that threatened sensitive natural areas. Prescribed fires would allow the Park staff to schedule actions to reduce fuels at the most effective/least disruptive time for optimizing vegetation growth periods and seasonality. Fire-dependent natural communities in the Park, regardless of the intensity or frequency of fire required, could be restored and kept vigorous under this alternative.

The descriptions of vegetation associations below generally discuss the effects fire have on the priority assembles and communities in the Park. It should be noted that it is difficult to contrast the two alternatives as the slight difference between alternative do not lend them to an alternative based comparison.

<u>PINE, PINE-OAK and OAK-PINE</u>. 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. The natural role of fire in the Park is

believed to be one of frequent, low- to occasionally moderate-intensity fires. The low-ridge topography of these forests is often oriented southwest to northeast. High-intensity fires may have been 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.

A pollen analysis study in Cades Cove indicated that pines and charcoal increased dramatically about 2,000 years ago at this low-elevation site (Davidson 1983). Harmon (1980), in a dendrochronology study of the pre-park era, found a return interval of 12 years in these forest types, but this was during Euro-American settlement. Despite the low elevations, more remote ridges often are dominated by old-growth, short-leaf pines (Pinus echinata) that are 200 to 360-plus years old. Invariably, 50- to 70-year-old thickets of Virginia pine (Pinus virginiana), a species very intolerant of fire, and thin-barked hardwood tree species, such as red maple (Acer rubrum), dominate the understory. It is believed that these latter species were found naturally in these areas but in much fewer numbers. Frequent fires would have kept fire intensities low so that longer-lived pines and some fire-resistant hardwoods (oaks) would eventually dominate. The result may have been an open forest with little understory, containing low shrubs, with grasses and forbs common.

Two issues currently concern Park Managers about the dry, low-elevation pinelands. In some sites, hardwoods now dominate stands that were mostly pine 20 years ago. It is not known at this point whether these areas will revert to pine with the reintroduction of fire, as the under-the-canopy microclimate may have become moister, less windy and the fuels less resinous to the point that a fire cannot appreciably alter the composition of the stands. Second, the Park is studying whether recently killed pine stands regenerate with the application of prescribed fire. The southern pine beetle (Dendroctonus frontalis) (SPB) is a native insect that kills adjacent pines in a stand. Cyclical in occurrence, every 10-15 years, the beetles become epidemic, killing thousands of pines in hundreds of "spots" in the Park. There is strong evidence that pine stands that are unnaturally dense (overstocked) are much more susceptible to SPB attack (USDA Forest Service 1992). Since 1988, the Park has experienced a prolonged SPB event which has been both extensive as well as intensive. Whole ridges of several square kilometers have received heavy losses of pine (Nicholas et al., 1984). Kuykendall (1978) suggested that pines, SPB and fire are dependent links that follow one another in that order. Extensive beetle-killed pine stands do not regenerate pine since the seedbed required for adequate germination of pine-mineral soil is absent (Kuykendall 1978).

TABLE MOUNTAIN PINE (TMP). Table Mountain pine (*Pinus pungens*) 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 TMP study conducted during the late 1990s documented 60 stands of this species, 5 acres and larger, in the Park. Most are located above 2,500 feet in elevation. Studies by Sanders (1992) in the Park and in other sites in eastern Tennessee suggest that high-intensity fire is necessary to regenerate TMP, though more recent research suggests that moderate intensity fires may actually provide better conditions for sustained development of regeneration (Waldrop 2002). Park stands are old and decadent; the only significant regeneration found in the Park was in a small stand that was part of a 1986 wildfire. In 1992 and 1993 and again around 1999 and 2000, there were major losses in TMP stands due to SPB. Park Managers

are concerned that some stands have lost most of their trees in the last two cycles of SPB, and that there may not be enough live trees to reproduce a stand even if fire is reintroduced.

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. 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 northern 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 eastern 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. For example, Regelbrugge (1988) suggests that oaks are capable of replacing themselves on medium quality sites following wildfire-induced canopy removal in 55- to 60-year-old stands.

The gypsy moth (Lymantria dispar) is well known for its ability to build high, defoliating populations in oak stands. Infestations have occurred all around the Park boundary but not in it. The Park will probably not become generally infested for another 10 to 15 years. The Park's old-growth oak stands are some of the most extensive left in eastern North America. The moth will not eliminate oaks in the Park, but mortality will probably be high in dense stands. The impacts of reintroducing fire into old-growth mesic oak stands need to be studied. If fire can reduce competition and increase vigor, it may minimize degradation of the stands by the moth.

In mesic oak and several other forest associations, flowering dogwoods 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*). Past research has shown that the fungus does not survive well in drier, windier microclimates, and more current research conducted in the park suggests that dogwoods have preferentially survived on sites that have burned (Holzmueller et. al., 2008). 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, small 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 tulip tree (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 occurs in this "catch-all" category: black walnut (Juglans nigra), sycamore (Platanus occidentalis), ironwood (Carpinus caroliniana), hemlock, tuliptree, elm, 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 naturally have an infrequent fire interval.

GRASSY BALDS. Several small, ridgetop, grassy balds occur along the main ridge of the Park in the western and central sections. 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. No lasting impact resulted.

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 firs (Abies fraseri) have been killed by an introduced insect, the balsam woolly adelgid (Adelges piceae). This has led to much speculation about the temporary flammability of these dead stands. Following corporate logging in the 1920s, highly cured, highly resinous slash was left on the ground. In the fall of 1925, large wildfires broke out at several locations. The fires were intensive and caused some soil erosion. Tree invasions back into these burned sites have been minimal in the intervening 70 years or so. 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. Their vegetative structure is much like the western spruce-fir forests, some of which burn every summer. The southern Appalachian climate is different, resulting in high fuel moistures year-round. In the unprecedented droughts of 1984-88, several small wildfires occurred near or ran into spruce-fir stands, and all were self-extinguished. This forest type contains many endemic species of plants and animals, and also natural vegetation communities many of which are globally imperiled. Fire can be destructive to this these communities, and recovery can be on the order of decades to centuries (e.g. Mt. Buckley).

Rare Plant Populations in GRSM That Might Benefit from Fire

The effects of fire management on rare plant populations under Alternative 2 would be the same as those discussed under Alternative 1. *Cardamine flagellifera* (Bittercress) enjoys a certain level of disturbance and experimentation with a late summer/early fall burns has resulted in an increase in plants at the site. *Helianthus glaucophyllus* (Whiteleaf sunflower) is stimulated by low intensity fire which improves growth. *Botrychium matricariifolium* (Daisy-leaved moonwort) is dependent on mineral soil to become established. Experimental manipulaton with fire and raking showed both to be beneficial.

Platanthera peramoena (Purple fringeless orchid) requires some sort of disturbance, usually in some particular quality and scale to maintain populations, thus fire may be beneficial. Lastly, *Silene ovata* (Rough-leaved campion) is a perennial that occupies light gaps in old-growth mesic oak forests and may benefit from the fire strategies used to manage oak communities (see Mesic Oaks discussion, above).

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

The effects of fire management on exotic plant species under Alternative 2 would be the same as those discussed under Alternative 1. *Alliaria petiolata* (Garlic mustard), *Lonicera japonica* (Japanese honeysuckle) *Pueraria lobata* (Kudzu), and *Microstegium vimineum* (Japanese grass) each respond to fire management techniques.

Threatened and Endangered Species:

The impact to listed threatened and endangered plant and lichen species would be similar to those described under Alternative 1. The fire management program at GSMNP calls for prescribed burns on 3,500 per year, or 17,500 acres over a 5-year period. To date, however, only 2,000 acres of prescribed burns are conducted each year. Therefore, over the next five-year period, between 10,000 and 17,500 acres will be burned. Most of the acreage burned to data has been grassland habitat in Cades Cove.

As such, prescribed burning would affect only between 0.004% to 0.008% of all available habitat within the Park each year (0.02% to 0.04% over a 5-year period). We therefore believe that any adverse effect to any federally threatened or endangered species would be negligible. Specific burn plans will be provided to U.S. Fish and Wildlife Service that would provide details of each prescribed fire operation and mitigations/avoidance options to address any sensitive species.

***Cumulative Impacts*:** Exotic plant control activities would work in concert with fire management operations to both treat for exotics in disturbed areas where fire has occurred or in the use of fire to control exotic plants. Monitoring of fire effects would capture alterations to listed plant species both positive and negative (i.e., restoration and exotic plant program areas). Thus, the activities encompassed by this alternative have already been addressed within other planning and monitoring programs and thus there would be no cumulative impacts under this alternative.

4 5.2.3 Fish and Wildlife (including threatened and endangered species)

***Impact Analysis*:** Impacts associated with this alternative would be similar to those described by the no action. As stated earlier, some additional acreage could be added as a result of the policy implementation of this alternative. That increased acreage could result in slight increases in disturbance to wildlife but also result in enhancement of habitat and food production for many wildlife species. Thus, this alternative would, in the long-term, provide critical benefits for wildlife species in the Park. Prescribed natural fires would result in a more natural mosaic of vegetative types, management ignited prescribed fires could be utilized to reduce heavy fuels, thus returning more areas to a natural condition. The impacts are therefore characterized as

minor localized short-term adverse with long-term net beneficial effects associated with habitat enhancement.

Threatened and Endangered Species:

The impact to listed threatened and endangered plant and lichen species would be similar to those described under Alternative 1. The fire management program at GSMNP calls for prescribed burns on 3,500 acres per year, or 17,500 acres over a 5-year period. To date, however, only 2,000 acres of prescribed burns are conducted each year. Therefore, over the next five-year period, between 10,000 and 17,500 acres will be burned. Most of the acreage burned to data has been grassland habitat in Cades Cove.

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***Cumulative Impacts*:** There would be no cumulative impacts identified associated with this alternative.

***Natural Resource Conclusion*:** Alternative 2 would result in minor adverse short-term localized impacts isolated populations in peripheral habitats (i.e., amphibians) but over all would have a net long-term beneficial impact to natural resources by enhancing habitats and restoring vegetation communities.

***Natural Resources Impairment*:** Alternative 2 would result in no impairment to Park natural resources because of the inherent ecosystem benefits of fire in enhancing natural resources values.

4.5.3 Cultural Resources

Impact Analysis: The effects of fire on cultural resources are largely the same as those discussed for the no action alternative. With use of strategic response to wildland fires, acreage may increase slightly from the approach employed within the no action.

> ***Archeological Resources.*** Known archaeological resources would receive protection from prescribed fire. Light-hand tactics (MIST) would reduce the probability that unknown resources would be damaged. Reasonable efforts will be made to identify and locate archeological resources in advance and protect them from the effects of prescribed fire. Heat from typical surface fires would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of fire on archeological resources at the Park would generally be negligible. Fire may also expose archeological resources as vegetation is removed.

The direct adverse impacts of fire suppression on archeological resources under the no-action alternative would be to displace surface materials, expose buried archeological materials during handline construction, or disturb materials immediately below the surface with vehicle use due to earth moving or compaction. The indirect effects include exposure of artifacts to erosion. Given the very infrequent fire occurrence, the small fire size, and implementation of identified mitigations and management constraints, the direct and indirect adverse effects of the no-action alternative on archeological resources would be localized and minor.

The direct adverse impact of mechanical hazard fuel reductions would be exposure of materials due to ground disturbance associated with the activities. Indirect adverse impacts would include exposure of artifacts to erosion. With avoidance of known archeological resources and implementation of mitigation actions, the direct and indirect adverse impacts of hazard fuel reductions would be localized, short-term, and minor.

In implementing prescribed burns, known archeological sites could be avoided during preparation of control lines. The direct adverse impacts of prescribed burning would be to damage stone or ceramic resources by scorching, fracturing, charring, and spalling if fire severity is quite high. However, fire severity in surface fires would usually elevate temperatures at the ground surface only slightly. Prescribed fires would be designed to avoid known archeological sites with surface organic material. Indirect adverse impacts include exposure of surface artifacts to erosion. Most burned areas would "green up" within the same season or, at the latest, the next spring. Regrowth would then diminish the possibility of artifacts being eroded or stolen. Thus the direct and indirect adverse impacts of prescribed burning would be localized, short-term, and minor.

Historic Structures. Protection of historic and nonhistoric structures would be accomplished by the creation of defensible zones adjacent to those determined to be at high risk. The direct adverse impact of wildland fire on historic buildings could be destruction or damage to the structures if fire contacts the structures directly. The indirect impacts would include smoke impacts. The direct adverse impact of fire suppression on historic structures would be limited to the potential to damage such structures by contact with firefighting equipment. Indirect adverse impacts include the possibility of damaging the historic integrity of sites. Given the proposed hazard fuel reduction projects near historic structures, the direct and indirect adverse effects of fire suppression on historic structures under the preferred alternative would be localized and negligible to minor. The relative infrequency and small size of wildland fires would further diminish the probability of adverse impacts on historic structures.

Most prescribed burning would not be conducted near historic structures. When prescribed burning is proposed near historic structures, one or more of the mitigations would be included in the prescribed fire plan and implemented prior to ignition. With mitigations in place, there should be no direct adverse impacts to historic structures. Indirect adverse impacts would include smoke drifting into structures. Prescriptions using wind directions that move smoke away from structures would reduce or eliminate this effect. Given the location of prescribed fires and typically small burn block size, the direct and indirect adverse impacts of prescribed burning on historic structures would be localized, short-term, and negligible to minor.

Mechanical hazardous fuels reduction would occur near historic structures. There would be no direct adverse impacts of mechanical hazardous fuels reduction actions (ensuring that fuels reduction does not include removal of vegetation from cultural landscape) to such resources. Indirect beneficial impacts would include reducing the threat of wildland fire near the historic structures, reducing the potential damage of vegetation encroachment on the resources, and, in the case of historic structures associated with farm communities, preserving more of the open character field associated with these types of sites. The indirect impacts would be localized, short-term to long-term, negligible to minor, and beneficial.

The direct and indirect adverse impacts of the preferred alternative on historic structures would be localized, short-term, and negligible to minor. Long-term indirect impacts would be beneficial.

Cultural Landscapes.

The action alternative, Alternative 2 would involve minor changes to cultural landscapes. Cades Cove is the only landscape currently considered within planned burn operation and the impact is moderately beneficial. No other changes to cultural landscapes are anticipated. As a result, there would be no adverse but a minor beneficial impact to cultural landscape resources. This alternative would permit hazard fuel reduction burns in the urban interface areas. Even in the short term, when size and duration of wildfires are not significantly affected, protection of values at risk would be enhanced by this alternative. Since all known cultural landscapes are associated with historic structures, the potential adverse impacts of the preferred alternative would be the same as those described for archeological resources and historic structures. Cultural landscapes could be disrupted by equipment use in fire suppression associated with soil compaction and ground disturbance but equipment use is limited given minimum tool requirements other Park use restrictions. Thus construction of a trace road could alter landscapes more dramatically but Park policy would not support that activity. Fire lines could also alter a landscape but generally fire lines area not ground disturbing and involve only the surficial removal of leaf litter. The direct and indirect adverse effects of fire and fire suppression activities on cultural landscapes under the preferred alternative would be localized and negligible to minor.

Cultural Resources Cumulative Impacts: Both within and outside the park, natural erosion, and exposure over time contribute to cumulative effects on archeological resources, historic structures and cultural landscapes. Vandalism or theft may also diminish their values. Other activities outside the park that contribute to cumulative effects include grazing, wildland fire and collecting. The direct adverse impacts of the preferred alternative would be localized and negligible to minor. The indirect adverse impacts would be localized and negligible to minor. No projects or activities are proposed in the park in the foreseeable future that would contribute to cumulative effects. The cumulative effects of the preferred alternative are regarded as adverse, localized, and minor.

Cultural Resources Conclusion: Alternative 2 would result in localized, short-term, and minor effects with regard to archeology and historic structures. Cultural landscapes would receive a net localized long-term moderate beneficial to Cades Cove due to the enhancement of fields and

minor beneficial throughout the rest of the Park. The indirect adverse impacts would be localized, short-term, and negligible to minor.

Cultural Resources Impairment: This alternative would not produce any major adverse impacts or impairment of archeological resources, historic resources, and cultural landscapes whose conservation because MIST principles will be utilized and thus cultural resources will not be disturbed. Under the FMP, each proposed burn plan specifically addresses mitigations and avoidance techniques to protect cultural resources.

4.5.4 Surrounding Community

***Impact Analysis*:** Alternative 2 would have negligible short-term adverse impacts since there would be limited disruption of surrounding community area during a prescribed or managed fire. Under this alternative, it is expected that there would still be only occasional, temporary impact to scenic views, day and overnight hikes, camping, picnicking, and fishing opportunities or to the adjacent community due to wildland fires and prescribed fires similar in level and intensity of that described under the no action alternative. Therefore, the direct adverse impacts of Alternative 2 would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial by improving the environmental quality of the Park thus making it initially disturbed but ultimately more natural in setting and viewscape to our Park neighbors.

Cumulative Impacts: The direct and indirect adverse impacts of this alternative would be localized, short-term, and minor. Other activities which contribute to cumulative impacts on visitor experiences and park use include recreational uses, grazing, residential development, wildland fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from adjacent land owners or businesses. In some cases, these activities (e.g. grazing) may contribute to historic scenes and community/visitor experiences. The paved park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are currently proposed within the park that would contribute to cumulative impacts on the surrounding community other than several repaving projects that are all short-term and localized with minor adverse impacts to access. The cumulative effect of this alternative would be localized and minor.

***Surrounding Community Conclusion*:** Alternative 2 would have localized, short-term, and minor direct adverse impacts on the surrounding community. The indirect adverse impacts would be localized, short-term, and minor. Long-term effects would be considered minor beneficial with regard to the reduce fuels and enhanced habitats.

4.5.5 Public Use and Access

***Impact Analysis*:** Alternative 2 would have negligible short-term adverse impacts since there would be limited disruption of public use of this area during a prescribed or managed fire similar to that described under the no action alternative. Under this alternative, it is expected that there would still be only occasional, temporary impact to scenic views, day and overnight hikes,

camping, picnicking, and fishing opportunities due to wildland fires and prescribed fires. Therefore, the direct adverse impacts of Alternative 2 would be localized, short-term, and minor. The indirect impacts would be short-term, localized, negligible to minor, and adverse to beneficial by improving the environmental quality of the Park thus making it initially disturbed but ultimately more natural in setting and viewscape.

Direct adverse impacts may include minor displacement of some visitor activities during prescribed burn operations, but that would be limited to a few hours over the course of a year in total. Other direct adverse impacts of increased burning on visitor experiences and aesthetic resources would include smoke in scenic views, odors, temporary restrictions in access to some areas, and the presence of blacked areas within natural vistas. The potential direct adverse impact to visitor experiences and aesthetic resources is localized, short-term, and negligible to minor. The low frequency and small size of these fires further reduces the potential adverse impacts. The indirect effect of the preferred alternative would be the presence of blackened areas for the remainder of the growing season. The indirect effects of this alternative would be localized, short-term, minor, and adverse or beneficial based on the effect noted by the specific fire in the localized area.

Mechanical removal of hazardous fuels would be conducted during periods of low visitation or in areas of restricted public access and managed to create little visual impact or change in scenic vistas. Visitor access to the park would not be curtailed; consequently there would be no direct adverse impacts to visitors. Indirect adverse effects would include the sound of chainsaws and/or leaf blowers for very short periods of time and a somewhat changed scene as fuels near park facilities and historic structures are reduced. Therefore, the adverse direct impacts of the preferred alternative on visitor experiences would be short-term, localized, and minor. Longer-term indirect impacts would include a reduced potential for large fires and subsequent reduced potential for substantive modifications of scenic vistas; these indirect impacts would be minor and beneficial.

Some of the visitors' diminished park experience would probably be offset as they realize the beneficial aspects of the prescribed fire through educational programs.

Cumulative Impacts: The direct and indirect adverse impacts of this alternative would be localized, short-term, and minor. Other activities which contribute to cumulative impacts on visitor experiences and park use include recreational uses, grazing, residential development, wildland fire, and other land management activities. The adverse impact of these activities is considered negligible to minor since most would be distant from visitor use activities. In some cases, these activities (e.g. grazing) may contribute to historic scenes and visitor experiences. The paved park roads and park facilities intrude on the visual scene, though they are situated so as to minimize the intrusion. No other projects are currently proposed within the park that would contribute to cumulative impacts on public use and access other than several repaving projects that are all short-term and localized with minor adverse impacts to access. The cumulative effect of this alternative would be localized and minor.

***Public Use and Access Conclusion*:** Alternative 2 would have localized, short-term, and minor direct adverse impacts on public use and access. The indirect adverse impacts would be localized, short-term, and minor. The long-term effects would be negligible to minor beneficial as habitats would be enhanced and generally the public may notice these improvements.

4.5.6 Park Management/Operations and Safety

Impacts: Under Alternative 2, the response to fire is similar to that described within Alternative 1 (no action). Alterations in process and staffing are largely associated with the specifics of implementing the National Fire Policy Guidance and linked with changes outlined in the *Review and Update of the 1995 Federal Wildland Fire Management Policy (January 2001),* signed by the Secretaries of Agriculture and Interior, is the key interagency policy document for federal wildland fire management. It was followed by the *Interagency Strategy for the Implementation of the Federal Wildland Fire Policy (June 2003)*, which has been superseded by *Guidance for Implementation of Federal Wildland Fire Management Policy (February 2009)*. Within this guidance are descriptions of a process of strategic fire response, which is a holistic approach to managing wildfires with the goal of meeting fire management unit objectives. Typically, fire response ranges across a spectrum of tactical options (from monitoring from a distance to intensive suppression actions).

Under Alternative 2, Suppression activities are managed as stated within Alternative 1 (no action) with the exception of managing for resource benefit. Under this alternative, one flank of the fire can be managed for resource benefit, while intense suppression activity is occurring on a different flank. This change in approach may result in some level of increased staffing during initial action in order to achieve management objectives because of the need to evaluate best practices for fire fighter safety and resource protection.

Every naturally occurring fire would be evaluated by the Fire Management Committee for suitability for resource benefit when located within FMU 2. As this alternative largely combines the old FMU 2 and 3 units (from the no action), it could result in an increase is the number of fires that were previously suppressed and are now managed for multiple benefits. Ultimately, this change would not impact staffing levels but would potentially increase the number of fires that require a certain increased staffing level.

This alternative also places more emphasis in ensuring fire qualifications are in place for defined fire staffing classes rather than the previous language that linked roles and responsibilities with Park positions. In other words, staffing classes defined in the Interagency Standards for Fire and Fire Aviation Operations defines the level staffing required rather than assigning or linking the role with a Park position name (i.e., District Ranger), regardless of their qualifications.

In association with human caused fires, Alternative 2 allows full range of tactical options to be considered under extended attack incidents. Initial action is suppression under this alternative but the fire may be managed for multiple objectives under extended attack if the initial actions are unsuccessful. The no action alternative permitted suppression only under this scenario. Again, this change may alter the staffing and length of time personnel may be dedicated to a fire operation.

Lastly, the new guidance requires the development of a structured decision process (WFDSS) to guide the ongoing effectiveness and re-evaluation of suppression strategies during an extended action. If the fire is being managed by park staff, the incident commander with assistance from the Fire Management Officer (FMO) and or the Fire Duty Officer (FDO) will perform and document this periodic assessment. If the fire has been delegated to an off park management team, the Command Section will complete the assessment and documentation as required with assistance, review and concurrence by park staff.

These modifications will allow for a full spectrum of management response to wildland fire on federal lands commensurate with public and firefighter safety, the current and predicted risk, values to be protected, and land management objectives.

Under Alternative 2, prescribed fire operations and management and fuels management would remain the same as those described within Alternative 1 (no action).

***Safety Impact Analysis**:* The preferred alternative would reduce risks from wildland fire to wildland firefighters and visitors, a beneficial impact, by allowing use of an appropriate management response to wildland fires. This response may include selecting control lines along natural or man-made barriers which reduces fireline construction and the exposure of firefighters to active fire perimeter. The direct adverse effect of the preferred alternative is exposure of fire management personnel to the hazards typically associated with wildland fire suppression and prescribed burning: burns, cuts and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include the long-term effects of smoke inhalation.

Many risks associated with prescribed burning can be minimized or avoided by planning. For example, prescriptions (desired fire behavior, ignition patterns, timing) can be designed to minimize smoke production and subsequent smoke exposure to firefighters. Control lines would be prepared prior to ignition; line construction without the urgency associated with an active fire perimeter presents fewer risks of cuts and abrasions from equipment, falls, burns and other injuries.

The modifications to the implementation of current policy will increase safety for firefighters through less exposure on the fireline; increase the effectiveness of available resources by assigning them to identified values to be protected; and help reduce fuels and rejuvenate vegetation in pre-identified areas of unit fire plans.

Direct adverse impacts to firefighters from hazard fuels reductions activities include cuts and bruises from equipment such as brush cutters, chainsaws, axes and pulaskis, shovels and other hand-held equipment. Other potential direct adverse impacts include falls associated with steep terrain, slippery substrates, or rocky ground. Hazard fuels themselves pose some risk and may injure firefighters as the fall or roll during removal operations. Indirect adverse impacts include risks associated with vehicle use and power tools.

Additional exposure for firefighters and visitors is therefore created by prescribed burning and mechanical fuels reduction so the overall risks, particularly to firefighters, are slightly elevated from the no-action alternative.

Direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, 18 watch out situations, LCES, and other risk mitigation actions. Temporary closures would be used to reduce exposure to park visitors and neighbors. The risks associated with prescribed fire (pile burning) would be further mitigated by ensuring the burns are conducted within the approved prescription. Mechanical hazard fuel reduction activities would employ standard safety equipment and protocols. Prescribed fire (pile burning) in support of mechanical reduction of hazard fuels would result in succeeding fires in the treatment exhibiting lower intensity. This would be an indirect beneficial impact on firefighter safety.

Park Management/Operations and Safety Cumulative Effects: Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Cumulative effects of the preferred alternative include a slightly longer duration of exposure to hazards associated with fire suppression and prescribed burning activities. The potential for exposure to smoke and particulate matter is slightly elevated with inclusion of prescribed burning in this alternative, but such exposure is readily mitigated by ignition patterns and minimizing the time individual firefighters spend in smoky conditions. The cumulative effects on wildland firefighter and public safety are localized and minor.

Park Management/Operations and Safety Conclusion: With mitigation measures in place, the direct and indirect impacts of the preferred alternative would be adverse and beneficial, short-term to long-term, localized, and minor.

4.6 Mitigations

Several elements of fire management relative to natural resource protection, cultural resource protection and public safety require additional safeguards in order to protect resources, staff, visitors and the adjacent community. These recommendations to mitigate issues identified are represented in the table below.

Issue	Mitigation
Natural Resources	
Disturbance and Exotic Species	• Use Minimum Impact Suppression Tactics (**MIST**) • Monitor and treat impacted areas for exotics and disturbance using Burned Area Emergency Rehabilitation (**BAER**) process.
Threatened and Endangered Species	• Consult with U.S. Fish and Wildlife Service on specific prescription on planned burns to protect species.
Threatened and Endangered Species/Water Resource Protection	• Minimize installation of ground disturbing fireline in areas adjacent to creeks to avoid sedimentation (specifically Abrams Creek). Waterbars would be placed on lines in steep areas, near creeks.

Issue	Mitigation
Threatened and Endangered Species	• Indiana Bats: When removing large trees (greater than 6 inches DBH) that have characteristics for Indiana Bat summer roosts (i.e., dead trees with exfoliating bark, tree cavities, and crevices) then follow the decision process: 1). Remove potential roost trees only between Oct 15 and April 15 or 2). Have a qualified individual observe for bats existing in the trees for 20 minutes before and after sunset. If bats are observed, use mist netting to determine species or resurvey tree at a later date. Specific details associated with this procedure are outlined as part of each burn plan.
Threatened and Endangered Species	• Northern flying squirrel: Fire staff should avoid removal of any large snags or any beech, fir, or spruce trees near or within Northern flying squirrel habitat. In general, staff should not cut any yellow birch (*Betula alleghaniensis*).
Threatened and Endangered Species	• Wildfire in the vicinity of Mt. LeConte should be suppressed to protect spreading avens and rock gnome lichen.
Water Resources	• Use caution and input from Resource Advisors on placement of hose lays, water pumps and use established procedures for selection of water sources. • Contain fuels to avoid spills according to appropriate procedure.
Cultural Resources	
Archeological Resources	• Use MIST procedures to avoid ground disturbance • Consult with SHPO prior to implementation of burn plans in accordance with Section 106. • Have Resource Advisor present during wildland fire operations.
Cultural Landscapes	• In hazard fuel reduction, do not remove vegetation adjacent to structures or within other areas that may constitute a cultural landscape. • Consult with SHPO prior to implementation of burn plans in accordance with Section 106.
Historic Structures	• Provide for defensible space in association with historic structures but do not remove vegetation without consultation with Cultural Resources (planned fires). Suppress wildland fires adjacent to historic structures. • Consult with SHPO prior to implementation of burn plans in accordance with Section 106.
Public Safety	
Transportation Corridors	• Smoke Screening Tools • Post Warning Signs/Notify visitors at park entrances • Implement appropriate level of traffic control or request assistance • Monitor smoke dispersal • Mop-up smoldering fuels

Issue	Mitigation
Urban Interface and Park Infrastructure	• Prescribed burns to reduce hazard fuel accumulation • Notify and update residents and employees of proposed and/or ongoing operations • Relocate at-risk residents or park staff • Respond to fires in the Mutual Response Zone • Pre-attack plans • Monitor urban expansion to identify new communities at risk
Visitor Use	• Post current fire information on websites as available • Time prescribed burns to minimize impacts to visitors • Provide and post fire information at backcountry permit stations, at visitor access points, and visitor centers • Close areas to the public during fire operations • Contact backcountry permit stations and ascertain if permits are issued for a fire area • Visually survey fires to ensure that no visitors are present • Suppress fires that threaten visitor use areas
Park Operations	• Post current fire information on websites as available • Send email notifications to park staff regarding current fire information • Close areas to administrative use during fire operations and/or limit access • Time prescribed burns to minimize impacts to park operations • Temporarily relocate at-risk park staff
Park Neighbors	• Use Smoke Screening Tools • Post current fire information on websites as available • Inform park neighbors of wildland fires • Use information officer and/or park public affairs to disseminate information

4.7 Environmentally Preferred Alternative

Alternative 2 has been identified as the Environmentally Preferred Alternative since it is the alternative that will promote the environmental policy expressed in the National Environmental Policy Act (NEPA) (Sec. 101 (b). The specific objectives of NEPA that will be met by Alternative B include the following:

- *Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations.*
    - Alternative 2 will provide moderate long-tem benefits to natural resources and will not have any long-term adverse impacts on the environment.
- *Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings.*

- Alternative 2 will improve the esthetics of the park's natural communities. Both alternatives pose roughly equal concerns associated with health and safety yet the mitigation strategies proposed above should address those concerns.

- *Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences.*
  - Alternative 2 will improve the natural communities by enhancing native vegetation community structure, reducing exotic infestations and facilitating the growth of fire adapted species. This alternative is cognizant of safety issues and provides safe procedures in implementing the fire policy.
- *Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice.*
  - Alternative 2 will preserve historic, cultural, and natural aspects of our heritage. It will improve cultural landscapes and vegetation community structure in a way that will enhance the Park visitor's understanding, use, appreciation, and enjoyment of these resources.
- *Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and*
  - Alternative 2 will enhance the quality of natural resources, which will increase opportunities for visitors to enjoy the natural features in the Park.
- *Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.*
  - Alternative 2 will not have any adverse impact on renewable resources or finite resources. Fire is a natural process and adding options for addressing fire management only enhances the Park's ability to reduce waste in response to fires.

4.8 Summary of Impacts / Alternatives

The following table (Table 1) summarizes and compares the likely results of implementing the No Action Alternative and the Preferred Alternative as they relate to the environment.

Table 1. Summary of Environmental Consequences

Impact Topic	Alternative 1 - No Action	Alternative 2 - Preferred
Physical Resources -Soils	Short-term: Negligible adverse impact Long-term: Negligible adverse impact Cumulative: Negligible adverse impact	Short-term: Negligible adverse impact Long-term: Negligible adverse impact Cumulative: Negligible adverse impact
Physical Resources -Air Quality	Short-term: Negligible adverse impact Long-term: No effect Cumulative: Minor adverse	Short-term: Minor adverse impact Long-term: No effect Cumulative: Minor adverse
Natural Resources (Water, Vegetation and Wildlife)	Short-term: Minor adverse Long-term: Moderate beneficial Cumulative: No effect.	Short-term: Minor adverse Long-term: Moderate beneficial impact Cumulative: No effect

Cultural Landscape	Short-term: Minor adverse impact Long-term: Minor adverse Cumulative: Negligible adverse	Short-term: Minor adverse impact Long-term: Minor beneficial impact Cumulative: Negligible adverse
Surrounding Community	Short-term: Minor adverse impact Long-term: Minor beneficial impact Cumulative: Minor adverse impact	Short-term: Minor adverse impact Long-term: Minor beneficial impact Cumulative: Minor adverse impact
Public Use and Access	Short-term: Negligible adverse impact Long-term: Negligible beneficial impact Cumulative: Minor adverse impact	Short-term: Negligible to minor adverse impact Long-term: Negligible to minor beneficial impact Cumulative: Minor adverse impact
Park Management/ Operations and Safety	Short-term: Minor adverse impact Long-term: Negligible adverse impact Cumulative: Minor adverse impact	Short-term: Minor adverse impact Long-term: Negligible to minor adverse impact Cumulative: Minor adverse impact

5.0 CONSULTATION AND COORDINATION

To date the NPS has consulted or coordinated with the following groups and individuals on this assessment:

Eastern Band of Cherokee Indians Tribal Historic Preservation Office
Tennessee State Historic Preservation Office
North Carolina State Historic Preservation Office
U.S. Fish and Wildlife Service

Public notice regarding the availability of this Environmental Assessment will be distributed to local news media and other interested parties. A public comment period is scheduled to run from to October 9, 2009 to November 10, 2009. Written comments can be submitted to:

Superintendent
Great Smoky Mountains National Park
107 Park Headquarters Road
Gatlinburg, Tennessee 37738

Public comments will be reviewed and responded to on an individual basis. Public comment will be summarized in the decision document. This environmental assessment will be on public review for 30 days. Comments may also be submitted on the NPS' Planning web site at http://parkplanning.nps.gov/grsm.

6.0 RELATIONSHIP TO OTHER PLANNING EFFORTS

The Park's 1982 General Management Plan (GMP) establishes long-range strategies for resource management, visitor use, and provides an integrated plan for the management of the Park. This plan creates a framework for all future programs, facilities, and management actions. The proposed action supports the General Management Plan summary statement regarding fire management, which is as follows:

> "Research into the natural role of fire in the park will 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. (pp 25)"

The GMP further states that nesting habitat for the endangered red-cocked woodpecker (RCW) will be restored around known colony trees. While the RCW is thought to be extirpated from GRSM, the GMP specifically states that "Cutting and possibly prescribed burning will be tested in the pinelands west of Cades Cove" (pp 26), suggesting the use of fire in restoration, as appropriate.

Other planning documents discuss fire as a tool to achieve Park objectives. The details of those planning processes are addressed within the specific elements of the Fire Management Plan itself. For example, the Elk Management Plan and Environmental Assessment currently being drafted discuss the use of fire to create habitat for elk. The proposed elk habitat will be identified in the FMP's 5 year planning, which is updated annually. This allows for flexibility in achieving Park objectives as needed without the need to revise the entire FMP as the fire program objective remain consistent with protection and enhancement of natural and cultural resources.

7.0 COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

National Environmental Policy Act of 1969

The National Environmental Policy Act (NEPA) requires consideration of the environmental effects of proposed federal actions. NEPA also ensures that environmental information is available to public officials and members of the public before decisions are made and before actions are taken. This Environmental Assessment provides a description of a No Action alternative and an Implement National Fire Policy Alternative, and summarizes potential environmental consequences of the alternatives. A public review period will be held.

Endangered Species Act of 1973

Section 7 of the Endangered Species Act directs all federal agencies to further the purposes of the act. Federal agencies are required to consult with the U.S. Fish and Wildlife Service to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of listed species or critical habitat. The NPS has submitted this document to FWS for review and in order to initiate consultation with the U.S. Fish and Wildlife Service regarding the proposal.

Clean Water Act

The proposed actions will have no effects on water quality. No construction activities or activities that would result in release of sediment or contaminants to the environment are planned under either alternative proposed and thus would not need to comply with the requirements of sections 401 and 404 of the Clean Water Act and other applicable federal, state and local regulations.

Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)

Executive Orders 11988 and 11990 direct federal agencies to enhance floodplain and wetlands value, to avoid development in flood plains and wetlands whenever possible, and to minimize adverse impacts if development cannot be avoided. The preferred alternative, Implementation of National Fire Management Policy will not adversely affect wetlands or floodplains.

Section 106 of the National Historic Preservation Act of 1966, as Amended

Section 106 of the National Historic Preservation Act requires that an assessment be conducted of any project, activity, or program that could change the character or use of properties listed in or eligible for listing in the National Register of Historic Places. The NPS has coordinated with the State Historic Preservation Office in Tennessee to ensure concurrence that there are no potential impacts on the cultural landscape from the proposed project.

Archeological Resources Protection Act of 1979

The Archeological Resources Protection Act requires that archeological resources be identified and that proper permits be obtained prior to ground disturbing activities. The NPS has conducted the necessary survey work to ensure that no archeological resources will be impacted by this project. The NPS has initiated consultation with the State Historic Preservation Office in Tennessee regarding the proposed project.

Comprehensive Environmental Response, Compensation and Liability Act

The Comprehensive Environmental Response, Compensation and Liability Act established regulations regarding the assessment, remediation, and liability for remediation of hazardous substances that have caused contamination. No areas within the park have been designated as a National Priority List site, nor found to contain any hazardous materials.

Clean Air Act

The Clean Air Act establishes regulations regarding disclosure, control, and abatement of air pollutants. The alteration in use of the areas associated with the project is not expected to have a significant impact on regional air quality. Therefore, the alternatives are compatible with the requirements of the Clean Air Act.

Toxic Substances Control Act

The Toxic Substances Control Act establishes regulations regarding proper management and disposal of polychlorinated biphenyls (PCBs) and other hazardous chemicals. The proposed project will not involve the use of any hazardous materials.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act establishes regulations regarding the generation, transportation, storage, treatment, and disposal of hazardous waste. No hazardous materials are to be used as part of the proposed project.

Americans with Disabilities Act of 1990

The Americans with Disabilities Act (ADA) establishes federal guidelines that define requirements for disabled access to Parking facilities, pathways, and buildings. The ADA is not applicable as the alternatives discussed do not impact disabled access to any facility or use area.

8.0 LIST OF PREPARERS

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Appendix 1: Draft Fire Management Plan

GREAT SMOKY MOUNTAINS NATIONAL PARK

FIRE MANAGEMENT PLAN

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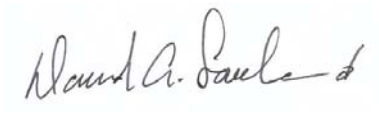

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1 Introduction

This plan revision updates and supersedes the 2004 version of the Great Smoky Mountains National Park (GRSM) Fire Management Plan (FMP). This update is necessary due to recent changes in both national interagency fire policy and National Park Service fire policy. This plan outlines a comprehensive fire program including wildland fire response, fire prevention and fuels management utilizing prescribed fire and mechanical treatments.

This Fire Management Plan to provides long-term direction for achieving park goals related to human safety and ecosystem management. The plan also satisfies the requirements and direction provided in policy, legislative authority, park purpose statements, higher-level planning documents, and natural and cultural resource management objectives.

This plan outlines those actions that will be taken by Great Smoky Mountains National Park in meeting the fire management goals for the park including the requirement as stated in Director's Order 18 (DO18), that:

> "As an important part of fulfilling its mission, the National Park Service manages wildland fire to protect the public; park communities and infrastructure; conserve natural and cultural resources; and maintain and restore natural ecosystems and processes. The risks and expenses associated with planning and implementing fire management activities require exceptional skill and attention to detail. The highest priority under all circumstances is firefighter and public safety. All plans, project implementation, and responses to wildland fire must demonstrate this commitment."

DO18 goes on to state that

> "Each park with burnable vegetation must have an approved Fire Management Plan that will address the need for adequate funding and staffing to support its fire management program. Parks having an approved Fire Management Plan and accompanying National Environmental Policy Act (NEPA) compliance may utilize wildland fire to achieve resource benefits in predetermined fire management units. Parks lacking an approved Fire Management Plan may not use resource benefits as a primary consideration influencing the selection of a suppression strategy, but they must consider the resource impacts of suppression alternatives in their decisions."

Finally, 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 the use of fire to meet resource objectives, assessment of hazardous fuel loadings, and the need to integrate fire as a natural process in the Park.

1.1 GRSM Wildland Fire Management Goals

The Park's fire management goals are to:

A. Protect human life, communities, and resources from the adverse effects of wildfire without compromising safety.

B. Maintain and restore fire adapted ecosystems using appropriate tools and techniques in a manner that will provide sustainable, ecological and social benefits.

C. Integrate knowledge generated through fire and natural resource research into fire management priorities, decisions and actions.

D. Integrate fire as a natural process into the Park's ecosystem to the fullest extent possible.

E. Communicate and coordinate with interagency organizations and other stakeholders to pursue common goals, programs and projects.

F. Build and promote organizational effectiveness by building program capacity, leadership, and effective management practices.

1.2 Strategy to Achieve Wildland Fire Management Goals

The goals described above will be achieved through the Park's preparedness, wildfire response, prescribed fire, prevention, interpretive programs, and cooperative research efforts. These programs are briefly discussed below as they relate to the goals; however, each is also discussed in more detail in later chapters.

<u>Goal A. - Protect human life, communities, and resources from the adverse effects of wildfire without compromising safety.</u>

- Ensure that firefighter and public safety is the first priority in every fire management action.
- Manage an efficient wildland fire preparedness organization according to established plans, protocols, and guidelines to prevent, detect, and take effective management action on all wildland fires.
- Use pre-treatment and suppression-oriented actions to reduce risk from fire to identified resource values at risk, private lands, developed areas and infrastructure.
- Simulate the effects of natural fires and/or reduce fuel loading in areas of the park where a fire escape may threaten lives and/or property of employees, visitors and neighbors.

<u>Goal B. - Maintain and restore fire adapted ecosystems using appropriate tools and techniques in a manner that will provide sustainable, ecological and social benefits.</u>

- Support the park by providing fire management tools to restore and perpetuate a structural and compositional vegetation mosaic.
- Mimic natural fire regimes as directed by resource management objectives.
- Improve ecosystem health and resilience, thereby reducing the probability of unacceptable impacts due to unusually large-scale disturbances such as disease and insect epidemics or large, high severity fires.
- Manage fires using the full range of management strategies to protect, restore, or maintain resources and developments within and adjacent to the park.

Goal C. - Integrate knowledge generated through fire and natural resource research into fire management priorities, decisions and actions.

- Improve fire prescriptions for management ignited fires (through fire effects monitoring) that will be safe and capable of restoring and maintaining park ecosystems and meet resource objectives.
- Ensure fire management program activities are integrated into land and resource management planning alternatives, goals, and objectives to fully complement one another in support of an ecological approach to resource management.
- Insure the program is responsive to input from resource management research efforts, interagency partners and the public.

Goal D. - Integrate fire as a natural process into Park ecosystem to the fullest extent possible.

- Evaluate every naturally occurring ignition for strategic fire response. For those ignitions which have been determined to be beneficial to the resource, the fire should be managed to achieve resource objectives. Fires may be managed to meet multiple objectives.
- Manage natural fire as a dynamic ecosystem process to the maximum extent feasible.

Goal E. - Communicate and coordinate with interagency organizations and other stakeholders to pursue common goals, programs and projects.

- Maintain an interagency fire program that provides for safe, cost effective, efficient and ecologically sound fire management addressing resource goals and reducing threats to life, property and other resource values across boundaries.
- Foster understanding, appreciation and support among park staff, visitors and neighbors for the wildland fire, prescribed fire, fuels, and aviation programs through park interpretation, public information, media, and inviting the media, private landowners, public officials, park visitors, etc., to observe fire management operations.
- Conduct educational outreach programs.
- Conduct a fire prevention program in cooperation with other agencies to reduce risks to human life, physical facilities and cultural resources; decrease modification of park ecosystems by excessive human-caused wildland fires.

Goal F. - Build and promote organizational effectiveness by building program capacity, leadership, and effective management practices.

- Implement a safe and objectives-oriented fire management program by identifying fire program skill requirements and responsibilities; actively recruiting, retaining, and training staff; and maintaining qualifications and developing employees through assignments.

- Promote teamwork and leadership development.
- Effectively manage fire actions commensurate with values at risk and meet incident objectives while employing fiscal responsibility.
- Reduce unnecessary financial burden to the park by managing fires using the full range of options to protect, enhance, and restore resources and developments within and adjacent to the park.

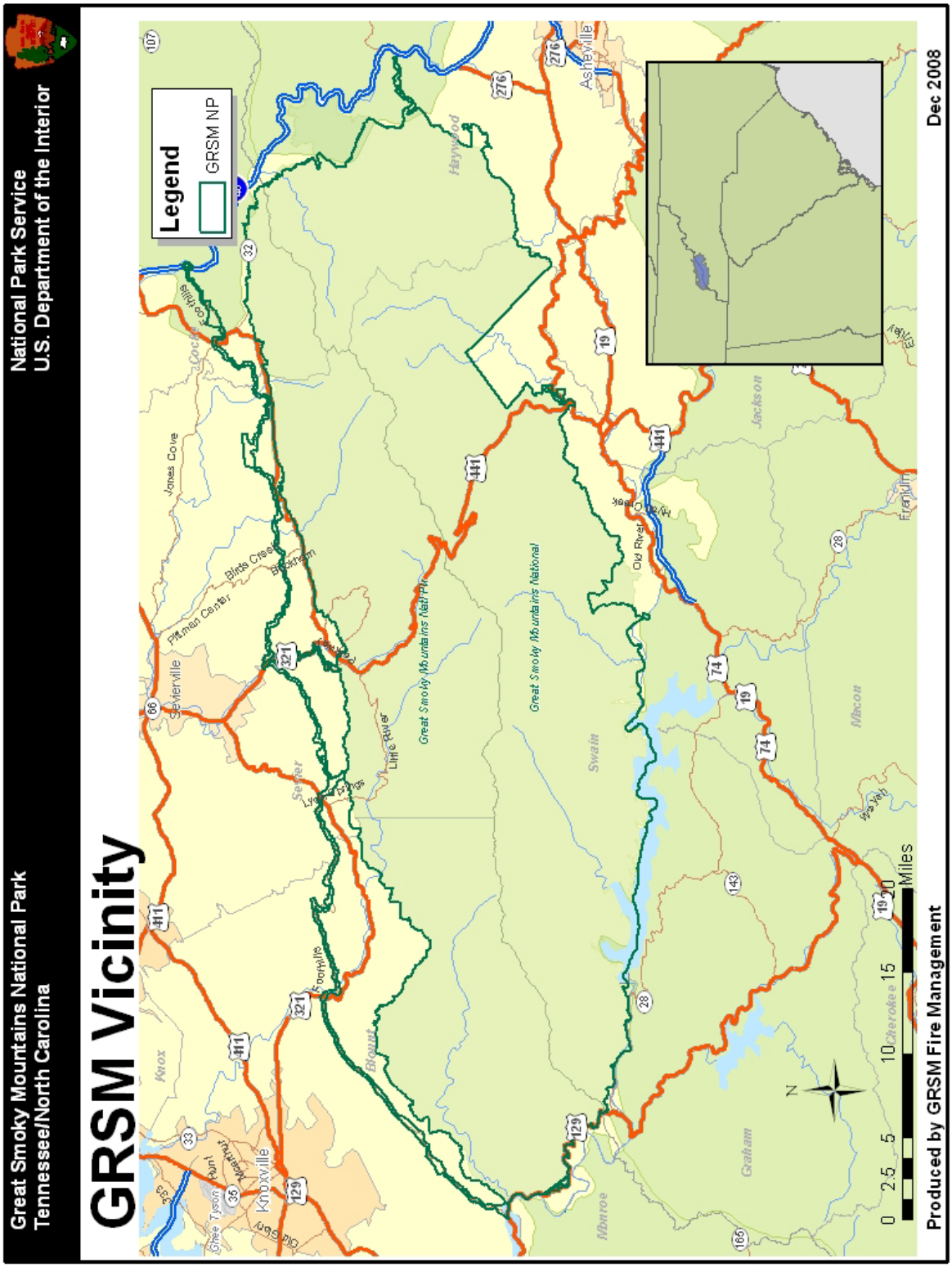


Figure 1. Great Smoky Mountains National Park and Vicinity.

2 Policy, Land Management Planning and Partnerships

Authority for carrying out a fire and fuels management program originates with the Organic Act of the National Park System, August 25, 1916. This Act states that the primary goal of the National Park Service is to preserve and protect the natural and cultural resources found on lands under its management in such manner as will leave them unimpaired for future generations. Additional authorities for fire management activities include: 31 U.S. Code 665 (E) (1) (B) which provides the authority to exceed appropriations due to wildland fire management activities; Section 302 (c) (2) of the Federal Property Administration Services Act of 1949, as amended; and Chapter VIII of the 1983 Supplemental Appropriations Act (P.L. 97- 257) which deals with contracting for fire protection; and The Reciprocal Fire Protection Act, Act of May 27, 1955 (42 U.S.C. 1856) that authorizes reciprocal agreements with federal, state, and other wildland fire protection organizations.

2.1 Fire Policy

This plan implements fire management policies and helps achieve resource management and fire management goals as defined in:

1. Federal Wildland Fire Management Policy and Program Review, 2001.

2. Guidance for Implementation of Federal Wildland Fire Management Policy, Feb 2009.

3. Managing Impacts of Wildfires on Communities and the Environment, and Protecting People and Sustaining Resources in Fire Adapted Ecosystems – A Cohesive Strategy (USDOI/USDA).

4. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan.

This plan meets all National Environmental Policy Act and National Historic Preservation Act requirements. 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).

Authorities for the management of wildland fire on National Park Service lands:

1. United States Department of the Interior, Departmental Manual
2. The National Park Service Management Policies, August 31, 2006
3. Director's Order 18 / Reference Manual 18, Fire and Aviation Management, 1 Jan 08.
4. Review and Update of the 1995 Federal Wildland Fire Policy, January 2001
5. Guidance for Implementation of Federal Wildland Fire Management Policy, Feb. 2009
6. Interagency Standards for Fire and Fire Aviation Operations
7. National Interagency Mobilization Guide
8. Interagency Incident Business Management Handbook
9. Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide
10. Wildland Fire Use Implementation Procedures Reference Guide
11. Interagency Fire Program Management Qualifications Standards and Guide

2.2 Resource Management Planning

The Resource Management Plan (RMP) 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 that 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."

The park General Management Plan states:

> “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.”

Implementation of the FMP will support Great Smoky Mountains National Park General Management Plan and RMP objectives by specifying an array of fire management strategies designed to help to reestablish natural fire regimes to the extent possible while providing for the prevention of undesirable effects to people and resources from wildfires.

As is evident from the above RMP information and other directives, there are several management objectives related to fire management in the Park. 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 the use of fire, fire effects research, and 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.

2.3 Partnerships

2.3.1 Southern Appalachian Fire Planning Unit

Great Smoky Mountains National Park is a member of the Southern Appalachian Fire Planning Unit (SAFPU). The SAFPU is an interagency partnership of federal land managers tasked with implementing Fire Program Analysis (FPA). The purpose of FPA is to support fire planning, inform budget development and implementation, and identify cost effective fire programs. The SAFPU charter can be found at:
http://inpgrsms01gis/fire/Shared%20Documents/Forms/AllItems.aspx.

2.3.2 Interagency 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.

Great Smoky Mountains National Park is actively involved and committed to cooperative agreements and interagency coordination to ensure the fire management program is implemented in a timely, safe, cost efficient and professional manner. The Park actively cooperates with the states of Tennessee and North Carolina, counties and cities surrounding the Park, the Tennessee Valley Authority, and the Eastern Band of the Cherokee Tribe as well as National Forests in four states through coordination of fire training and the hosting of the GRSM Wildland Fire Module.

2.3.3 Interagency Contacts

The source for all interagency contacts is the Tennessee State Mobilization Plan that is a non-attached appendix of this plan. Additional contacts for Cooperating Volunteer Fire Departments, National Weather Service, and local law enforcement are found in the phone listing located in the Park's Fire Management office.

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

2.3.4 Agreements

Agreements are listed in tabular form in the FMP Appendix D. This summary displays the name of agencies, purpose of agreement and expiration date. This table should be updated by the FMO as part of the annual FMP update. Copies of the agreements are located in the Park's Fire Management Office. It is the responsibility of the FMO and personnel of the Division of Resource and Visitor Protection to maintain these documents and to ensure that an open line of communication is maintained with cooperators.

Current GRSM agreements include: North Carolina Division of Forest Resources, U.S. Fish & Wildlife Service, Tennessee Department of Agriculture Division of Forestry, Bureau of Land Management, U.S. Department of Agriculture, Wears Valley VFD, Grassy Fork VFD, Pittman Center VFD, Pigeon Forge FD, Stecoah VFD, Bryson City VFD, Blount County #5 (Walland) FD, Townsend Area VFD, Jonathan Creek VFD, West Swain VFD, Gatlinburg FD, and Cosby Volunteer Fire Department.

3 Fire Management Unit Characteristics

3.1 Area-Wide Characteristics

Attributes identified within this section are consistent across the landscape and are applicable to both Fire Management Units identified in this Fire Management Plan.

3.1.1 Landscape Features

The park lies within the Southern Section of the Blue Ridge physiographic province, a region of geologically ancient mountains characterized by steep, rugged terrain, an abundance of clear running streams, and dense forests. Elevations in the park range from about 250m (820 ft) to 2,025m (6,640 ft), with sixteen peaks rising above 1830m (6000 ft). The geology of the park is dominated by sedimentary rock, with metamorphosed sandstones, siltstones, and shales comprising the most common formations. Soils are largely rocky and acidic and are classified as inceptisols or ultisols.

3.1.2 Major Vegetation/Fuel Types

Eight major vegetation/fuel types account for 95% of the park's land cover (Madden and others, 2004). Those major vegetation types and the relationship of each one to fire is briefly discussed below. In general, the park is dominated by deciduous forest, but contains significant inclusions of coniferous forest. Vegetation/fuel complexes in the park vary dramatically in terms of average fuel moisture, historical fire regime, and fire effects.

Spruce-Fir Forest- These forests have historically occupied elevations above 5000', and account for 6% of the park's land cover. High elevation communities have been beset by numerous maladies; most conspicuously, mature Fraser fir trees are nearly all dead. Due to the high amount of rainfall and frequent fog 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 Hardwood Forest – Mesic forests of American beech, yellow birch and white basswood co-occur with spruce-fir forests on slopes above 4500', accounting for 15% of land cover. Due to a high amount of annual rainfall and cool microclimate, fires are very infrequent.

High Elevation Northern Red Oak Forest – Forests dominated by northern red oak may be found on exposed ridges and slopes between 3500' and 5000' in elevation. This type accounts for only 4% of the park's land cover, but the exposed landscape positions and more receptive fuels result in a moderate frequency of low-intensity fires. There is a great deal of interest in using fire to maintain this vegetation in the southern Appalachians.

Cove Hardwood Forest – These rich forests are dominated by an admixture of primarily hardwood species, and make up 15% of the park's land cover. This type occurs in moist coves and on sheltered slopes, and has an inherently low fire frequency. Along with Northern Hardwood Forests, this community borders others that have regular fires and may tend to regulate the spread of wildfires.

Mesic Oak/Hardwood Forest – A large percentage of the park (21%) is covered by mature forests dominated by northern red, chestnut, and/or white oak, along with red maple and hickory. These forests occur on low or semi-sheltered slopes and ridgeline gaps at low elevations. The chief fuel is hardwood litter, and the availability of these fuels is a function of site and of the ambient conditions during a fire event. Though somewhat controversial, it is widely believed that maintenance of oak dominance in these communities is dependent upon frequent to moderately-frequent low-intensity fires.

Xeric Oak/Pine Forest and Woodland – 24% of the park is covered by xeric to subxeric woodlands of oak and pine that have been highly altered by past fire exclusion practices. Community dominants vary from chestnut and scarlet oaks to pitch, Virginia, white, shortleaf, and Table Mountain pines. Elevations vary from around 1000' to nearly 4000', but landscape position is almost always exposed to partially-exposed ridgetops and upper slopes. These woodlands and forests represent the most clearly fire-adapted vegetation within the park, and are involved in the vast majority of fire occurrences. Fuels range from open oak litter to heavy volumes of beetle-killed pine to highly flammable evergreen shrubs, with fire behavior that varies from creeping surface fires to moderate-intensity surface fires with occasional torching. Crown fires are extremely rare, limited by the small patch size of pure evergreen stands. The historic fire regime was one of frequent (MFI <35 years), low- to mixed-intensity fires.

Hemlock Forest – Evergreen forests dominated principally by Eastern hemlock can be found along streams, moist acidic coves, and sheltered slopes. Such forests make up about 3% of the park's vegetation cover, though hemlocks have been in steep decline since the hemlock woolly adelgid was first discovered in the park in 2002. These stands were historically protected from fire by moist site conditions and compact, heavily shaded fuels, but canopy openings and heavy fuel loadings associated with high tree mortality could alter the fire behavior in these sites, particularly during extended droughts.

Successional Hardwood Forest – Areas of past heavy settlement, agriculture, and/or logging are currently dominated by young forests of tulip poplar, with red maple, white pine and Virginia pine co-occurring on some sites. These stands account for 7% of vegetation cover, and occur on lower slopes and flats below 3000'. Moist site conditions and compact fuels result in extremely low fire frequency and behavior.

Other (Alluvial forest, Heath balds, grassy balds, fields, etc) – The park contains small inclusions of several plant communities that are, overall, scarcely impacted by contemporary fire. Two of these, heath balds and grassy balds, are suspected to have been created or partially maintained by fire, but currently have a very low probability of fire occurrence. Wildfires in fields are likewise uncommon, though the fields in Cades Cove have been managed with prescribed fire for a decade. Alluvial forest is a rich community type that is rare within the park, and limited to the floodplains and terraces of larger streams. The wet-mesic nature of these sites makes them very resistant to fire spread, though there are concerns with impacts to these areas during fire operations.

3.1.3 Historic Role of Fire:

Fire has long been a part of the Appalachian landscape. The legacy of fire is evident in the fossil pollen record, tree-ring scars, and written accounts. Perhaps the most compelling evidence is the contemporary vegetation of the region, which exhibits traits that have evolved over millions of years with naturally occurring fire. Adaptations to fire such as sprouting, cone serotiny, thick bark, pyrogenic foliage, and nitrogen fixation are common features of species found throughout the region. Evidence suggests that natural communities dominated by oak and pine have been maintained on the landscape for thousands of years by a regime of frequent, low- to moderate intensity fire (Delcourt and Delcourt, Van Lear and Waldrop). It should be noted that fire has not been ubiquitous on the Appalachian landscape. Mesophytic communities currently occupy over half of the park's land base, and it is unlikely that these sheltered forests have experienced any regular fire, at least in historic times. In the recent climate, these sites and the fuels that are produced there are simply too moist to burn under all but extreme conditions.

Lightning and humans have both served as important ignition sources for fires in the region, but their respective roles have changed over time. Lightning has provided a consistent source of ignition for millions of years, driving the evolution of plant and animal populations throughout the continent before the arrival of modern humans. Under the current climate and conditions of wildland fuels, lightning still provides a source of ignition, though it is of limited significance as a landscape-scale disturbance (Barden, recent WFU report). Since the advent of the park's "Fire-Use" policy for lightning ignitions in 1997, 13 lightning-caused fires have combined to burn nearly 2300 acres (209 ac/yr).

In contrast to the long history of lightning, the earliest known human habitation in the park occurred only 8000 years ago, though human occupation and disturbance have been more or less continuous since that time (Bass, 1977). Prehistoric human populations are known to have used fire for multiple purposes, and it is reasonable to deduce that such use of fire over thousands of years had profound impacts to vegetation and natural communities, particularly in areas adjacent to human use. It is also reasonable to assume that at least some percentage of these fires would have consistently burned beyond these adjacent areas, constrained only by ambient weather conditions, fuels and topography.

Several studies have provided more specific information about the frequency and seasonality of fires in the park, particularly those occurring since European settlement. A dendrochronology study by Harmon (1982) established a mean fire-free interval of 12.7 years for pine-oak forests in the western end of the park during the years 1856-1940, with most ignitions attributed to humans. Ongoing research by LaForest and others (unpublished data) has pointed to a 4-5 year mean fire–free interval for similar forest types, with most fires found to have occurred during the dormant season. Both studies found a significant decrease in fire frequency during the years following the establishment of the National Park, as Federal policies for full exclusion and suppression were implemented.

3.1.4 Fire Regime Alteration

The suppression and exclusion of fires in GRSM since the 1940's constitutes a substantial departure from the fire regime that likely exerted an overriding influence on vegetation dynamics over nearly half of the park's landscape for thousands of years. Prior to 1940, the fire regime on the more exposed parts of the landscape was primarily one of frequent, low to moderate intensity fire. In general, the mean fire-free interval necessary to maintain stands of pine and oak on the landscape is <35 years, with more frequent fires needed to maintain ridgetop pines and less frequent fires needed to maintain mesic oaks (Landfire, Frost, Harmon 82, Harrod, White, Harmon 98). The near absence of fire in the park between 1940 and 1997 (when the park began using fire) would suggest that the average pine stand has missed 2-5 fire return intervals and the average mesic oak stand has missed 2-3 fire events.

The impacts of this alteration are well documented by Harrod, Harmon, and White (1998,2000). In general, these researchers found that the average canopy density in xeric pine and oak stands had more than doubled between 1936 and 1995, with the largest increases occurring among fire and drought-intolerant species such as red maple, white pine, black gum, eastern hemlock, and flammable evergreen shrubs such as mountain laurel. As a result of changing stand conditions, these forests lack regeneration of the historically-dominant yellow pine and oak species and show decreases in abundance and diversity among herbaceous species.

Partially as a result of competitive stress on mature pines, the loss of ridgetop yellow pine forests has been accelerated by large-scale outbreaks of Southern pine beetle during the last 20-30 years. In the short term, these alterations to the fire regime can lead to increased risk of

wildfires that are very resistant to control, especially on sites with large accumulations of beetle-killed pine fuel and/or heavy growth of evergreen shrubs. In the longer term, continued succession to closed forest will result in widespread dominance by species that are poorly adapted to drought, fire, and changing climatic conditions. These changes over such a substantial portion of the park's land base are believed to pose a serious threat to the park's ability to achieve its goal for preservation of a diverse and resilient ecosystem.

3.1.5 Historic Weather Analysis

The climate zone for the park is classified as Humid Subtropical, with hot and humid summertime conditions and mild winters. Average temperatures and precipitation, however, vary considerably by location and elevation within the park. The average annual high/low temperatures at nearby Gatlinburg, TN (elevation 1289') are 70°F/43°F, and the average annual precipitation is 54 inches. By comparison, the average high/low temperatures at Clingman's Dome (elevation 6,640') are 50°F and 36°F, with average annual precipitation of 82 inches.

Precipitation is largely uniform throughout the year for a given site, though some important seasonal trends do exist. On average, the peak of rainfall occurs during the summer months of June, July, and August, while the lowest average rainfall occurs during the fall months of September, October, and November. Thunderstorms occur throughout the year, and lightning has ignited fires in most months; however the vast majority of lightning ignitions occur between the months of April and August.

The annual fire weather cycle is more a function of seasonality and temperature than precipitation. Warm temperatures and exposed fuels during the dormant seasons of spring and fall condition the fuels for easy ignition and spread. In contrast, during the winter, cold temperatures prolong the wetting effect of the precipitation, and in the summer, heavy sheltering of fuels by tree foliage (coupled with high humidity) makes for poor ignition conditions under normal circumstances. Exceptions to the norm have occurred. Atypical dry spells in any season can result in more fires and/or unusually higher fire intensities. In 1987, and again in 2007, extreme summer-time droughts made the normally fire-resistant hardwood forest susceptible to fire. Numerous lightning- and human-caused fires in and near the Park burned thousands of acres during summer months in those years.

The Keetch-Byram Drought Index (KBDI) is calculated from ongoing weather measurements taken at two remote fire weather stations within the park. The KBDI uses daily temperature, daily precipitation, antecedent precipitation and annual precipitation to produce a number between 0 (no drought) to 800 (extreme drought) to describe moisture conditions in deep duff and soil. KBDI has been shown to follow predictable annual cycles (Keetch and Byram 1968, NPS/USFS Fire Weather Data), and can be used to understand the availability of heavy fuels through an average year in the southern Appalachians. Though fires will readily spread in fine fuels at virtually any KBDI value, the persistence and severity of fire on the landscape are strongly related to the drought index. Generally, the lowest annual values for KBDI (<50) occur in late winter, and availability and consumption of heavy fuels is typically minimal . A steady increase in the index begins by mid-spring, and a broad annual maximum (250-450) occurs between August to November. During an average year, fall fires can thus be more resistant to control. Deviations from the annual cycle can also be useful for understanding atypical fire weather patterns.

3.1.6 Fire Season

Fires can occur at virtually any time of year in the park, with the lowest probability of occurrence in December and January. With that said, the Park has two primary fire seasons, late

winter/early spring and late summer/fall. Increasing temperatures and day length combine with exposed fuels to create a relatively predictable spring fire season. As green-up occurs and the forest closes, typical moist and humid summer conditions develop and effectively end the spring fire season. The peak in the annual cycle of water deficit and accumulated impacts of drought can create conditions for severe fires in the late summer and fall. Under average conditions, the timing of the late fire season is much less predictable than the spring season.
Note: These fire seasons should be monitored by tracking weather conditions and NFDRS indices, not by calendar dates.

3.1.7 Fire Behavior Associated with Area Fuels

Fuels in the park can generally be divided into three broad categories: hardwood timber litter, shrubs and grasses. By far, the dominant fuel type is hardwood timber litter. Hardwoods in various associations interspersed with pockets of short-needle pine make up over 80% of park lands. Heavy growth of shrubs such as rhododendron and mountain laurel can occur under hardwoods or conifers throughout the park. This understory layer under typical conditions is relied upon to dampen fire activity and check fire spread due to shading and higher humidity. During extended periods of dry and/or windy conditions, these shrubs can burn in short duration crown runs that can transition to individual and group tree torching, exasperating control efforts. Grass fuels are a localized and minor component of the park but are interspersed with numerous cultural values at risk from the effects of wildfire.

The fuel models described below are a subset of those available in Behave Plus. Fuel models are models only and provide approximate fire behavior associated with those fuels under given conditions. Observed fire behavior must be used to verify and fine tune predicted fire behavior outputs.

3.1.7.1 Timber Litter

Fire behavior fuel models TL4, TL6 and TL9 represent fire behavior associated with timber litter fuels in the park. Choosing which model to use depends on the type of leaf litter present, how much litter is present, and how compact or fluffy the litter is. The primary carrier of fire in TL4 is broadleaf (hardwood) litter. TL4 represents a moderate load of fine and coarse fuels, compact litter. Spread rate is low; flame length low. The primary carrier of fire in TL6 is moderate load broadleaf litter, less compact than TL4. Spread rate is moderate; flame length low to moderate. The primary carrier of fire in TL9 is very high load, fluffy broadleaf litter. TL9 can also be used to represent heavy needle-drape. Spread rate is moderate; flame length quickly exceeds that which can be addressed by direct attack by hand. Refer to Figures 2 and 3 for fire behavior associated with timber litter fuels.

3.1.7.2 Shrubs

Fire behavior fuel model SH4 represents tall shrubs such as rhododendron and mountain laurel. A week of dry, windy conditions can turn these shrubs from a natural fire break into a volatile complex of fuel capable of sustaining short duration crown runs. These shrubs, particularly mountain laurel, frequently occur under a pine canopy, posing a risk of overstory tree torching. Additionally, these fuels are of particular concern because they pose the greatest risk in the wildland urban interface where private structures are located. The primary carrier of fire in SH4 is woody shrubs and shrub litter. Low to moderate shrub and litter load, possibly with pine overstory, fuel bed depth about 3 feet. Spread rate is high; flame length high. Refer to Figures 4 and 5 for fire behavior predictions for SH4 fuels.

3.1.7.3 Grass

Fire behavior fuel models GR2 and GR5 represent the grass fuels found in areas such as Cades Cove. GR2 can be used to model sparser or previously mowed fields while GR5 models fields with taller grass and heavier fuel loads. The primary carrier of fire in GR2 is grass, though small amounts of fine dead fuel may be present. Load is greater than GR1, and fuelbed may be more continuous. Shrubs, if present, do not affect fire behavior. The primary carrier of fire in GR5 is humid-climate grass. Load is greater than GR2 but depth is lower, and grass height averages about 2 feet. Refer to Figures 4 and 5 for fire behavior predictions for grass fuels.

Table 2. Fuel Model Parameters

Fuel Model	Fuel Load (tons / acre)					Model Type	Fuel Bed Depth (ft)	Moisture of Extinction (%)
	1 hr	10 hr	100 hr	herb	woody			
TL4	0.5	1.5	4.2	0.0	0.0	static	0.4	25
TL6	2.4	1.2	1.2	0.0	0.0	static	0.3	25
TL9	6.7	3.3	4.2	0.0	0.0	static	0.6	35
SH4	0.9	1.2	0.2	0.0	2.6	static	3.0	30
GR2	0.1	0.0	0.0	1.0	0.0	dynamic	1.0	15
GR5	0.4	0.0	0.0	2.5	0.0	dynamic	1.5	40

Figure 2. Predicted Flame Lengths in Timber Litter for TL4, TL6 and TL9. Assumes 6% FDFM, 60% herbaceous and 90% woody fuel moistures and a 40% slope.

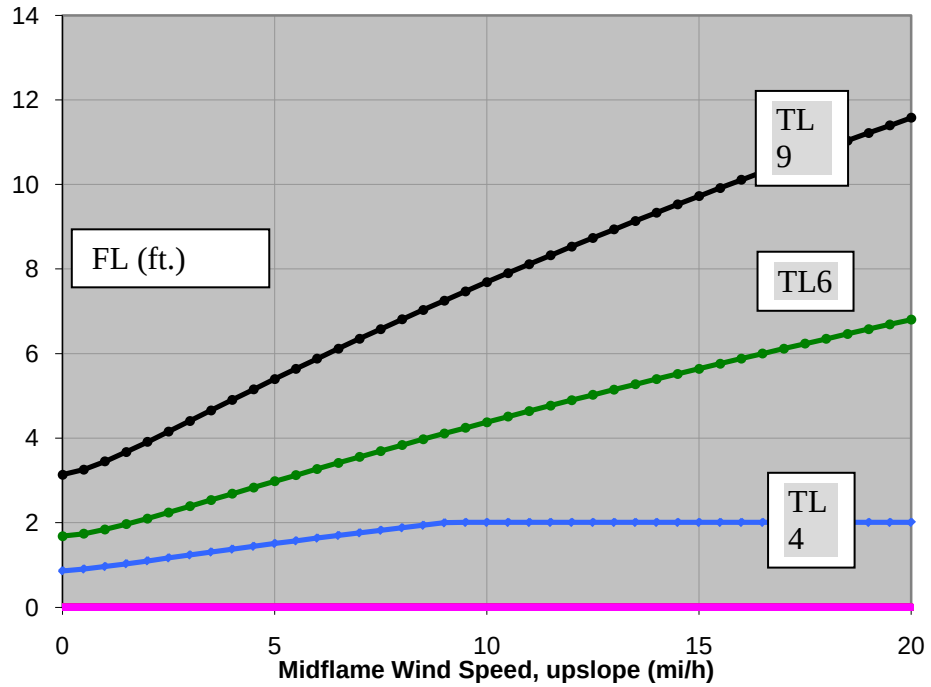


Figure 3. Predicted Rates of Spread in Timber Litter for TL4, TL6 and TL9. Assumes 6% FDFM, 60% herbaceous and 90% woody fuel moistures and a 40% slope.

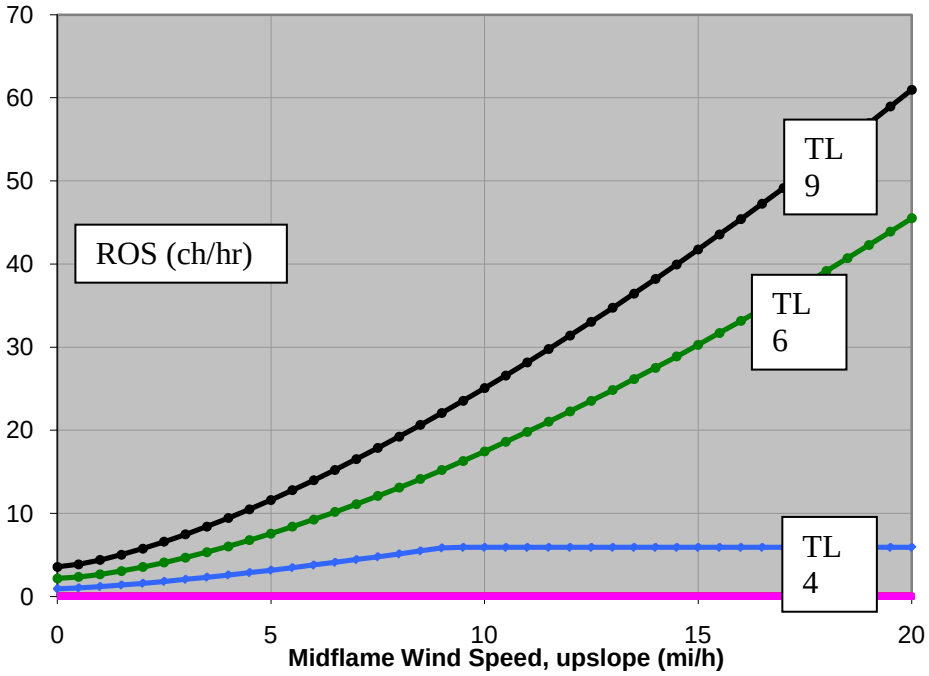


Figure 4. Predicted Flame Lengths in Grass and Shrub Fuel Types assuming 6% FDFM, 60% herbaceous and 90% woody fuel moistures and a 40% slope.

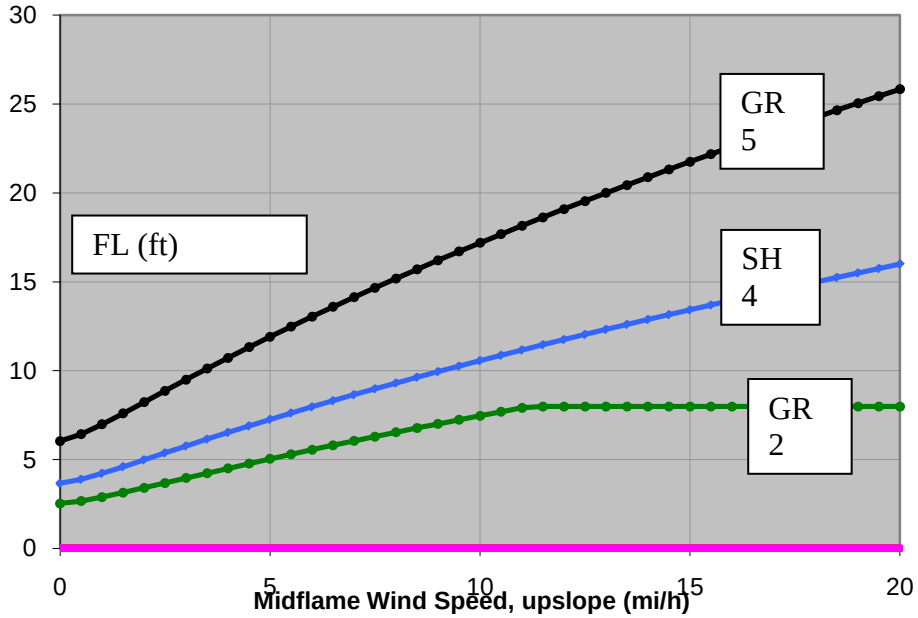
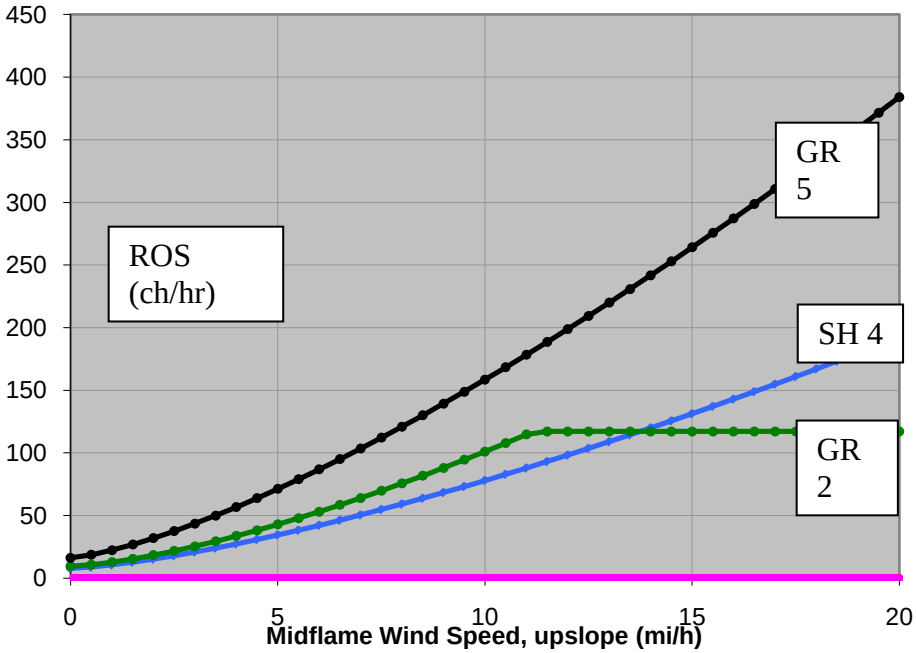


Figure 5. Predicted Rates of Spread in Grass and Shrub Fuel Types assuming 6% FDFM, 60% herbaceous and 90% woody fuel moistures and a 40% slope.


450
400
350
300
250
200
150
100
50
0
0
5
10
15
20
ROS
(ch/hr)
GR
5
SH 4
GR
2
Midflame Wind Speed, upslope (mi/h)

3.2 Area-wide Management Considerations

National Park Service policy requires the perpetuation of Park resources using natural forces whenever possible. Park directives instruct managers to preserve the exceptionally diverse resources of GRSM. It is believed that the native biological diversity throughout the fire-adapted portion of the Park landscape has already decreased for many reasons, but primarily because of fire exclusion and associated plant community succession.

Minimum impact suppression tactics are required policy for all fire management activities on National Park Service lands. Fire management activities within the Park will be carried out in a manner that minimizes impacts to the Park's natural and cultural resources. Interdisciplinary teams will meet to address potential impacts to park resources resulting from either wildfire or suppression activities.

3.2.1 Elements of the Fire Environment Affecting Management

Further discussion of the elements listed here is found elsewhere in this plan as well as other Park resource management plans and have been documented in the Environmental Assessment for the FMP. They are highlighted here for summary purposes. A complete listing of Park facilities can be found in Appendix E.

- Recreation and Visitation: Great Smoky Mountains National Park, being centrally located in the eastern United States, is convenient for a major part of the country's population. It is the most heavily visited national Park in the nation attracting approximately 9 - 10 million visitors annually. The Park is open year-round. Major visitation months are June, July, August and October (fall colors).

- Wildland-Urban Interface: The wildland-urban interface presents a sprawling tangle of developments, scattered individual summer and year-round homes, and resort areas. A systematic assessment of the Park boundary to identify structures at risk during normal fire years was completed in 1995. There were 277 structures identified valued at 22 million dollars. To date approximately six miles of boundary adjacent to Gatlinburg has had hazard fuel treatment. It is estimated that another 50 structures have been built on the boundary since the surveys of the 1990s.

- Developments and Facilities: Non-historic buildings make up the largest number of facilities. Examples being storage sheds, warehouses, shop buildings, comfort stations, equipment buildings, horse barns and information kiosks. There are approximately 290 non-historic structures.

- Air Quality: The Park has been designated as a Class I area by the Clean Air Act. The Clean Air Act also identified National Ambient Air Quality Standards (NAAQS) for a number of common pollutants. Portions of the park have been identified as falling in counties which have been designated as non-attainment for PM2.5 and or ozone. The park is working with state regulators to address non-attainment. Refer to section 3.2.2 of this plan.

- Cultural Resources: The Park has a wealth of archeological and historic resources. There are 150 plus historic structures. Refer to section 3.2.3.1 of this plan.

- Natural Resources: There are many resources of concern in Great Smoky Mountains National Park, including 11 federally threatened and endangered species. Refer to section 3.2.3.2 of this plan for information concerning the protection of natural resources.

- Wilderness: Lacking formal 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. The revised FMP 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).

- Local Economics: Providing services and a base for visitors to the Park are developed areas on two sides of the Park. Gatlinburg and Townsend are located on the north side and Cherokee and Bryson City are located on the south side. All have economies dependent on tourism. Several smaller towns are also present at various points adjacent to the Park boundary. The principal areas provide a wide range of services to the visitor, including lodging, restaurants, grocery stores, crafts and curio shops, and many amusement and sporting activities.

- The Tennessee Valley Authority has several power transmission lines that pass through the western and southern sections of the Park. These are the Fontana-Alcoa Number 1 and 2 transmission lines and the Fontana-Santeelah transmission line.

- Adjacent Ownership Issues: The trend toward development adjacent to the Park has accelerated in recent years, resulting in diminished amounts of privately-owned open space surrounding the Park. The Park has no control over this development. However, the development dictates to a large degree the kinds of management programs, policies, and hazards that the Park must address.

- Other Agencies: The fact that the Park lies in two states and numerous counties means that it must coordinate its fire program with many agencies, each of which has somewhat different charges, goals, and resources.

3.2.2 Air Quality and Smoke Management

3.2.2.1 Pertinent Air Quality Issues

Air quality in the Great Smoky Mountains National Park is an important environmental issue. Air pollution affects visitor health and impacts Park resources. It significantly reduces visibility, acidifies streams, and injures plants within the Park. Locally, Blount County has been designated as "non-attainment" for both PM2.5 and ozone while Sevier County is in "non-attainment" status for ozone.

Great Smoky Mountains National Park is a Class I airshed. Congress passed the Clean Air Act to create a national policy for the protection, preservation, and enhancement of air quality. The Clean Air Act designated all national Parks over 6000 acres as Class I areas and set a national goal for visibility as "the prevention of any future, and the remedying of any existing, impairment of visibility in mandatory Class I Federal areas which results from manmade air pollution." Amendments to the Act gave federal land managers the affirmative responsibility to assure that air quality and air quality related values do not deteriorate and to take aggressive action in protecting, preserving and enhancing the Park's resources.

Park staff maintain a network of air quality monitoring sites. These sites measure gaseous pollutants including: ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NO_x), fine particle matter (PM_{10} and $PM_{2.5}$), atmospheric deposition of sulfates, nitrates and mercury. Also, cameras record visibility every fifteen minutes from the Look Rock Tower and Purchase Knob.

Park staff maintain a network of air quality monitoring sites. These sites measure gaseous pollutants including: ozone (O_3), sulfur dioxide (SO_2), nitrogen oxides (NO_x), fine particle matter (PM_{10} and $PM_{2.5}$), meteorology (temperature, precipitation, winds), atmospheric deposition of sulfates, nitrates and mercury. Also, cameras record visibility every fifteen minutes from the Look Rock Tower and Purchase Knob.

The Park Air Resources Specialist issues an air pollution advisory on days when air pollution values exceed or are expected to exceed the National Ambient Air Quality Standards (NAAQS) for ozone and/or particulate matter .

3.2.2.2 Program Actions to Manage Smoke

Smoke management is a major concern of the Park. While fire is an important natural process and a critical component of resource management, it is also a safety hazard to motorists, a source of air pollution, a public health concern, and contributes to visibility impairment, from particulate matter.

To ensure safety, smoke will be monitored on roadways and appropriate traffic control measures will be taken. Smoke generated by prescribed fires will be managed in compliance with air pollution regulations of TN and NC.

The Park has an air pollution advisory system in place during days that exceed the National Ambient Air Quality Standards for ozone and/or particulate matter. These advisories must be taken into consideration when planning and implementing each prescribed fire. Under some advisories, large landscape-sized fires may be unacceptable while those of a smaller size might be allowed. Some fires may be remotely located and exposure to visitors and employees mitigated.

Prescribed fire managers must consider fuel loading, fuel moisture, anticipated consumption, anticipated smoke production, and smoke dispersal when planning a prescribed fire. Smoke production and dispersal are key elements considered when obtaining a burn permit. Smoke management mitigation measures are implemented as required on every burn conducted in the Park. These mitigations may include: burning smaller units, burning under higher duff moisture contents, determining acceptable/unacceptable wind directions, burning under higher ventilation rate values, refining prescription parameters, utilizing traffic control, rotating fire staff out of smoky conditions, or not implementing fires under adverse atmospheric conditions. It is widely accepted that there are fewer pollutants released into the atmosphere during prescribed fires verses wildfires. This is due to the mitigation measures mentioned above. Wildfires often occur under more extreme, drier conditions when more fuels are available and more consumption of heavy fuels, stumps and duff occur. These types of fuels often smolder for many hours producing air pollutants over-night when stagnant air conditions occur.

Fire staff meet with the park air resources specialist when unplanned ignitions occur. Air quality is one factor considered when determining whether a fire should be monitored for resource benefit rather than aggressively suppressed.

The proximity of federally listed bat (Indiana Bat) hibernaculum is considered and determines whether or when prescribed fire operations are allowed. This mitigates harmful smoke from entering caves being used by bat colonies. Fire staff routinely consult with park wildlife biologists when planning prescribed fires or evaluating wildfires.

The governors of NC and TN have recommended that the Great Smoky Mountains National Park be a CAA non-attainment area for the current 8-hour ozone standard (>75 ppb) . EPA will make a final determination on the designation recommendations in the near future. Both states will be required to monitor ozone, develop a State Implementation Plan to mitigate and reduce the sources of air pollution if the park continues to exceed the standard. Each plan could lead to increased monitoring of smoke and more stringent regulations.

3.3 Fire Management Unit Specific Descriptions

The park is divided into two fire management zones: FMU1 is the interface zone and is generally contiguous with the park boundary and Foothills Parkway, developed areas within the park are also included in this FMU. FMU2 is the natural zone, this FMU makes up the preponderance of park lands. Within FMU2, naturally occurring wildfires will generally be allowed to play their role in the eco-system. Refer to the following sections for specific FMU guidance.

3.3.1 Interface Fire Management Unit (FMU1)

FMU 1 (Figure 6) 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 90,595 acres in size within the Park proper, plus an additional 9,457 acres of the Foothills Parkway, totaling 100,052 acres. This represents approximately 19 percent of the area administered by the Park.

3.3.1.1 Physical and Biotic Characteristics

FMU 1 is contiguous with the park boundary and developed areas. FMU1 is comprised of developed park infrastructure, historical, cultural, and sensitive natural resources. The introduction to Chapter 3 accurately depicts the physical and biotic attributes of fire management unit 1.

3.3.1.2 Fire Management Objectives

Strategic Objectives:

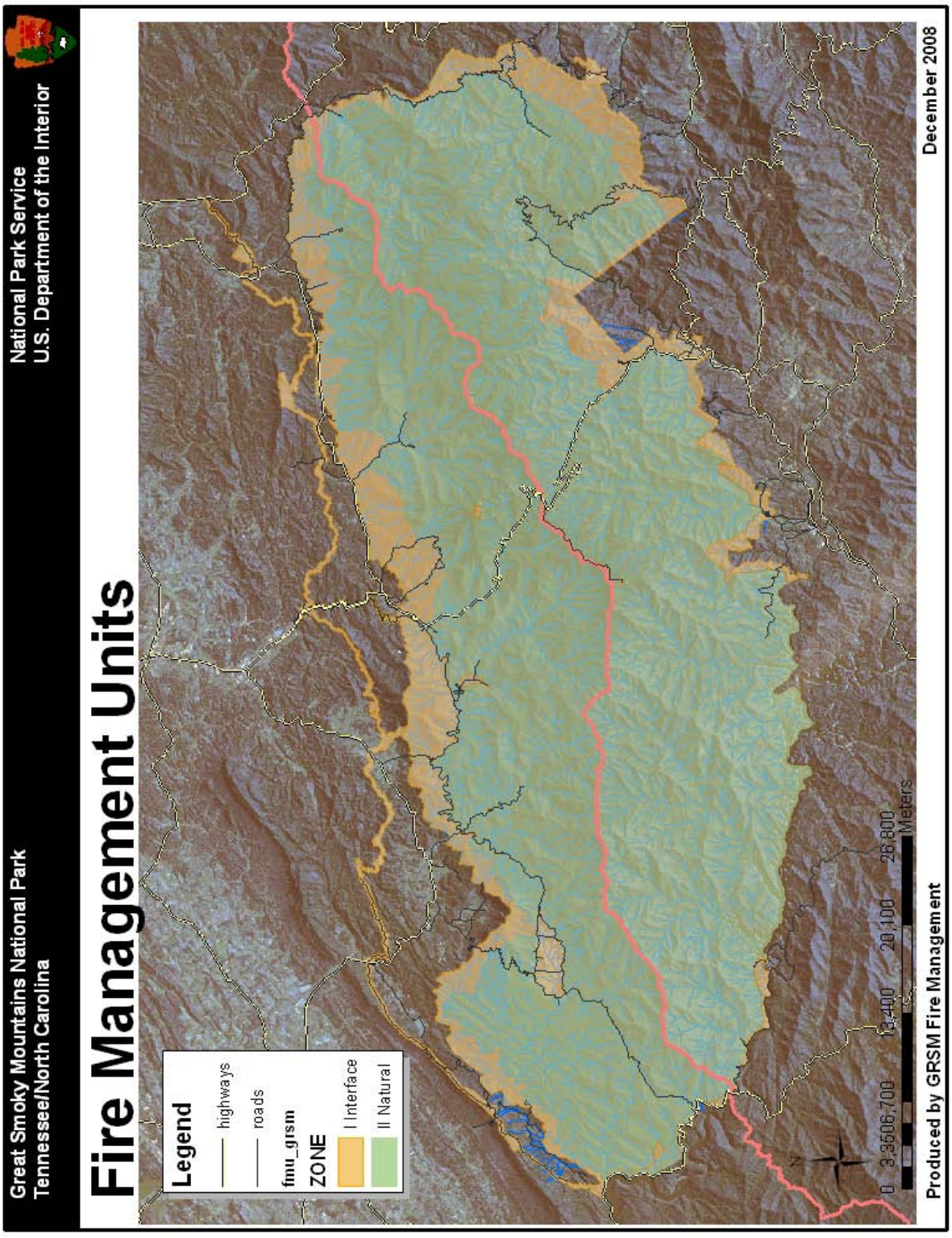
- The management objective during initial action on all wildfires regardless of cause in FMU 1 will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.
- A strategic fire response with supporting decision documentation will be initiated on each wildfire occurrence. Strategic fire response will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and effects, values to be protected, resource availability, cumulative effects of fire and cost effectiveness.
- Prescribed fires will be used to reach natural and cultural resource management objectives and for hazard fuel reduction activities.
- Mechanical fuel treatment methods may be used for hazard fuels reduction in areas where safe and effective prescribed fire treatment is precluded by fuel loads, or is otherwise unfeasible. Mechanical treatments may range from use of hand tools to using specialized equipment such as gyro-tracks if and as approved in treatment plans.

Resource benefit from fire is not a consideration during the initial action response process in FMU1. The effects of suppression may be considered during the assessment process. Documentation of the decision process will be accomplished using the WFDSS program.

Measurable Objectives:

- All wildfires are managed with the strategic fire response as directed by this fire management plan and analysis of the specific situation with the goal of using available resources to manage the fire for the most effective, most efficient and safest means available.
- All wildland fire operations are conducted so that no lost time injuries occur to firefighters or the public.
- No natural communities or rare species are lost due to either lack of prescribed fire or the destructive effects of wildfire.
- Hazard fuel reduction efforts within FMU1 show an average incremental increase in acres treated each year over the life of this plan.
- Increase the average annual acreage of mechanical fuel treatments in areas where safe and effective prescribed fire treatment is precluded by fuel loads, or is otherwise unfeasible.

Figure 6. Fire Management Units



3.3.1.3 Fire Management Considerations

- Firefighter and public safety is the first priority in all fire management activities.
- Minimum Impact Suppression Tactics will be employed.

- Protection mitigation measures for known historic and cultural resource sites in or near the project area must be assured before a prescribed fire project is initiated.
- Park neighbors, Park visitors and local residents will be notified of all planned and unplanned fire management activities that have the potential to impact them.
- All personnel involved in fire management operations will receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior.
- Only properly trained and qualified personnel will carry out fire management operations. Trainees must be supervised by fully qualified personnel.

3.3.1.4 FMU 1 Fire Management Situation

3.3.1.4.1 Historic Role of Fire By and large, most documented wildfires have occurred inside FMU 1. Wildfires have not occurred in a random, evenly spaced manner throughout this unit. Locations such as the Lakeshore Drive, 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 human caused fire occurrence.

3.3.1.4.2 Historical Weather Analysis See Area Wide Characteristics (Ch. 3.1).

3.3.1.4.3 Fire Season See Area Wide Characteristics (Ch. 3.1).

3.3.1.4.4 Fuel characteristics See Area Wide Characteristics (Ch. 3.1).

3.3.1.4.5 Control problems and dominant topographic features Normal fire behavior associated with fuels found in Cades Cove and Cattaloochee Valley does not pose a control problem. Many areas are flat and have relatively light fuel loads. However, areas with uncut old fields may pose control problems under extreme conditions. The area above Park Headquarters (and smaller areas like it), represented by fuel models SH4 and TL6, can pose 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 in the understory did occur in an area with similar fuels. Under drought conditions, torching and spotting of 0.5 miles have been documented.

3.3.1.4.6 Values at Risk Park-owned facilities at risk in this FMU have been sorted by major drainages established by Parker and Pipes (1990) within AppendixE. Since fire suppression strategy and tactics are fundamentally based on drainages, this sorting will greatly facilitate identification and protection of values in the event of wildfire. The drainage classification system used does not include the GRSM administered Parkways, so the Look Rock facilities are not sorted by drainage. However, they are included in the Appendix E. In addition, the Tennessee Valley Authority has several power transmission lines that pass through the western and southern sections of the Park. These are the Fontana-Alcoa Number 1 and 2 transmission lines and the Fontana-Santeelah transmission line.

Project sites where mechanical hazardous fuel reduction projects have previously been completed reflect areas where wildland urban interface communities at risk are concentrated. These include Ski Mountain, Bypass and Highlands, all areas on the boundary in the wildland-urban interface with Gatlinburg. The Ace Gap project area is located in the northwest corner of the Park in Townsend.

Sensitive natural resource areas, such as treated hemlock stands, Whiteoak Sink, Abrams Creek, the Sinks, Bull Cave area, Gum Swamp, Houston Chambers Pond, and Big Spring Cove have special fire retardant restrictions placed on them.

3.3.2 Natural Zone Fire Management Unit (FMU2)

FMU 2 (Figure 6) is approximately 421,294 acres in size. This represents approximately 81 percent of the area administered by the Park. Within this zone**,** natural processes shall be allowed to function wherever and whenever possible. As such, SFR will default to using naturally occurring wildfire to achieve resource benefit whenever conditions allow.

3.3.2.1 Physical and Biotic Characteristics

The introduction to Chapter 3 accurately depicts the physical and biotic attributes of fire management unit 2. FMU2 makes up the bulk of park lands interior of the boundary (Interface Zone FMU).

3.3.2.2 Fire Management Objectives

Strategic Objectives:

- The initial action to all human caused wildfires in FMU 2 will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.
- Every naturally occurring fire will be evaluated for suitability for using wildfire to the benefit of the resource. A wildfire may be concurrently managed for one or more objectives and objectives can change as the fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography; varying social understanding and tolerance.
- Prescribed fires will be used to reach natural and cultural resource management objectives and for hazard fuel reduction activities.
- Every wildfire will be assessed following a decision support process that examines the full range of responses. Wildland fire response strategies and tactics will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and effects, values to be protected, resource availability, cumulative effects of fire and cost effectiveness. Documentation of the decision process will be accomplished using the WFDSS program.

Measurable Objectives:

- All wildfires are managed with the strategic fire response as directed by this fire management plan and analysis of the specific situation with the goal of using available resources to manage the fire for the most effective, most efficient and safest means available.
- All wildfire operations are conducted so that no lost time injuries occur to firefighters or the public.
- No natural communities or rare species are lost due to either lack of prescribed fire or the destructive effects of wildfire.
- Hazard fuel reduction efforts within FMU2 show an average incremental increase in acres treated each year over the life of this plan.

3.3.2.3 Management Considerations

- Firefighter and public safety is the first priority in all fire management activities.
- Minimum Impact Suppression Tactics will be employed.

- Protection mitigation measures for known historic and cultural resource sites in or near the project area must be assured before a prescribed fire project is initiated.
- Park neighbors, Park visitors and local residents will be notified of all planned and unplanned fire management activities that have the potential to impact them.
- All personnel involved in fire management operations will receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior.
- Only properly trained and qualified personnel will carry out fire management operations. Trainees must be supervised by fully qualified personnel.

3.3.2.4 FMU2 Fire Management Situation

3.3.2.4.1 Historic Role of Fire See Area Wide Characteristics (Ch. 3.1).

3.3.2.4.2 Historical Weather Analysis See Area Wide Characteristics (Ch. 3.1).

3.3.2.4.3 Fire Season See Area Wide Characteristics (Ch. 3.1).

3.3.2.4.4 Fire Characteristics See Area Wide Characteristics (Ch. 3.1).

3.3.2.4.5 Fire Regime Alteration See Area Wide Characteristics (Ch. 3.1).

3.3.2.4.6 Control Problems Suppression efforts undertaken within FMU2 will typically focus on confinement tactics using natural barriers. Whenever possible, fires within FMU2 will be managed for the benefit to the resource.

3.3.2.4.7 Values at Risk Efforts are underway to pre-identify all known values that can be adversely impacted by wildfire. These values are being spatially depicted so that fire managers will have immediate access to all known values at the time of fire discovery. This information will be available to the Fire Duty Officer and accessible from any work station.

4 Wildland Fire Operational Guidance

All actions defined in this Fire Management Plan will conform to safety policies defined in agency and departmental policy, including, but not limited to:

a. *Interagency Standards for Fire and Fire Aviation Operations* (NFES 2724).
b. *NPS Director's Order 18*, *and Reference Manual 18, Standards for Operations and Safety chapter.*
c. *NPS Directors Order 60, and Reference Manual 60*, *Aviation Management.*
d. NPS Directors Order 50B , and Reference Manual 50B, Occupational Safety and Health Program.
e. Interagency Helicopter Operations Guide (NFES 1885).

Firefighter and public safety is our first priority. This Fire Management Plan and activities defined within reflect this commitment. The commitment to and accountability for safety is a joint responsibility of all firefighters, managers, and administrators. Individuals must be responsible for their own performance and accountability. Every supervisor, employee, and volunteer is responsible for following safe work practices and procedures, as well as identifying and reporting unsafe conditions. All firefighters, fireline supervisors, fire managers, and agency administrators have the responsibility to ensure compliance with established safe firefighting practices.

4.1 Management of Unplanned Ignitions

Wildfire will be safely managed to enhance resource protection, diminish risk and consequences of severe wildfires and, to sustain naturally occurring vegetative communities.

As previously noted, the philosophy behind wildland fire management is strategic fire response (SFR). SFR is a holistic approach to managing wildfires with the goal of meeting fire management unit objectives. Typically, fire response ranges across a spectrum of tactical options (from monitoring from a distance to intensive suppression actions). Beginning with the initial action to any wildfire, decisions will reflect the goal of using available firefighting resources to manage the fire for the safest, most effective, and most efficient means available while meeting identified fire management unit objectives.

The SFR strategies and tactics will consider firefighter and public health and safety, fire cause, current and predicted weather, current and potential fire behavior and fire effects, values to be protected from fire, management priorities, resource availability, cumulative effects of the fire, and cost effectiveness. Direct assessment of resource benefits is allowed only for those fire management units (FMU2), where the use of wildland fire to achieve resource management objectives has been addressed in the FMP as an acceptable strategy.

The initial action to human caused wildfires will be with the objective of suppressing the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

Where the objective is to put the fire out, wildfire managers may apply different strategies and tactics as part of a strategic fire response. Aggressive suppression may be the preferred strategy for a portion of the perimeter and on another portion of the perimeter; point protection or monitoring may be the desired strategy. By taking into account the fire season, current and

expected weather, burning conditions, fire managers apply the best tactics to mitigate risks to the public and firefighters, meet cultural/natural resource management objectives and meet protection priorities.

Wildfire Decision Support System (WFDSS) will be used on each wildland fire to document the decision making process and outline strategy and tactics employed. The level of decision support documentation required will depend on the fire response level.

4.1.1 Preparedness

As stated in NPS policy, preparedness 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 Preparedness Plan is a comprehensive set of documents that provide management direction for wildfire operations, including initial action and incident management activities. These actions are based on the goals, objectives, and wildfire management strategies identified in the Fire Management Plan, as well as established local level procedures for wildland fire operations. The Preparedness Plan will be reviewed annually and is available at:
http://www.grsm.nps.gov/offices/showOffice.cfm?grp=fire
or at:
http://inpgrsms01gis/fire/Shared%20Documents/Forms/AllItems.aspx

4.1.1.1 Annual Training

Annual fireline safety refresher training, firefighter physicals and work capacity tests are required for all personnel participating in fire management actions or prescribed fire activities that are subject to assignments on the fireline. This training is scheduled in early to mid-January annually. This training will include National Park Service requirements and meet NWCG standards.

The Fire Management Officer will assure that an annual training program is established that:

- Meets the needs of the park's Step-up Plan and fire management staffing.
- Meets Interagency Fire Program Management (IFPM) qualification standards for fire program personnel.

The unless delegated, the fire management officer is designated as the Training Officer and is responsible for facilitating the aforementioned training needs and overseeing the management of the Incident Qualification and Certification System (IQCS). The Training Officer will establish a Training and Qualifications Committee to assist in all aspects of the training and qualifications program. This committee should meet in October to establish the training needs for the fiscal year. Annually, training is achieved through a combination of courses held locally or attended non-locally. Training will be obtained in the most cost-effective manner.

4.1.1.2 Readiness

Wildland fire and aviation preparedness reviews shall be conducted annually in late January following the Annual Fireline Safety Refresher Training. This review will identify operational, procedural, personnel, or equipment deficiencies and recommend corrective actions. Standards for preparedness reviews are based on the Interagency Standards for Fire and Fire Aviation Operations and conducted according to the Fire Preparedness Review Guide. The Fire Management Officer or his designee will ensure completion of this task.

Bi-annual meetings with all park incident commanders will be held per the following schedule:

Fall Fire Season: ICs meet by September 15th
Spring Fire Season: ICs meet by March 1st

The purpose of these meetings is to brief ICs on recent fire policy updates, long-term weather forecasts, fuels conditions and resource availability. This meeting will be chaired by either the AFMO Operations or the FMO if the AFMO position has not been filled. Attendance of all park incident commanders is mandatory.

4.1.1.3 Fire Weather and Fire Danger

Fire Weather and Fire Danger Indices are tracked via the Weather Information Management System (WIMS). WIMS can be accessed via the internet at: http://fam.nwcg.gov/fam-web/

It is the parks responsibility to access WIMS several times each day. Daily access at a minimum must include:

- Entering fire weather observations. It is critical that these observations be entered into WIMS by the time requested by the National Weather Service forecaster.
- Retrieving and interpreting fire danger indices for the area and adjacent stations. The indices may then be used to determine daily observed and predicted staffing classes for use in the Parks Step-up Staffing Plan.

Current and recent weather activities are monitored via National Weather Service radar website and other public websites. Lightning strike data is available through the Bureau of Land Management and can be accessed via the internet at:
https://www.nifc.blm.gov/cgi/nsdu/Lightning.cgi

4.1.1.3.1 Weather Stations: Great Smoky Mountains National Park maintains two permanent automated fire weather stations: one on the North Carolina side of the Park (Cherokee RAWS) and one on the Tennessee side (Indian Grave RAWS). Temporary stations may be set up as needed in advance of prescribed fire projects.

Table3. Weather Stations

Station ID	Station Name	Elevation	Aspect	Slope	Climate	NFDRS Fuel Model
313902	Cherokee	3400	South	2	3	E/R
407603	Indian Grave	2700	South	2	3	E/R

4.1.1.3.2 National Fire Danger Rating System (NFDRS): GRSM monitors both short-term fire danger and long-term drought conditions. Short term fire danger is tracked using 1988 NFDRS Burning Index (BI) which represents the difficulty suppression forces will have in controlling a

fire should one start on that day. During spring and fall fire seasons, fuel model E (Hardwood litter – fall) is monitored and during the summer season, fuel model R (Hardwood litter – summer) is monitored. Longer-term drought conditions are tracked using the Keetch-Byram Index (KDBI), a measure of soil moisture and thus is considered a good drought indicator. It ranges from 0, when the ground is saturated, to a maximum of 800 which is reached after protracted drought.

Table 4. Short-term fire danger thresholds for Great Smoky Mountains National Park (from analysis by C.Cross. 2002)

INDEX	90^{TH} PERCENTILE	97^{TH} PERCENTILE
BI (Fuel Model E)	27	35
BI (Fuel Model R)	8	12

Fire Danger "pocket cards" have been developed which display critical thresholds of fire danger to both local and out of area fire suppression resources to make them aware of local trends. (See Appendix C).

4.1.1.4 Step-up Staffing Plan

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

Appropriate activities for use of emergency preparedness 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 preparedness 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 typically has two fire seasons, spring and fall. These fire seasons occur first in the spring prior to green-up and then again in the fall after leaf drop prior to the onset of winter rain / snow events.

There are five staffing classes that describe escalations in preparedness responses to increased fire danger. Table 5 below shows the actions to be taken for each of the five staffing classes in the Park. For the purpose of determining appropriate step-up staffing, Fuel Model E is used to track Burning Index. The daily observed and predicted BI values are obtained via WIMS. Observed BI as well as tomorrow's forecast BI can be accessed after the NWS fire forecaster has processed (usually by 1600), the 1300 fire weather observations entered by the park each day.

Table 5. Step – Up Plan

Staffing Class Step-Up Plan					
Burning Index Fuel Model "E"	0 - 6	7 - 13	14 - 26	27 - 34	35 +
Staffing Class	**SC 1**	**SC2**	**SC3**	**SC4**	**SC5**
Fire Danger	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Open Preparedness Account for extended staffing and outside resources ordered as required	No	No	No	Contact regional office for preparedness account number.	Request severity funding if prolonged fire danger is anticipated.
Engines (ENGB + FFT2) **Squads** (FFT1/ICT5 + 3 FFT2)	1 T6 within 1 hour	1 T6	1 T6	1 T6 1 Squad 7 day coverage	1 T6 1 Squad 7 day coverage
Overhead *** ENGB can also function as ICT5 in SC 1 and SC2 only**	ICT5 *	ICT5 *	ICT4	ICT4 Designate daily Duty Officer ICT3 (available within 2 operational periods)	ICT4 Designate daily Duty Officer ICT3 Determine need for local T3 team

Staffing Class Step-Up Plan					
Burning Index Fuel Model "E"	0 - 6	7 - 13	14 - 26	27 - 34	35 +
Staffing Class	**SC 1**	**SC2**	**SC3**	**SC4**	**SC5**
Fire Danger	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Support Function				Establish logistical support Determine availability/ status of collateral duty and AD employees	Establish expanded dispatch Expand logistical support Determine availability / status of collateral duty and AD employees
Coordination			Daily verification of available resources with District Rangers	Daily coordination of available resources with division chiefs; TN/NC Division of Forestry, Cherokee BIA and Cherokee NF	Daily coordination of available resources with division chiefs; TN/NC Division of Forestry, Cherokee BIA and Cherokee NF

<table>
<tr><th colspan="6">Staffing Class Step-Up Plan</th></tr>
<tr><td>Burning Index
Fuel Model “E”</td><td>0 - 6</td><td>7 - 13</td><td>14 - 26</td><td>27 - 34</td><td>35 +</td></tr>
<tr><td>Staffing Class</td><td>SC 1</td><td>SC2</td><td>SC3</td><td>SC4</td><td>SC5</td></tr>
<tr><td>Fire Danger</td><td>Low</td><td>Moderate</td><td>High</td><td>Very High</td><td>Extreme</td></tr>
<tr><td>Management Actions</td><td></td><td></td><td></td><td>Duty Officer determines need for extended hours

Evaluate need for expanded incident management functions</td><td>Duty Officer determines need for extended hours

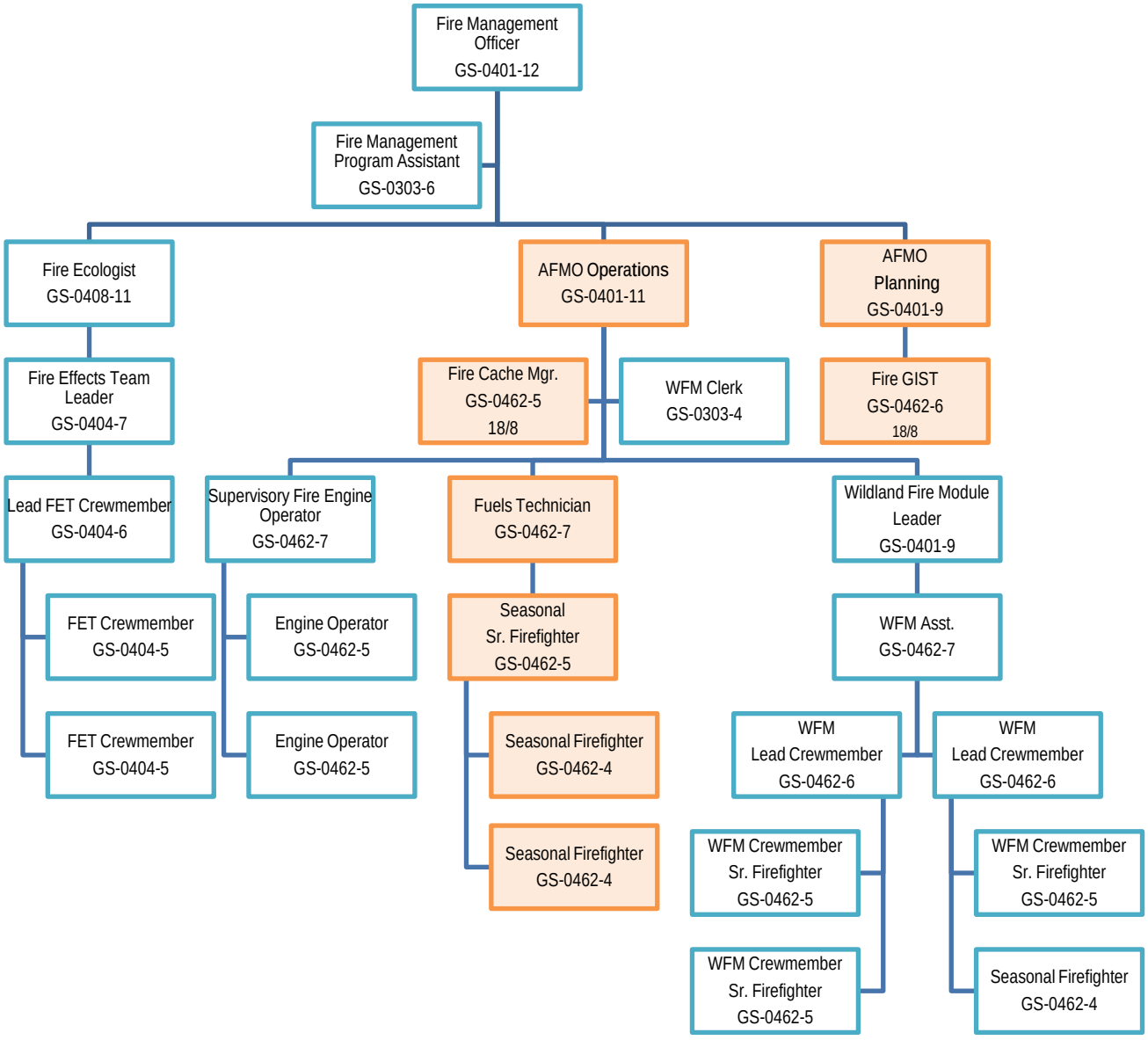
Initiate daily incident planning meeting</td></tr>
<tr><td rowspan="3">Prevention Activities</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="2"></td><td>Fire Danger Signs Posted (refer to fire prevention plan)</td><td>Fire Danger Signs Posted (refer to fire prevention plan)</td></tr>
<tr><td colspan="2">Superintendent may restrict campfires based on current activities and conditions</td></tr>
<tr><td colspan="3">Increase patrols and visitor contacts in campgrounds, boundary areas and Parkways and other high use areas.</td></tr>
</table>

Staffing Class Step-Up Plan					
Burning Index Fuel Model "E"	0 - 6	7 - 13	14 - 26	27 - 34	35 +
Staffing Class	**SC 1**	**SC2**	**SC3**	**SC4**	**SC5**
Fire Danger	**Low**	**Moderate**	**High**	**Very High**	**Extreme**
Miscellaneous Requirements	Daily Weather entered into WIMS Verify / Relay NFDRS indices Situation Reporting	Daily Weather entered into WIMS Verify / Relay NFDRS indices Situation Reporting	Daily Weather entered into WIMS Verify / Relay NFDRS indices Situation Reporting	Daily Weather entered into WIMS Verify / Relay NFDRS indices Situation Reporting	Daily Weather entered into WIMS Verify / Relay NFDRS indices Situation Reporting

4.1.1.5 Fire Management Program Structure

The target organizational structure for Great Smoky Mountains National Park Fire Management is illustrated in Figure 3. This "desired future condition" represents the organization required to fully implement the fire management goals and objectives stated within this plan.

Figure 7. GRSM Fire Management Organization Chart



Note: Highlighted positions have been identified as critical to safely and effectively implementing a moderate complexity fire management program as outlined in this FMP. Currently, these positions have not been approved or funded. All designated IFPM positions are required to meet the IFPM Training and Qualifications Standards for a moderate complexity program.

4.1.1.5.1 Fire Management Organization Roles and Responsibilities

Effective comprehensive fire management organizations require an interdisciplinary and interdivisional approach to the management of both planned and unplanned ignitions. The following individuals play key roles in fire management within the park:

A. Superintendent

- Take necessary and prudent actions to ensure firefighter and public safety.
- Ensure sufficient and qualified fire and non-fire personnel are available to support fire operations at a level commensurate with the local and national fire situations.
- Ensure Fire Management Officers (FMOs) are fully qualified as identified in the *Interagency Fire Program Management Qualification Standards.*
- Provide a written Delegation of Authority to individual(s) responsible for wildland fire management activities to ensure an adequate level of operational authority. Written delegations may be provided to the Chief of Visitor and Resource Protection, Chief of Resource Management and Science, FMO, or to individuals from neighboring fire management organizations, provided a written agreement or memorandum of understanding is in-place.
- Ensure applicable park resource management objectives are included in Fire Management Plan (FMP). Ensure FMP is annually reviewed and valid.
- Review and approve wildland fire preparedness funding based on and accurate and defensible readiness analysis. Review and approve fuels management funding requests.
- Develop protection and fire use standards and constraints that are in compliance with agency fire policies.
- Ensure use of fire funds is in compliance with Department and Agency policies.
- Ensure management teams meet once a year to review fire and aviation policies, roles, responsibilities, and delegations of authority. Specifically address oversight and management controls, critical safety issues, and high-risk situations such as team transfers of command, periods of multiple fire activity, and Red Flag Warnings.
- Review safety policies, procedures, and concerns with field fire and fire aviation personnel. Discussions should include issues that could compromise safety and effectiveness during the upcoming season.
- Ensure fire and fire aviation preparedness reviews are conducted each year.
- Ensure timely follow-up actions to program reviews, fire preparedness reviews, fire and fire aviation safety reviews, fire critiques, and post-season reviews.
- Ensure an approved burn plan is followed for each prescribed fire project, including technical review and Go/NoGo checklists are completed, follow-up monitoring and documentation to ensure management objectives are met.
- Meet annually with major cooperators and review interagency agreements to ensure their continued effectiveness and efficiency. (may be delegated).
- Ensure post fire reviews are conducted on all fires that escape initial attack or are managed as long term incidents. Participate in all reviews that require management by any type of Incident Management Team.
- Provide management oversight by personally visiting wildland and prescribed fires each year.
- Provide incident management objectives, written delegations of authority, and Agency Administrator briefings to Incident Management Teams.
- Monitor wildfire potential and provide oversight during periods of critical fire activity/situations.
- Convene and participate in annual pre- and post-season fire meetings.

- Attend *Fire Management Leadership Course.*
- Ensure appropriate investigations are conducted for incidents, entrapments, and serious accidents.
- For all unplanned human-caused fires where liability can be determined, ensure actions are initiated to recover cost of suppression activities, land rehabilitation, and damages to the resource and improvements.
- Ensure Wildfire Decision Support System documentation is completed for all wildfires by reviewing and approving documents.
- Ensure compliance with National and Regional Office policy and direction for prescribed fire activities and ensure that periodic reviews and inspections of the prescribed fire program are completed.
- Review Prescribed Fire Plans and recommend or approve the plans depending upon the delegated authority. Ensure that the Prescribed Fire Plan has been reviewed and recommended by a qualified technical reviewer who was not involved in the plan preparation.

B. Chief, Resource and Visitor Protection

- Serves as a member of the Fire Management Committee.
- Coordinates and oversees the initial response to wildfires.
- 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.
- Prepares and revises cooperative fire agreements with adjacent federal, state and local agencies and municipalities.
- Coordinates public safety efforts (evacuations, traffic control, etc.) on behalf of the incident commander during wildland fire 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 preparedness.
- 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.

C. Chief, Resource Management and Science

- Serves as chair of the Fire Management Committee; presents committee recommendations to the Superintendent for review and approval.
- Coordinates and oversees all aspects of the prescribed fire program.
- Directs the staff functions of fire management through the Fire Management Officer (FMO).
- 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.
- Evaluate the need for resource advisors for all fires, and assign as appropriate.

- Responsible for development of rehabilitation programs resulting from wildfires.

D. Fire Management Committee

The purpose of the Fire Management Committee is to provide consistent and coordinated management of wildfires and prescribed fires. The Committee will consist of the Chief of Resource Management and Science, who shall chair the committee; the Chief of Resource and Visitor Protection; and the FMO. The committee may request technical expertise from other individuals at any time.

Specifically, the role of the committee is to a) review all decision support documentation for ongoing wildfires for adherence to fire policy and goals stated in land and resource management plans; b) recommend WFDSS for superintendents approval and daily validation; c) meet annually to review the parks prescribed fire program including prior year accomplishments and current year proposed projects; d) participate in annual reviews of the Fire Management Program.

E. Fire Management Officer

The Fire Management Officer is responsible and accountable for providing leadership for the fire program. The FMO determines program requirements to implement land use decisions through the fire management plan to meet land management objectives. The FMO negotiates interagency agreements and represents the Park Superintendent on local interagency fire and fire aviation groups. The FMO is required to meet the Unit Fire Program Manager standards of the Interagency Fire Program Management Qualifications Standards (IFPM) for a moderate complexity program.

- Maintain safety first as the foundation for all aspects of fire and fire aviation management.
- Ensure completion of a Job Hazard Analysis (JHA) for fire and fire aviation activities so mitigation measures are taken to reduce risk.
- Ensure work / rest and length of assignment guidelines are adhered to.
- Ensure that only trained and qualified personnel are assigned to fire and fire aviation duties.
- Develop, implement, evaluate and document fire and fire aviation training program to meet current and anticipated needs.
- Establish an effective process to gather, evaluate, and communicate information to managers, supervisors, and employees. Ensure clear and concise communications are maintained at all levels.
- Develop and maintain open lines of communication with public and cooperators.
- Ensure that the fire management staff understand their role, responsibilities, authority, and accountability.
- Organize, train, equip and direct a qualified work force. Establish a “red card” certification / qualification process at the park level.
- Ensure fire and fire aviation policies are understood, followed, and coordinated with other agencies as appropriate.
- Monitor to recognize when complexity levels exceed program capabilities. Increase managerial and operational resources to meet the need.

- Initiate, conduct, and participate in fire management related reviews and investigations.
- Provide for and personally participate in periodic site visits to individual incidents and projects.
- Utilize the incident complexity analysis to ensure the proper level of management is assigned to all incidents.
- Review and evaluate performance of the fire management organization and take appropriate actions.
- Ensure incoming personnel and crews are briefed prior to fire and fire aviation assignments.
- Ensure a WFDSS is initiated, completed and approved for all wildfires according to policy.
- Monitor fire season severity predictions, fire behavior, and fire activity levels. Take appropriate actions to ensure safe, efficient, and effective operations.
- Provide fire personnel with adequate guidance and decision making authority to ensure timely decisions.
- Ensure a written / approved burn plan exists for each prescribed fire project.
- Ensure effective transfer of command of incident management occurs and oversight is in place.
- Develop and maintain agreements, annual operating plans, and contracts on an interagency basis to increase effectiveness and efficiencies.
- Provide the expertise and skills to fully integrate fire and fire aviation management into interdisciplinary planning efforts.
- Work with cooperators to identify processes and procedures for providing fire safe communities.
- Develop, maintain, and annually evaluate the Fire Management Plan to ensure accuracy and validity.
- Ensure budget requests and allocations reflect analyzed anticipated workload.
- Develop and maintain current operational plans, e.g. dispatch, preparedness and prevention.
- Ensure that reports and records are properly completed and maintained.
- Ensure fiscal responsibility and accountability in planning and expenditures.
- Assess, identify, and implement program actions that effectively reduce unwanted wildland fire ignitions and mitigate risks to life, property, and resources. Utilize safe, effective, and efficient management.
- Effectively communicate the “natural role” of wildland fire to internal and external audiences.
- Complete trespass actions when unplanned human-caused fires occur.
- Ensure compliance with National and Regional policy and direction for prescribed fire activities and ensure that periodic reviews and inspections of prescribed fire program are completed.

F. Fire Duty Officer (FDO)

Fire Duty Officer coverage will be implemented during any period of predicted incident activities (SC 4 or SC5). FDOs responsibilities may be performed by any individual with a signed Delegation of Authority from the local agency administrator. The required duties for all FDOs are:

- Evaluates incident complexity, ensuring appropriate type of IC is assigned.
- Monitor unit incident activities for compliance with NPS safety policies.

- Coordinate and set priorities for unit suppression actions and resource allocation.
- Notifies and briefs the Fire Management Committee (FMC) on new fire starts or progress of on going incidents.
- In absence of the FMC, briefs superintendent on fire situation.
- Assures compliance with FMP and fire policy and provides information to Incident Commanders.
- Keep agency administrators, suppression resources, communications and Information Officers informed of the current and expected situation.
- Plan for and implement actions required for future needs.
- Ensures daily weather duties have been accomplished and NFDRS Indices have been disseminated to field personnel.
- Evaluates conditions and implements staffing step-up plan in absence of FMO.
- Document all decisions and actions by initiating and completing a WFDSS as required.

FDOs will provide operational oversight of these requirements as well as any specific duties assigned by the fire management officer through the fire preparedness plan or the FMP. FDOs will not fill any ICS incident command functions connected to any incident. In the event that the FDO is required to accept an incident assignment, the FMO will ensure that another authorized FDO is in place prior to the departure of the outgoing FDO.

G. District Rangers

- Receive fire calls in their districts, assess resource and fire situation.
- Assign a qualified initial action Incident Commander (ICT5 minimum), and additional required resources to respond to fire report.
- Request additional Park resources when needed. Request out-of-Park resources, including aircraft, through the FMO.
- Notify Chief Ranger in the event of a wildfire on their district or if the fire exceeds the capabilities of their personnel.
- Ensure that initial attack caches are maintained in compliance with established standards.
- Ensure that fire reports and associated documents 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 prescribed fire operations.
- Provide for public safety and implement evacuations, if necessary.
- Ensure that all potential Incident Commanders are informed of policy and procedures to follow in regards to response to wildland fire.
- Ensure that all ignitions are investigated.
- Post "Area Closed...Emergency" signs when required by Step-Up Plan.
- Administer physical fitness tests to firefighters within their districts.

H. Communications Center

- Receives smoke reports and relays information to FMO or FDO and appropriate District Ranger.
- Follows the mobilization guidelines within the Preparedness Plan.
- Maintains a current roster of fire-qualified resources.

- Maintains Fire Duty Officer rotation list during periods of anticipated high fire danger.

I. Fire Ecologist

The fire ecologist coordinates with Fire Management and other park staff on all wildland fire planning, compliance, operations, evaluation, and ecological monitoring activities. The fire ecologist provides oversight of the fire effects monitoring program including continued implementation of the monitoring program and data analysis and interpretation expertise for the monitoring program. Duties also include:

- Assisting fire staff with compliance issues such as updating the park Fire Management Plan and Environmental Assessment.
- In coordination with fire staff, develops sound ecological objectives for fire management activities based on analysis of existing fire ecology data, fire effects data, and fire management information.
- Liaison for the Fire Management program to the research community, identifying research needs and integrating fire management activities into overall ecosystem restoration.
- Supervises the Lead Fire Effects monitor.

J. Fire Program Management Assistant (FPMA)

This position is the administrative officer of the Fire Management organization. Responsibilities of the FPMA include:

- Budget tracking and management, payroll and timekeeping.
- Administrative files and recordkeeping.
- Processing personnel actions.
- Managing travel.
- Fire support including logistics and dispatching. This includes assuring implementation of support portions of the Step-Up Plan.
- During incidents, the FPMA completes daily situation reports, transmits ICS 209's, and documents, fills and tracks all resource orders.
- Incumbent may function in an expanded dispatch capacity as needed.

K. Wildland Fire Module Clerk (WFMC)

This position is an administrative assistant for the Fire Management organization with the primary role of supporting the wildland fire module. Responsibilities of the FUMC include:

- Budget tracking and management.
- Payroll and timekeeping.
- Administrative files and recordkeeping; processing personnel actions; managing travel.
- Fire support including logistics and dispatching.
- During incidents, the WFMC may complete daily situation reports, transmits ICS 209's, and documents, fills and tracks all resource orders.
- Incumbent may function in an expanded dispatch capacity as needed.

L. Wildland Fire Module (WFM)

The Wildland Fire Module provides skilled and mobile personnel for wildland fire or prescribed fire management. The module is self-contained and normally consists of 7 fire fighters. The module is a national resource assigned to support wildland fire activities within the Southeast Region. Based in the Great Smoky Mountains National Park, the module is often available locally when not committed elsewhere. The module is composed of the following personnel: Module Leader, Module Assistant, two Lead Crewmembers, and three crewmembers. The module lead is a secondary fire position, all other personnel are primary fire. These positions have been removed from IFPM requirements because the required minimum qualifications exceed those identified under IFPM, refer to the Wildland Fire Module Position Management Guide for minimum qualification requirements tied to these positions.

M. Fire Effects Team (FET)

The Fire Effects Team supports prescribed fire activities at a cluster of parks throughout the Southeast Region. The team monitors vegetative change associated with fire over time as well as fuel and weather conditions during prescribed burns. Staff members also help implement burns and may take part in fire suppression efforts as qualified. The team is composed of a team leader, an assistant, and two fire effects monitors. All positions are collateral duty fire positions and are not covered under IFPM.

N. Engine Crew

The Engine Crew is composed of 3 wildland firefighters assigned to a type 6 fire engine. The crew is composed of an engine module foreman (ENGB, ICT4) and two engine operators. All three positions are primary fire positions and subject to IFPM requirements.

O. Chief of Facilities Management

- Actively promotes participation by employees in fire management operations as qualified, either operationally or logistically.
- Ensure that all interested employees and those with assigned suppression responsibilities are available for fitness testing, annual firefighter refreshers 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.

P. Chief of Resource Education

- Actively promotes participation by employees in fire management operations as qualified, either operationally or logistically.
- Ensure that all interested employees and those with assigned suppression responsibilities are available for fitness testing, annual firefighter refreshers and training to support the maximum potential firefighter roster.
- Adjust schedules as needed to ensure that firefighters are readily available for in-Park assignments.
- Promotes the effective communication of the “natural role of fire” to internal and external audiences, especially during ongoing fire incidents that may be visible to the public.

Q. Management Assistant and Public Affairs

- Maintains communications with the Incident Commander or members of the Incident Management Team.
- Writes and disseminates daily press releases on incidents.
- Gives interviews to media.
- Escorts media employees around incidents in a safe manner.
- Works closely with Fire Management Officer or Burn Boss to disseminate pre-burn press releases.

R. Resource Management and Science Staff

- Provides the IC with known potential impacts to cultural and natural resources, especially rare species and habitats, as a result of the fire or suppression tactics.
- Provides Interdisciplinary Team Members to support fire management activities as required.

4.1.1.5.2. Future Staff Positions Required to Fully Implement the FMP

This fire management plan has outlined a moderate complexity fire management program implementing all aspects of wildland fire. Additional key positions have been identified as necessary for successfully implementing this program. These positions include:

A. AFMO Operations

This position reports directly to the FMO and is responsible for overseeing day to day fire management activities including response to wildland fire, and implementation of prescribed fire and mechanical fuels treatments. This position supervises the fire cache manager, wildland fire engine crew, fuels squad, and the wildland fire module. This position functions as the FDO during staffing class 4 or 5 as needed. This individual would function as either ICT3 or Operations Section Chief during wildland fire or all risk incidents as appropriate.

B. Fire Cache Manager

Maintains fire cache system to outfit primary and collateral duty fire staff and maintain adequate materials to support wildland and prescribed fire operations. This position would serve as logistics unit leader during fire or all risk incidents.

C. Fuels Technician

Reports directly to AFMO Operations, supervises seasonal fire fighters tasked with fuels management projects within the park. This squad would also be tasked with normal fire response activities during periods of high fire danger.

D. AFMO Plans

This position reports directly to the FMO and is responsible for fire planning efforts including but not limited to: Fire Program Analysis, Programmatic and Project level planning efforts, Interdisciplinary Team Leader for fire management efforts. Responsible for overseeing collection and dissemination of daily fire weather and NFDRS indices to fireline personnel. Functions as FDO during staffing class 4 or 5 as needed. Serves as Planning Section Chief as required during fire or all risk incidents.

E. Fire GIST

Supports fire management with all aspects of fire GIS functions including mapping of fire perimeters, maintaining fire GIS database. Maintains fire weather RAWs stations,

documents daily weather observations, retrieves and disseminates NFDRS indices. Functions as situation unit leader during fire incidents within the park.

4.1.1.6 Required Qualifications to Implement Plan

The following table reflects the fire qualifications required to safely and effectively implement a comprehensive, moderate complexity wildland fire program within Great Smoky Mountains National Park. The goal for the qualification requirements is to be able to field an in park Type 3 incident management team for extended attack wildfires and other all risk incidents / events as required. Under the strategic fire response framework, it is highly desirable to include a SOPL and LTAN in the management of these events. These qualifications are not tied to any specific program position unless specifically required for the performance of that position by policy or guidance.

Table 6. Required Wildland Fire Qualifications

ICS Functional Group	Qualification	Number Required	Fully Qualified Individuals	Current Trainees	Additional Number Needed
Command	ICT3	**2**	**0**	**0**	**2**
	ICT4	**6**	**8**	**0**	**0**
	ICT5	**12**	**5**	**3**	**7**
	SOFR	**2**	**0**	**0**	**2**
	RXB1	**1**	**0**	**0**	**1**
	RXB2	**3**	**5**	**0**	**0**
Operations	DIVS	**2**	**0**	**0**	**2**
	TFLD	**4**	**1**	**1**	**3**
	FIRB	**6**	**7**	**1**	**0**
	ENGB	**4**	**5**	**2**	**0**
	CRWB	**4**	**4**	**2**	**0**
	FFT1	**10**	**7**	**2**	**3**
	FFT2	**40**	**20**	**20**	**20**
Air Ops.	HMGB	**2**	**0**	**2**	**2**
	HECM	**6**	**7**	**0**	**0**
	PLDO	**3**	**3**	**0**	**0**
Planning	SOPL	**2**	**1**	**2**	**1**
	FEMO	**6**	**9**	**0**	**0**
	FOBS	**2**	**1**	**0**	**1**
	FBAN	**2**	**0**	**0**	**2**
	LTAN	**2**	**0**	**0**	**2**
	SITL	**1**	**0**	**0**	**1**
	GISS	**1**	**0**	**2**	**1**
Finance	PTRC	**2**	**2**	**1**	**0**
	TIME	**1**	**1**	**0**	**0**
	EQTR	**1**	**1**	**1**	**0**
	PROC	**1**	**0**	**0**	**1**
Logistics	SPUL	**1**	**0**	**0**	**1**

	GSUL	**1**	**0**	**0**	**1**
	FACL	**1**	**0**	**0**	**1**
	COML	**1**	**0**	**0**	**1**

Note that the above table includes Wildland Fire Module and Fire Effects Team personnel who are regional resources and may not be immediately available locally.

4.1.2 Initial Action

The Chief of Resource and Visitor Protection is responsible for providing the initial response to wildfires in Great Smoky Mountains National Park and adjacent mutual response zones where park resources may be threatened. District Rangers will ensure a qualified incident commander (ICT5 or higher) is assigned to each incident. If a qualified Initial Attack Incident Commander Type 5 (ICT5) is not available within the district, one will be requested through Park Dispatch. The Fire Duty Officer shall ensure a complexity analysis has been performed and that the appropriate type (ICT5 / ICT4 / etc.) of incident commander is assigned.

The incident commander (IC) is responsible for performing a strategic fire size-up (refer to the Wildfire Preparedness Plan), including fire cause and recommended strategy, relaying that information to the Fire Management Officer or designated Fire Duty Officer who will initiate the Wildland Fire Decision Support documentation process and notify the Fire Management Committee.

Response to a wildland fire is based on ecological, cultural, social and legal consequences of the fire. The circumstances under which a fire occurs, the likely consequences on firefighter and public safety, natural and cultural resources, and values to be protected, dictate the response to the fire.

National fire policy allows multiple objectives to be considered on each fire. Under this policy, aggressive suppression actions may take place on one portion of the fire perimeter to protect values at risk while monitoring active fire on another portion of the perimeter to achieve resource benefit. The desired strategic response to the fire will be documented in a timely manner and relayed to the IC on scene so that the appropriate tactics can be implemented.

The IC will brief all incoming resources prior to engaging those resources. The briefing shall include at a minimum: the fire environment situation; the mission and execution; communications; logistics and support; and risk management. The *Initial Response Pocket Guide* (IRPG, NFES 1077), contains a briefing checklist which should be used to ensure all key topics are discussed. The on-scene IC shall remain in command of the incident through all phases of the incident from initial size – up through the de-mobilization process unless relieved by a more qualified incident commander. Any change of command will be documented and relayed to all assigned forces and to the park dispatch and fire management offices. The IC is responsible for ensuring the completion of all required fire documentation and mapping.

4.1.2.1 Information Used to Set Initial Action Priorities

Fires occurring in the Interface FMU will normally receive the highest priority. In addition, fires occurring within 1/2 mile of the Park boundary that have the potential to exit the Park will also receive high priority. Elsewhere, fires will be prioritized based on potential threats to Park resources and visitor safety.

4.1.2.2 Criteria for Determining Fire Response

The following criteria will be utilized in determining the strategic fire response:

a. Public and firefighter safety
b. Protection of cultural, historic, and natural resources
c. Protection of improvements and private property
d. Minimum Impact Suppression Tactics
e. Available suppression resources and response times
f. Long and short term fire danger
g. Potential benefits to the ecosystem (*cannot be a primary consideration in FMU1 or on human caused fires*)

4.1.2.3 Confinement as an Initial Action Strategy

A confinement strategy may be selected for initial action as long as it is not being used solely to meet resource management objectives. Resource benefits may be a side benefit but the strategy must be based upon the criteria listed above. Confinement can also be an appropriate strategic selection when the fire is expected to exceed initial action capability or planned management capability.

4.1.2.4 Typical Fire Response Times

Response times vary depending on the fire's location and accessibility. Fires within the interface zone are typically within 45 to 60 minutes from most responding locations. Air tankers from the Chattanooga Tanker Base can respond in approximately 30 minutes when the base is staffed. Currently, the tanker base is only operational during periods of anticipated high fire activity as determined by the National Interagency Coordination Center.

4.1.2.5 Restrictions and special concerns by management area

Areas of special concern have been identified elsewhere in this plan through inclusion in the Interface FMU, FMU1. Appendix E, Values at Risk by Watershed, lists values that need to be protected by watershed. Since fires are suppressed by watersheds, this sorting will be helpful under emergency conditions.

4.1.2.5.1 Minimum Impact Suppression Tactics

Minimum impact suppression tactics are required policy for all fire management activities on National Park Service lands. Fire management activities within the Park will be carried out in a manner that minimizes impacts to the Park's natural and cultural resources. Interdisciplinary teams will meet to address potential impacts to park resources resulting from either wildfire or suppression activities. 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. General MIST guidelines are found in the Incident Response Pocket Guide (IRPG). Park Specific MIST guidelines can be found in the Wildfire Preparedness Plan.

4.1.2.6 Tribal relationships/local govt. issues

The Park cooperates with the Eastern Band of the Cherokee Indians when conducting annual fire fighter refresher training. In addition, it is not uncommon to assist one another during suppression and or prescribed fire operations. And, every few years, a fire burning in both jurisdictions is managed under a unified command strategy.

4.1.3 Incident Management

Extended attack occurs when objectives have not been met in the case of initial fire response, and/or where a fire managed for multiple objectives requires resources outside the immediate pool of available to sustain long term management objectives. Extended attack action requires a structured decision process (WFDSS) to guide the ongoing effectiveness and re-evaluation of suppression strategies. If the fire is being managed by park staff, the incident commander with assistance from the Fire Management Officer (FMO) and or the Fire Duty Officer (FDO) will perform and document this periodic assessment. If the fire has been delegated to an off park management team, the Incident Command and General Staff will complete the assessment and documentation as required with assistance, review and concurrence by park staff.

4.1.3.1 Determining Extended Attack Needs If a fire threatens to exceed the initial attack and extended attack capabilities of the Park and local cooperating agencies, an Incident Management Team will be requested through the Tennessee Interagency Coordination Center by the FMO or FDO utilizing the Resource Ordering and Status System. The Tennessee Interagency Coordination Center can typically fill T3 team positions within 24 hours.

4.1.3.2 Implementation Plan Requirements Preparation of the WFDSS for extended attack and large fire suppression shall be completed to document suppression responses to wildfires that have exceeded initial attack response or exceeded management capability. The FMO or FDO shall be responsible for initiating the WFDSS process. The parks Fire Management Committee shall review WFDSS documents for recommendation to the agency administrator for approval.

4.1.3.3 Complexity Decision Process for Incident Management Transition 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 the analysis indicates the fire complexity is or is expected to exceed capabilities of the current management, the FMO or FDO shall initiate a resource order for the appropriate resources required to manage the incident. The FMO or FDO shall brief the Fire Management Committee of the change in complexity and actions taken to order appropriate resources. Incoming fire managers shall receive a limited Delegation of Authority prepared by the FMO and signed by the Superintendent during the transition process.

4.1.3.4 Delegation of Authority Letters for Incident Commander Should fire activity and complexity warrant the ordering of an Incident Management Team as discussed above, a Delegation of Authority will be signed by the Superintendent and incoming Incident Commander giving the team authority to manage the incident. A sample of this delegation can be found in Appendix B.

4.1.3.5 WFDSS Re-evaluation Situations that could require selection of a new strategy through the WFDSS analysis include, but are not limited to:

- Exceeding periodic assessment criteria, i.e. trigger points, air quality;
- Unacceptable risk to firefighter safety, natural or cultural resources, improvements;
- Fire leaving or threatening to leave the Maximum Manageable Area boundary or Park boundary;
- Fire exceeds prescribed fire plan;
- Increasing demand on local and/or national fire management situation;
- Agency administrator prerogative.

4.1.3.6 Records and Reporting

The Superintendent is ultimately responsible for fire reporting and fiscal accounting. Individual reporting assignments may be made by the Superintendent. The table below is a checklist of possible wildland fire documents and the individual usually responsible for completing them.

Time and filing deadlines are associated with each of these reports and will control scheduling and response times.

Table 7. Checklist of Wildland Fire Documentation

Checklist of Wildland Fire Documents and Reports		
Document	**Revision or Preparation Frequency**	**Person Responsible for Completion (Filer, tracker)**
DI-1202	Each incident, w/in 5 days of declared out	Incident Commander
ICS -201	Each incident	Incident Commander
ICS-214, w/narrative	Each incident, each operational period	IC and/or Unit Leaders
Resource Orders	Each incident	IC/Fire Duty Officer (FDO)/Fire Dispatcher
Fire Map	Each incident	IC/Fire Monitor (FEMO)
Archived Photographs	Each incident	All photos taken w/government equipment
WFDSS (Including periodic review)	As needed	IC and/or FMO/FDO
Spot Weather Forecast	Each operational period as needed	IC or FMO/FDO
Fire Monitoring Reports (includes smoke emission and transport observations)	Required for WFU and RX	FEMO
Incident Status Summary ICS-209	Each operational period as needed	IC and FMO/FDO entered by Fire Dispatcher
Fire Behavior Predictions	Each operational period as needed	IC, FMO/FDO
Incident Complexity Analysis	Each operational period as needed	IC, FMO/FDO
Incident Action Plan (IAP)	Each operational period as needed	IC or Plans Section Chief if assigned
After Action Review (AAR)	Each incident	IC
Cost Tracking	Each incident/daily	IC/FMO/FPMA

Checklist of Wildland Fire Documents and Reports		
Document	**Revision or Preparation Frequency**	**Person Responsible for Completion (Filer, tracker)**
	as needed	

The Fire Management Officer shall ensure all appropriate documents are completed and filed as required.

4.2 Burned Area Emergency Response Program

Many fires occur naturally, and some ecosystems are adapted to fires, relying on them to maintain their health. However, wildland fires can sometimes leave behind a burned landscape that threatens human safety, property, and ecosystems.

The Burned Area Emergency Response (BAER) program is the NPS post-fire response program that implements Emergency Stabilization (ES) treatments to minimize threats to life or property resulting from the effects of a wildfire or to stabilize and prevent unacceptable degradation to natural and cultural resources resulting from the effects of a fire.

Damages resulting from wildfires are addressed through four activities:

- **Wildfire Suppression Activity Damage Repair** Planned actions taken to repair the damages to resources, lands, and facilities resulting from wildfire suppression actions and documented in the Incident Action Plan. These actions are usually implemented immediately after containment of the wildfire by the IMT before demobilization.
- **Emergency Stabilization** Planned actions to stabilize and prevent unacceptable degradation to natural and cultural resources, to minimize threats to life or property resulting from the effects of a wildfire, or to repair/replace/construct physical improvements necessary to prevent degradation of land or resources. Emergency stabilization actions must be taken within one year following containment of a wildfire and documented in a Burned Area Emergency Response Plan.
- **Rehabilitation** Efforts taken within three years of containment of a wildfire to repair or improve wildfire damaged lands unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by wildfire. These efforts are documented in a separate Burned Area Rehabilitation Plan.
- **Restoration** Continuing the rehabilitation beyond the initial three years or the repair or replacement of major facilities damaged by the wildfire.

Table 8. Burned Area Emergency Response Components

	Suppression Rehabilitation	**Emergency Stabilization**	**Rehabilitation**	**Restoration**
Objective:	Repair Suppression Damages	Protect Life and Property	Repair Damages	Long Term Ecosystem Restoration
Damage Due To:	Suppression Activities	Post-Fire Events	Fire	Fire
Urgency:	Before Incident Close-out	1 – 12 Months	1 – 3 Years	3 + Years
Responsibility:	Incident Commander	Agency Administrator	Agency Administrator	Agency Administrator
Funding Type:	Suppression	Emergency Stabilization	Rehabilitation	Regular Program

4.2.1 Emergency Stabilization

Emergency stabilization is an extension of emergency actions. These actions may also include repair, replacement, or construction of physical improvements in order to prevent unacceptable degradation to natural and cultural resources. The objectives of emergency stabilization are to first determine the need for emergency treatments, and then to prescribe and implement the treatments. Life and property are the first priority. Cultural and natural resources treated through ES should be unique and immediately threatened. The Park Fire Coordinator and the Natural Resource Specialist will jointly assess and if necessary formulate a BAER emergency stabilization plan. The BAER plan will be submitted to the Regional BAER Coordinator through the Fire Management Officer for approval within 7 days from the date the fire is declared contained. BAER project requests totaling $500,000 or less can be approved by the Regional Director. Submissions over this amount are reviewed at the regional level and forwarded to the NPS Fire Management Program Center for approval.

Burned areas will not be seeded; residual seed and sprouting from surviving rootstalks will provide natural re-vegetation. 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 in locations susceptible to erosion.

Rehabilitation of firelines and other efforts to control erosion will start as soon as possible, 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.

4.2.2 Burned Area Rehabilitation

Post-fire Burned Area Rehabilitation (BAR) projects is the NPS post-fire response program that implements the types of long-term actions to repair or improve lands damaged directly by a wildland fire. Burned area rehabilitation consists of non-emergency efforts undertaken to repair or improve wildfire-damaged lands unlikely to recover naturally, or to repair or replace minor facilities damaged by wildfire. The objectives of burned area rehabilitation are to (1) evaluate actual and potential long-term post-wildfire impacts to critical cultural and natural resources and to identify those areas unlikely to recover naturally from severe wildfire damage; (2) to develop and implement cost-effective plans to emulate historical or pre-wildfire ecosystem structure, function, diversity, and dynamics consistent with approved land management plans, or if that is infeasible, to restore or establish a healthy, stable ecosystem in which native species are well represented; and (3) to repair or replace minor facilities damaged by wildfire. The Park Fire Management Committee and Natural Resource Specialists will jointly assess and if necessary formulate a non-emergency Burned Area Rehabilitation plan. BAR project requests are approved as part of a competitive process within the Department of Interior and project selections are made at the beginning of each fiscal year or after an approved appropriations bill, whichever is later. The BAR plan will be submitted to the Regional BAER Coordinator through the Fire Management Officer. Projects are reviewed at the regional level and forwarded to the NPS Fire Management Program Center for processing. It should be submitted by the end of the first fiscal year in order to be funded in the next fiscal year. Projects are eligible for BAR funding up to three years of the containment date of the fire.

Fire managers should ensure that rehabilitation activities do not result in the spread of invasive plant propagules. Vehicles, equipment, and firefighters should be cleaned before entering the rehabilitation area. Any materials brought in to prevent erosion, such as organic mats or lumber should be free of unwanted seeds. Before spreading any cut materials from the fire line check to be sure you will not be introducing invasive plant material to the newly burned area.

For detailed direction concerning Burned Area Emergency Rehabilitation refer to the Interagency Burned Area Rehabilitation Guidebook, Oct. 2006; and the Burned Area Emergency Response Treatments Catalog, December 2006.

4.3 Management of Planned Fuels Treatments

The strategy of the Fuels Management Program is to supplement natural fires role as an ecosystem process. Prescribed fire is also used to reduce hazard fuel accumulations, reduce threats to wildland urban interface from wildfires, and maintain fire dependent ecosystems.

4.3.1 Planning and Documentation

The following schedule describes the annual prescribed fire planning process:

Table 9. Annual Prescribed Fire Planning Process

Task	Completed by	Responsibility
Out-Year Planning Meeting	Jan 30th	AFMO Planning (*or FMO if AFMO position not staffed*)
Out-Year Project Proposals Submitted to NFPORS	March 23rd	AFMO Planning (*or FMO if AFMO position not staffed*)
Out-Year Project Verification	April 23rd	Superintendent
Prescribed Fire Seasonal AAR	May 15th	AFMO Operations (*or FMO if AFMO position not staffed*)
Annual Fuels Treatment Planning Meeting • Review burn unit objectives • Determine burn unit overhead • Assess compliance needs • Evaluate implementation needs	July 15th	AFMO Planning (*or Fire Ecologist if AFMO not staffed*)
Bi-annual Prescribed Fire Operations Meeting • Assess preparation needs / progress • Verify organization / responsibilities • Set priorities / timelines	Sept 15th and Jan 15th	AFMO Operations (*or FMO if AFMO position not staffed*)
Annual Prescribed Fire briefing to IDT members (Fire Ecologist, Biologist,	October 15th	AFMO Planning

Archeologist, Forester, Resource Education, Resource and Visitor Protection, Chief RM&S)		(*or Fire Ecologist if AFMO not staffed*)
Submission of Plans to USFWS	November 30th	Fire Ecologist
Complete Draft Annual Burn Plans	October 15th	Fuels Technician
Review and Approve Burn Plans	As Required	Superintendent

- **March/April** – The AFMO Planning (FMO if position not staffed) submits prescribed burning project proposals and budgets for the next fiscal year via National Fire Plan Operations and Reporting System (NFPORS). Projects are designed on a landscape scale. Once projects are entered into NFPORS, a treatment verification form will be signed by the park superintendent or designee and forwarded to the regional FMO.

- **Fall** – The planning AFMO coordinates an annual meeting including fire management staff, burn bosses, and other interested park staff and cooperators to review the current year's fuels treatment program and to finalize target areas, objectives, and concerns for the coming year's fuels treatment program. After the annual meeting, the planning AFMO will group target areas into landscape projects to facilitate planning, prepare landscape burn plans, and coordinate planning and compliance with fire and park staff. The planning AFMO, FMO and Division Chiefs will review burn plans and make needed changes before presenting the plans to the superintendent for approval. The Fire Ecologist may need to coordinate additional review of the plans as needed with Resource Management staff and/or the US Fish and Wildlife Service.

- **Year-round** – Completion and implementation of Incident Action Plans according to overall planning. Burning can occur at anytime of year, but most burning will be targeted for the dormant or early growing season (October - May) to achieve the desired fire effects. It is anticipated that as fire effects progress, more emphasis may be placed on growing season burns to better mimic naturally occurring fires.

4.3.2 Long-term Prescribed Fire Strategy

Individual annual proposed projects support the Great Smoky Mountains National Park 5 Year Prescribed Fire Plan (see Appendix F). The 5 Year plan proposed a steady increase in the average annual acres treated to 4000 acres by 2014. This long-term management strategy will be assessed yearly and updated as required.

4.3.3 Personnel Requirements

Staffing for all fire management operations at Great Smoky Mountains National Park (GRSMNP) is integrated for greater efficiency. The scope of prescribed fire activities requires a considerable and highly qualified staff to fully implement all aspects of the fire management plan (refer to section 4.1.1.7).

Qualifications unique to prescribed fire which are necessary for a successful program include: Prescribed Burn Boss Type 1 (one required), Prescribed Burn Boss Type 2 (two required). Additionally, operational qualifications not specific to prescribed fire required for a successful program include: Firing Boss (six required), Fire Effect Monitors (six required), Helicopter Manager (one required), Helicopter Crewmember (six required), Plastic Sphere Dispenser Operator (three required). These qualifications are not tied to any one staff position.

4.3.4 Non-Fire Fuel Treatment Applications

As stated above, the primary tool to accomplish hazard fuels reduction will be the use of prescribed fire. In addition, various non-fire treatments utilizing mechanical and/or chemical application may be used in areas not suited for prescribed fire such as around Park improvements or other areas where prescribed fire is not feasible.

4.3.4.1 Preparedness Activities Chainsaw training will be accomplished to ensure all chainsaw operators are qualified for the work they will be doing.

4.3.4.2 Equipment Use Restrictions Equipment use for non-fire applications will adhere to the same guidelines found in the section on Minimum Impact Suppression Techniques. Resource specialists will work with Fire Management on project plans where tracked or wheeled power equipment will be used to ensure that resource damage does not occur. Minimum Tool Analysis will be completed and approved for each project as required prior to implementation.

4.3.4.3 Effects Monitoring Due to the low-impact nature of the mechanical treatments to be utilized at Great Smoky Mountains National Park, monitoring effects will be primarily visual assessment of the success of the project in reducing the fuel hazard. Before and after photographs and dead-and-downed fuels transects (Brown's lines) may be used to document the effects and measure success.

4.3.4.4 Critiques Critiques of the mechanical treatment projects will occur as part of the annual fire management review process.

4.3.4.5 Cost Accounting The FMO will maintain cost records for all mechanical treatment projects. In many cases, treatment costs will be cost shared by the use of in-house preparedness resources during lower staffing level days.

4.3.4.6 Documentation All mechanical treatment projects will be documented using requirements found in NPS Wildland Fire Management Reference Manual -18.

4.3.4.7 Annual Planned Project List Fuels reduction efforts may be implemented around all Park improvements and inholdings that have been identified as requiring treatment. Projects will require treatment plans and those funded through hazardous fuels or wildland urban interface funding sources must be requested through the NFPORS process. These treatments will be included during annual treatment planning meetings with IDT members.

4.4 Prevention, Mitigation and Education

The objectives of the park's fire prevention program are to proactively mitigate damages and losses from unwanted wildfires; reduce human caused ignitions; reduce suppression costs; mitigate the risks of wildfire to private property and natural and cultural resources; and protect the lives of firefighters and the public. This is accomplished by working with cooperating agencies and educating park employees, the public and our neighbors, not only in fire prevention, but also the natural role of fire in the Appalachian Mountains.

4.4.1 Prevention

The objectives of the park's fire prevention program are to proactively mitigate damages and losses from unwanted wildfires; reduce human caused ignitions; reduce suppression costs; mitigate the risks of wildfire to private property and natural and cultural resources; and protect the lives of firefighters and the public. This is accomplished by working with cooperating agencies and educating park employees, the public and our neighbors, not only in fire prevention, but also the natural role of fire in the Appalachian Mountains. As of this time, a formal fire prevention plan has not been developed for Great Smoky Mountains N.P.

4.4.2 Public Safety

Safety is the primary concern of the fire management program. All operational documents will address both public and employee safety. The potential effects of all projects on employees and public will be considered. Public Safety issues and concerns are described in detail in the Fire Management Plan Environmental Assessment. Key issues include:

A. Transportation Corridors

Fires have the potential to affect several transportation corridors. This includes the Highways 441, 321, 129, Interstate 40, the Foothills Parkway, and secondary surface roads in and adjacent to the park.

B. Urban interface and park infrastructure

Three Wildland Urban Interface Communities at Risk or of concern are adjacent to the park. These arethe communities of Gatlinburg (particularly “Ski Mountain” area), Wear Cove, Top of the World, Happy Valley, Bryson City, and Big Cove. These communities are at risk from wildlfires burning in natural fuels intermixed with homes. Other park infrastructure potentially at risk from wildfire is located in Cades Cove, Look Rock, Tremont, Elkmont, Smokemont and Oconaluftee.

C. Visitor Use

The primary high visitor use areas that are potentially impacted by fire include Cades Cove, and the Abrams Creek area. Great Smoky Mountains National Park also has an extensive backcountry area accessible by hikers. Fires in the wilderness pose potential risk to these park visitors.

D. Park Operations

Park Operations can be impacted by both wildfire and prescribed fire incidents. Impacts can include smoke, direct fire exposure and road or area closures.

E. Park Neighbors

Residents of numerous gateway and neighboring communities in both Tennessee and North Carolina can be impacted by ongoing fire operations, mainly due to smoke impacts. These impacts may be caused by both planned and unplanned fire events.

4.4.2.1 Mitigation

This section outline mitigation actions required to protect values at risk and to ensure the safety of park staff and visitors as well as the neighboring public.

Table 10. Mitigations for Public Safety Issues

Public Safety Issues	Mitigation
Transportation Corridors	• Smoke Screening Tools • Post Warning Signs/Notify visitors at park entrances • Implement appropriate level of traffic control or request assistance • Monitor smoke dispersal • Mop-up smoldering fuels
Urban Interface and Park Infrastructure	• Prescribed burns to reduce hazard fuel accumulation • Notify and update residents and employees of proposed and/or ongoing operations • Relocate at-risk residents or park staff • Respond to fires in the Mutual Response Zone • Pre-attack plans • Monitor urban expansion to identify new communities at risk • Suppress those fires or portions there of that threaten infrastructure
Visitor Use	• Post current fire information on websites as available • Time prescribed burns to minimize impacts to visitors • Provide and post fire information at backcountry permit stations, at visitor access points, and visitor centers • Close areas to the public during fire operations • Contact backcountry permit stations and ascertain if permits are issued for a fire area • Visually survey fires to ensure that no visitors are present • Suppress fires that threaten visitor use areas

Public Safety Issues	Mitigation
Park Operations	• Post current fire information on websites as available • Send email notifications to park staff regarding current fire information • Close areas to administrative use during fire operations and/or limit access • Time prescribed burns to minimize impacts to park operations • Temporarily relocate at-risk park staff
Park Neighbors	• Use Smoke Screening Tools • Post current fire information on websites as available • Inform park neighbors of wildland fires • Use information officer and/or park public affairs to disseminate information • Suppress those fires or parts there of that threaten to burn off of park property or that adversely impact public health and safety

4.4.3 Information and Education

Disseminating information about fire's natural role and effects is an important step in establishing public support for such programs. GRSM's wildland fire management information program will be factual, straightforward, and aimed at many different audiences. The following guidelines will be followed:

A. The Management Assistant (Public Information Officer) will be kept informed daily by the Fire Management Officer of management actions, and the status of fires in the Park.

B. Ecological concepts upon which the wildland fire management program is based will be incorporated into interpretive and curriculum-based education programs, information handouts, selected books written about the Park, Park web page, and wayside and visitor center exhibits.

C. Information handouts explaining the fire management program will be prepared and periodically updated. During periods when management fires are burning, these handouts will be distributed to visitors at Park information boxes and visitor centers, and by NPS field personnel during informal contacts out in the Park.

D. The fire management program will be incorporated into appropriate interpretive talks, walks, automatic slide and/or video-taped programs, curriculum-based educational programs, the Park newspaper, the Park safety brochure, the Park camping and hiking brochure, Park web page, and wayside and visitor center exhibits. Particular attention will be given to these activities when fires are conspicuous from visitor centers and/or local communities.

E. During ongoing fires, press releases will be written and distributed to local newspapers, radio, television stations and posted on the Park web site.

F. Articles will also be written about GRSM's fire management program and released for publication in statewide, regional, and national periodicals.

G. Public information outlets for neighboring land management agencies will be provided with fire management information, particularly when ongoing fires are burning in the Park.

H. To effectively answer visitor questions, NPS, Great Smoky Mountains Association, Tremont and concession employees in the Park will be made aware of the wildland fire management program and the status of ongoing fires. Park volunteers and interns working in Resource Education will also be made aware of the program.

I. The Great Smoky Mountains Natural History Association currently makes available relevant, factually accurate sales publications that address fire's role in natural areas to visitors at its sale outlets.

J. The wildland fire management program will be discussed in informal contacts with all divisions, Park concessionaires, Great Smoky Mountains Association and Tremont staff, special use permittees, Park neighbors, and Park visitors.

K. Signs notifying the public about ongoing wildfires and or prescribed fires, and unwanted wildland fires, area closures, dense smoke, or other special situations will be placed along roadways, and at visitor centers, boat launching ramps, trailheads, campsites, day use sites, cabin sites, and resorts.

5 Monitoring and Evaluation

5.1 Short and Long-Term Monitoring

All wildland fires and prescribed fires will be monitored for their effects on the eco-system. Information gathered during fire monitoring is needed to keep fires within predetermined criteria, know when to take suppression action, and protect human life and/or property. A fire monitoring team will observe the fire, assess its potential and provide a historical record. Monitoring will include documenting the fire environment (weather, fuels, topography), fire behavior (manner and rate of spread, flame length, etc.), and fire effects (percent of fuels consumed, changes in plant and animal community composition and structure, etc.). Photographs will be taken. Weather readings will be made periodically at the fire site. Forms for recording data will be supplied to monitors.

5.1.1 The Fire Monitoring Handbook

This handbook, developed by the National Park Service, outlines protocols for monitoring fire weather, behavior and effects, and describes in detail all aspects of a comprehensive, state-of-the-art monitoring program. These protocols have been adopted at Great Smoky Mountains National Park.

5.1.2 Fire Monitoring Plan

The Great Smoky Mountains National Park Fire Monitoring Plan is currently under development by the Fire Ecologist. It will define fire monitoring goals and objectives, minimum qualification standards for fire monitors, and monitoring levels and minimum acceptable standards for documenting fire weather, and behavior and effects. Monitoring protocols adhere to those described in the Fire Monitoring Handbook, the NPS's national standard. In brief, fire effects monitoring in the Park consists of sampling permanent vegetation plots, which includes measurements of canopy and pole-size trees, ground cover, dead and down fuels, and duff, and taking photographs. Plots are sampled pre-burn, immediately post-burn, and one, two, five, and ten years post-burn. Fire monitors are essential to the early detection and eradication of invasive species in burned areas. Data gathered on pre-burn invasive plant infestations can help prevent further spread during fire management activities as well as giving specific locations for future monitoring. Post-burn sampling is also critical as preventing invasive plants from becoming established is by far the most effective and least costly management approach. Annual fire effects monitoring information is provided to resource management staff to provide feedback on the success of fire use with respect to meeting Park vegetation management goals and to approaching the desired future condition of Park vegetation.

5.2 Fire Program Evaluation

All wildland fires and fire related incidents will be reviewed. Reviews are conducted for one or more of the following purposes:

- To examine the progress of an ongoing incident to confirm effective decisions or correct deficiencies.
- To identify new or approved procedures, techniques, or tactics.
- To compile consistent and complete information to improve or refine park, regional or national fire management programs.
- To examine anomalous fire related incidents in order to determine cause(s), contributing factors and where applicable, recommend corrective actions. If negligence is indicated, the circumstances will be reported and investigated in accordance with applicable regulations, policies, or guidelines.
- To determine the cost effectiveness of a fire operation.

Incident reviews will follow procedures outlined in RM-18, Chapter 13, as well as the Interagency Standards for Fire and Fire Aviation Operations.

Annual FMP reviews will follow standards and procedures outlined in RM-18, Chapter 4.

Table 11. Wildland Fire Reviews

Review	Responsible Party	Timeframe
Hotline Review	Fire Management Officer	During incident
IMT Closeout and Review	Park Superintendent	During transfer of command
Park Level Review	Park Superintendent or designee	After incident
Regional Level Review	Regional FMO	After incident
National Level Review	National FMO	After incident
Entrapment and Fire Shelter Deployment Review	Regional FMO	ASAP after incident or deployment
Fire Readiness Review	FMO	Annual
Prescribed Fire Plan Technical Review	Qualified Burn Boss	Each plan
After Action Review (AAR)	Incident Commander, Burn Boss, or Fire Use Manager	Immediately post event
Review of any fire requiring a WFSA	Park Superintendent or Regional Director	After incident

Review	Responsible Party	Timeframe
Escaped Prescribed Fire Review	FMO, Regional FMO, National Fire Director	After incident
Fire Management Plan Review	Park Superintendent, FMO	Comprehensive FMP update every 5 years and annual update of appendices

Table 12. Fire Management Plan and Environmental Assessment reviews and updates:

Item	Responsible Party	Recommended Revision
Annual Revision Documents	FMO	September - annually
Pre-attack Plan	FMO	September- annually
Step-Up Plan	FMO, AFMO if filled	September- annually
Long-term Fuel Treatment Plan	Fire Ecologist	October- annually
Fire Prevention Plan	FMO, AFMO if filled	January- annually
Cooperative Annual Operating Plan	FMO	February- annually
Initial Scoping FMP/EA Update	FMO/Planning and Compliance	October 2013
EA Update	FMO/Planning and Compliance	November 2013
FMP Update	FMO	June 2014
FMP Update Approved	Superintendent	December 2015

Glossary

also see the Glossary of Wildland Fire Terminology at:
http://www.nwcg.gov/pms/pubs/glossary/pms205.pdf

Appropriate Management Response – the response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to the protected. The evaluation must also include an analysis of the context of the specific fire within the overall local, geographic area, or national wildland fire situation. (*This term is being replaced with Response to Wildland Fire.)*

Burning Index (BI) - A numberical index related to the contribution of fire behavior to the effort of containing a fire. BI divided by 10 roughly equates to anticipated flame length at the head of a fire.

Daily revalidation – A process named the periodic fire assessment, which evaluates the continued capability of the local unit to manage the fire for resource benefits, and to determine if the fire is escalating in complexity and operational needs. This process is completed as frequently as specified by the local unit.

Decision criteria checklist (Initial Go/No-Go Decision) – A set of standard evaluation criteria to determine if the current wildland fire meets criteria to be managed for resource benefits. The completion of these criteria will lead to a decision to “Go/No-Go” with management of the fire for resource benefits.

Expected weather conditions - those weather conditions indicated as common, likely, or highly probable based on current and expected trends and their comparison to historical weather records. These are the most probable weather conditions for this location and time. These conditions are used in making fire behavior forecasts for different scenarios (one necessary scenario involves fire behavior prediction under "expected weather conditions").

Disturbance – any relatively discrete event, either natural or human induced, that causes a change in the existing condition of an ecological system.

Confine / Contain- the strategy employed in where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuel, and weather factors.

Ecological process – the actions or events that link organisms and their environment, such as predation, mutualism, successional development, nutrient cycling, carbon sequestration, primary productivity, and decay.

Ecosystem management – the careful and skillful use of ecological, economic, social, and managerial principles in managing ecosystems to produce, restore, or sustain ecosystem integrity and desired condition over the long term.

Ecosystem sustainability – the ability to sustain diversity, productivity, resilience to stress, health, renewability, and/or yields of desired values, and resource uses from an ecosystem while maintaining the integrity of the ecosystem over time.

Escaped fire – a fire which has exceeded or is expected to exceed initial attack capabilities or prescription.

Fire complexity analysis – A process for assessing wildland fire organizational needs and relative complexity in terms of ICS types (I, II, III etc.).

Fire Management Unit - any land management area definable by objectives, topographic features, access, values-to-be-protected, political boundaries, fuel types, or major fire regimes, etc., that sets it apart from management characteristics of an adjacent unit. FMUs are delineated in Fire Management Plans (FMP). These units may have dominant management objectives and pre-selected strategies assigned to accomplish these objectives.

Fire dependent or fire maintained ecosystems - an ecosystem can be called fire dependent or fire maintained if periodic perturbations by fire are essential to the functioning of the system.

Fire exclusion – the disruption of a characteristic pattern of fire intensity and occurrence (primarily through fire suppression).

Fire evaluation - the process of examining and appraising fire monitoring information.

Fire monitoring - the act of observing a fire to obtain information about its environment, behavior, and effects for the purpose of evaluating the fire and its prescription.

Fire prescription - a written statement defining the objectives to be attained, and the conditions of temperature, humidity, wind direction and speed, and fuel moisture, under which a fire will be allowed to burn. Generally expressed as an acceptable range of the various indices, and the limit of the geographic area to be covered.

Fire regime – the fire pattern across the landscape, characterized by occurrence interval and relative intensity. Fire regimes result from a unique combination of climate and vegetation. Fire regimes exist on a continuum from short-interval, low-intensity (stand maintenance) fires to long interval, high-intensity (stand replacement) fires.

Fire return interval – the number of years between two successive fires occurring in a designated area.

Fire use – the combination of wildland fire use and prescribed fire application to meet resource objectives.

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)

Hazard fuels – excessive live and/or dead wildland fuel accumulations (either natural or created) having the potential for the occurrence of uncharacteristically intense wildland fires.

Holding actions - planned actions required to achieve wildland and prescribed fire management objectives. These actions have specific implementation timeframes for fire use actions but can have less sensitive implementation demands for suppression actions. For wildland fires managed for resource benefits, an MMA may not be totally naturally defensible. Specific holding actions are developed to preclude fire from exceeding the MMA. For prescribed fires, these actions are developed to restrict the fire inside the planned burn unit. For suppression actions, holding actions may be implemented to prohibit the fire from crossing containment boundaries. These actions may be implemented as firelines are established to limit the spread of fire.

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.

Initial Action – The actions taken by the first resources to arrive at a wildfire. Initial Action may include the full spectrum of responses from monitoring to aggressive containment.

Initial Attack – The initial action focused on aggressive containment of the fire perimeter.

Management action points - also called "trigger points." Either geographic points on the ground or specific points in time where an escalation or alteration of management actions is warranted. These points are defined and the management actions to be taken are clearly described in an approved Wildland Fire Implementation Plan (WFIP) or Prescribed Fire Plan. Timely implementation of the actions when the fire reaches the action point is generally critical to successful accomplishment of the objectives.

Maximum Manageable Area (MMA) - MMA defines the firm limits of management capability to accommodate the social, political, and resource impacts of a wildland fire. Once established as part of an approved plan, the general impact area is fixed and not subject to change. MMAs can be developed as part of the FMP and described as a Fire management area or FMA. They can also be developed as part of the planning and implementation of management actions after a fire has ignited. If they are developed after the ignition, their definition will occur during the Wildland Fire Implementation Plan Stage III process. In the event a fire occurs in a pre-planned MMA or FMA and the local unit determines that this MMA is not the best-suited alternative for the present conditions, a new MMA can be developed as part of the Stage III process. Once this occurs, the Stage III MMA becomes the firm limits of the fire and is fixed.

Mitigation actions - Mitigation actions are considered to be those on-the-ground activities that will serve to increase the defensibility of the MMA; check, direct, or delay the spread of fire; and minimize threats to life, property, and resources. Mitigation actions may include mechanical and physical non-fire tasks, specific fire applications, and limited suppression actions. These actions will be used to construct firelines, reduce excessive fuel concentrations, reduce vertical fuel continuity, create fuel breaks or barriers around critical or sensitive sites or resources, create "blacklines" through controlled burnouts, and to limit fire spread and behavior.

Normal fire year – The normal fire year for suppressed wildland fires is the year with the third highest number of wildland fires in the past ten years of record. The normal wildland fire managed for resource benefits year is the year with the third highest number of acres burned by wildland fire managed for resource benefits in the past ten years of record.

Preparedness - Activities that lead to a safe, efficient and cost effective fire management program in support of land and resource management objectives through appropriate planning and coordination. This term replaces presuppression.

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.

Natural ignition – a wildland fire ignited by a natural event such as lighting or volcanoes.

Prescription – a set of measurable criteria that guides the selection of appropriate management strategies and actions. Prescriptions criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

Prescribed fire – any fire ignited by management actions to meet specific objectives. Prescribed fires are conducted in accordance with prescribed fire plans. Also known as planned ignitions.

Prescribed fire plan – a plan required for each prescribed fire. Plans are documents prepared by qualified personnel, approved by the agency administrator, and include criteria for the conditions under which the fire will be conducted (a prescription).

Strategic fire response (SFR) – the response to a wildland fire is based on an evaluation of risks to firefighter and public safety, the circumstances under which the fire occurs, including weather and fuel conditions, natural and cultural resource management objectives, protection priorities, and values to the protected. The evaluation must also include an analysis of the context of the specific fire within the overall local, geographic area, or national wildland fire situation. This evaluation process uses the WFDSS decision support system.

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.

Unplanned Ignition – The initiation of a wildland fire by lightning, volcanoes, unauthorized human caused fires, and escaped prescribed fires where the objective is to protect values at risk while meeting resource objectives specified in resource management plans.

Use of Wildland Fire – Management of either wildfire or prescribed fire to meet objectives specified in resource management plans.

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

Wildfire – Any fire (natural or human caused) burning in wildland fuels. Synonymous with wildland fire.

Wildland Fire – Any non-structural fire that occurs in the wildland. Two distinct types of wildland fire have been defined and include wildfire (unplanned ignitions) and prescribed fire (planned ignitions).

Wildland Fire Decision Support System (WFDSS) – A strategic fire management assessment and documentation process (program) used to determine the appropriate response to wildfires. This process is replacing the previously used WIFP and WFSA analysis processes.

Wildland Fire Use – the management of naturally ignited wildland fires to accomplish specific pre-stated resource management objectives in predefined geographic areas outlined in fire management plans. Previously a separate program component, now one end of the fire management spectrum of responses. Currently referred to as "use of wildland fire".

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Appendix A NEPA Compliance Documents

This page reserved for NEPA Documents

Appendix B Sample Delegation of Authority Letters

a. Delegation of Authority to Incoming Incident Commander

DELEGATION OF AUTHORITY

As Line Officer in charge of Great Smoky Mountains National Park, I have the responsibility for protection of the resources and the lives of Park visitors and all employees. Your expertise in the area of fire management will assist me in fulfilling that responsibility during the present incident. By means of this memorandum on this day of _____ at _____ hours, I am delegating to you the authority to carry out the task of management of the _____ incident in accordance with the attached line officer's briefing statement.

The statement will provide you with my priorities in fire management, specific restraints which are necessary to protect cultural and natural resources and other guidelines for carrying out your overall task of fire suppression on this unit. In addition, the Line Officer's Briefing Statement will provide you with names of certain individuals who have been assigned to assist you in carrying out your duties and a list of facilities which may be available to you under the conditions stated. A fireline briefing will be conducted on site by the current local Incident Commander. Either I or my delegated representative will be available to you and your staff for advice and council.

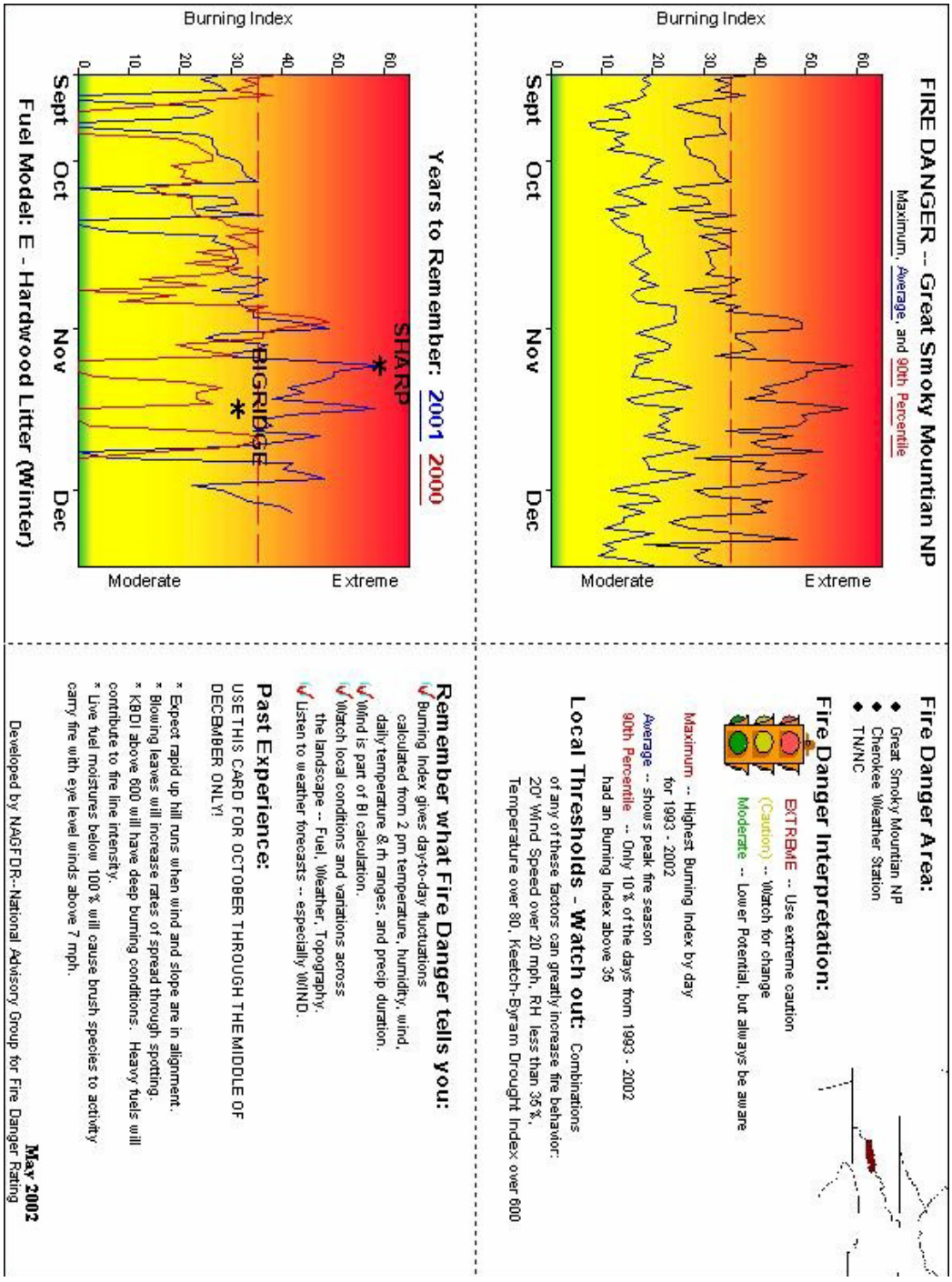
_____ _____
(Park Superintendent) Date

_____ _____
(Incident Commander – Incoming Team) Date

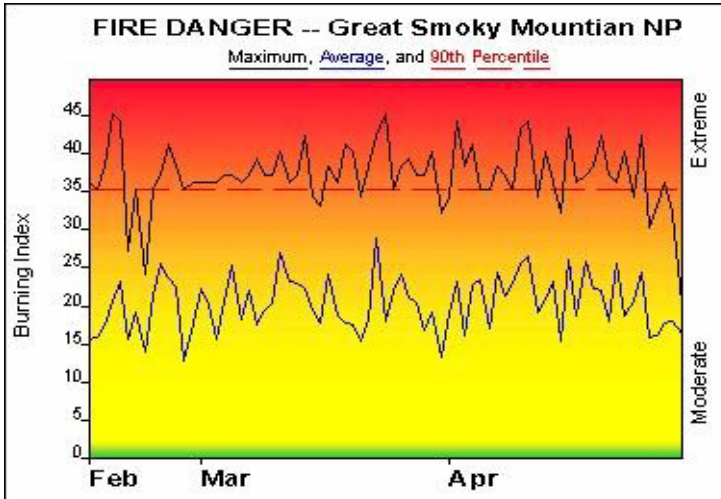
Appendix C Pocket Safety Cards

Attached are Pocket Cards describing critical fire danger indices and conditions present during past large fire events at Great Smoky Mountains National Park. They are intended for use by firefighters from outside the Park who might be ordered to GRSM to assist in wildland fire use or suppression actions:

a. Fall Pocket Card

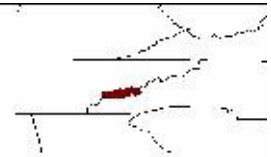


b. Spring Pocket Card

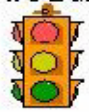


Fire Danger Area:

- Great Smoky Mountian NP
- Cherokee Weather Station
- TN/NC



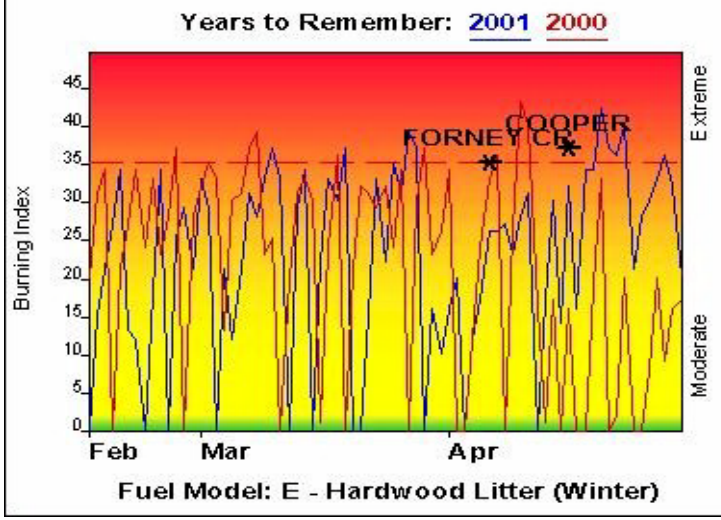
Fire Danger Interpretation:



EXTREME -- Use extreme caution
(Caution) -- Watch for change
Moderate -- Lower Potential, but always be aware

Maximum -- Highest Burning Index by day for 1987 - 2002
Average -- shows peak fire season
90th Percentile -- Only 10% of the days from 1987 - 2002 had an Burning Index above 35

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior: 20' Wind Speed over 20 mph, RH less than 35%, Temperature over 80, Keetch-Byram Drought Index over 600



Remember what Fire Danger tells you:

- ✓ Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- ✓ Wind is part of BI calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:

USE THIS CARD FOR FEBRUARY THROUGH THE END OF APRIL ONLY!

* Expect rapid up hill runs when wind and slope are in alignment.
* Blowing leaves will increase rates of spread through spotting.
* KBDI above 600 will have deep burning conditions. Heavy fuels will contribute to fire line intensity.
* Live fuel moistures below 100% will cause brush species to activity carry fire with eye level winds above 7 mph.

May 2002

Developed by NAGFDR--National Advisory Group for Fire Danger Rating

Appendix D Reciprocal Fire Management Agreements

AGENCY(S)	OBJECTIVE	EXPIRATION DATE
North Carolina Division of Forest Resources, DOI, NPS, U.S. Fish & Wildlife Services	To coordinate efforts in the prevention, detection, suppression and investigation of wildfires in and adjacent to their areas of responsibility	September, 2007
National Park Service, Tennessee Department of Agriculture Division of Forestry	To establish a reciprocal fire protection agreement	February 8, 2006
Great Smoky Mountains National Park and the Bureau of Land Management	Study designated Wildland fuels and fire science project for the "Predicting the invasion and survival of the exotic species Paulonia Tometosa following burning in pine and oak-pine forests	January 29, 2005
Department of Interior and U.S. Department of Agriculture	Interagency agreement for Fire Management	October 1, 2008????
Great Smoky Mountains National Park and the Bureau of Indian Affairs	To establish an agreement for cooperation in wildland fire protection within the Eastern Band of the Cherokee Indians.	April 14, 2003
Great Smoky Mountains National Park and the Wears Valley Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 12,2014
Great Smoky Mountains National Park and the Grassy Fork Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Pittman Center Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013

AGENCY(S)	OBJECTIVE	EXPIRATION DATE
Great Smoky Mountains National Park and the Stecoah Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Bryson City Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Blount County #5 (Walland) Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Townsend Area Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Jonathan Creek Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 10, 2013
Great Smoky Mountains National Park and the Gatlinburg Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	December 17, 2012
Great Smoky Mountains National Park and the Cosby Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	Unsigned
Great Smoky Mountains National Park and the West Swain Volunteer Fire Department	To establish the terms and conditions under which the parties will provide mutual assistance in wildland and structural fire suppression.	June 14, 2010
Great Smoky Mountains national	To establish the terms and conditions under which the parties	February 6, 2014

AGENCY(S)	OBJECTIVE	EXPIRATION DATE
Park and the Pigeon Forge Fire Department	will provide mutual assistance in wildland and structural fire suppression.	

Appendix E Potential Values at Risk by Watershed

Watershed	State	Type	Values to Protect
1	Cosby Creek		Total – 21 Structures
1	TN	Building	ND PG 48 MOUNT CAMMERER FIRE TOWER
1	TN	Building	Cosby Campground Kiosk, CO 646
1	TN	Building	Cosby Residence Area Pump house, CO 563
1	TN	Building	Cosby Maintenance Building, CO 569
1	TN	Building	Cosby Wastewater Chlorinator Building, CO 328
1	TN	Building	Cosby Picnic Pavilion, CO 424
1	TN	Building	Cosby Campground Pump house, CO 560
1	TN	Building	Cosby Campground Comfort Station, CO 324
1	TN	Building	Cosby Campground Comfort Station, CO 325
1	TN	Building	Cosby Campground Comfort Station, CO 326
1	TN	Building	Cosby Campground Comfort Station, CO 327
1	TN	Building	Cosby Campground Comfort Station, CO 548

1	TN	Building	Cosby Campground Comfort Station, CO 549
1	TN	Building	Cosby Campground Comfort Station, CO 550
1	TN	Building	Cosby Campground Comfort Station, CO 551
1	TN	Building	Cosby Ranger Station, CO 372
1	TN	Housing	Cosby Apartments, CO 570 - 5 & 6
1	TN	Housing	Cosby Quarters @ Campground, CO 372
1	TN	Housing	Cosby Quarters @ Maintenance Area, CO 518
1	TN	Housing	Cosby Quarters @ Maintenance Area, CO 517
1	TN	Shelter	Cosby Knob Shelter
2	Greenbrier Creek		(none)
3	Indian Camp Creek		Total – 1 Structure
3	TN	Building	ND PG 145 WILLIS BAXTER CABIN
4	Dunn Creek		Total – 4 Structures
4	TN	Building	ND PG 141 TYSON MCCARTER BARN
4	TN	Building	ND PG 142 TYSON MCCARTER CORN CRIB
4	TN	Building	ND PG 143 TYSON MCCARTER SMOKEHOUSE
4	TN	Building	ND PG 144 TYSON MCCARTER SPRINGHOUSE
5	Ramsey Creek		(none)
6	Soak Ash Creek		(none)
7	Copeland Creek		(none)
8	Middle Prong Little River		Total – 9 Structures
8	TN	Building	ND GR 467 MESSER BARN
8	TN	Building	ND GR 467A MESSER SPRINGHOUSE @ GREENBR
8	TN	Building	ND HIKERS CABIN @ GREENBRIER GR 279
8	TN	Building	Greenbrier Pump house, GR Pump
8	TN	Building	Greenbrier Picnic Area Comfort Station, GR
8	TN	Building	Greenbrier Picnic Pavilion, GR
8	TN	Building	Greenbrier PA Pavilion Pit Toilets, GR 225-A & B
8	TN	Housing	Greenbrier Quarters & Ranger Station, GR 348
8	TN	Shelter	Tri-Corner Knob Shelter
9	Dudley Creek		(none)
10	Roaring Fork		Total – 12 Structures
10	TN	Building	ND RF 131 ALEX COLE CABIN
10	TN	Building	ND RF 134 ALF REAGAN HOUSE
10	TN	Building	ND RF 135 EPHRAIM BALES CABIN
10	TN	Building	ND RF 136 EPHRAIM BALES CORN CRIB
10	TN	Building	ND RF 137 EPHRAIM BALES BARN
10	TN	Building	ND RF 138 EPHRAIM BALES PIG PEN
10	TN	Building	ND RF 139 HOMER / JIM BALES CORN CRIB
10	TN	Building	ND RF 140 HOMER / JIM BALES BARN
10	TN	Building	ND RF 406 ALF REAGAN TUB MILL

10	TN	Building	LeConte Maintenance Bunkhouse / Storage Bldg
10	TN	Building	LeConte Lodge
10	TN	Shelter	Mt. LeConte Shelter
11	Baskins Creek		(none)
12	LeConte Creek		Total – 12 Structures
12	TN	Building	ND RF 132 NOAH BUD OGLE TUB MILL
12	TN	Building	ND RF 133 NOAH BUD OGLE BARN
12	TN	Building	ND RF 464 NOAH BUD OGLE HOUSE
12	TN	Building	ND TW 238 TWIN CREEKS UPLANDS BOTNAY BU
12	TN	Building	ND TW 244 TWIN CREEKS UPLANDS BARN
12	TN	Building	ND TW 246 TWIN CREEKS UPLANDS DRIVE THR
12	TN	Building	ND TW 237 TWIN CREEKS UPLANDS LABORATOR
12	TN	Building	Twin Creeks Uplands Pump house #1, TW 1
12	TN	Building	Twin Creeks Uplands Pump house #2, TW 2
12	TN	Building	Twin Creeks Pavilion Comfort Station, TW
12	TN	Building	Twin Creeks Picnic Pavilion, TW 583
12	TN	Housing	Twin Creeks Seasonal Quarters, TW 241
13	West Prong Little Pigeon		Total – 44 Structures
13	TN	Building	ND SU 604 JOHN OWNBY CABIN
13	TN	Building	ND SU 442 SUGARLANDS VISITOR CENTER
13	TN	Building	ND SU 231 SUGARLANDS HEADQUARTERS Bldg
13	TN	Building	ND SU 164 SUGARLANDS NATURAL HISTORY Bldg
13	TN	Building	ND CHIMNEYS PICNIC AREA COMFORT STATION
13	TN	Building	ND CT 235 CHIMNEYS PICNIC AREA COMFORT
13	TN	Building	ND CT 234 CHIMNEYS PICNIC AREA COMFORT
13	TN	Building	ND SU SMOKY MOUNTAIN RIDING STABLE STORE
13	TN	Building	ND SU SMOKY MOUNTAIN RIDING STABLE OFFICE
13	TN	Building	ND SU SMOKY MOUNTAIN RIDING STABLE BARN
13	TN	Building	ND SU SMOKY MOUNTAIN RIDING STABLE BARN
13	TN	Building	Sugarlands Maintenance Offices, SU 320
13	TN	Building	Sugarlands Auto Shop and Offices, SU 88
13	TN	Building	Sugarlands Gas and Oil Building, SU 317
13	TN	Building	Sugarlands Warehouse Building, SU 89

13	TN	Building	Sugarlands Wildlife Building, SU 368
13	TN	Building	Sugarlands Radio / Historic Preservation, SU 90
13	TN	Building	Sugarlands Equipment Storage Shed, SU 91
13	TN	Building	Sugarlands Back Country VIP Storage Shed, SU
13	TN	Building	Sugarlands Dozer Storage Shed, SU
13	TN	Building	Sugarlands Vehicle Wash Station, SU
13	TN	Building	Sugarlands Sand Storage Shed, SU
13	TN	Building	Sugarlands Visitor Center Comfort Station SU 442-A
13	TN	Building	Sugarlands Park Historian Office Building, SU 226
13	TN	Building	Sugarlands Little River Ranger Station, SU 469
13	TN	Building	Sugarlands Pump house, SU Pump
13	TN	Building	Chimneys Picnic Area Pit Toilet, CT 225
13	TN	Building	Chimneys Picnic Area Pump house, CT 81
13	TN	Building	Chimneys Picnic Area Maintenance Storage, CT
13	TN	Building	Sugarlands Fire Cache and Vegetation Bldg, SU 443
13	TN	Housing	Sugarlands Apartments, SU 363 - 5 thru 8
13	TN	Housing	Sugarlands Apartments, SU - 363 3 & 4
13	TN	Housing	Sugarlands Apartments, SU 363 - 1 & 2
13	TN	Housing	Sugarlands Seasonal Quarters, SU 216
13	TN	Housing	Sugarlands Apartments, SU 617 - 1 thru 4
13	TN	Housing	Sugarlands Quarters, SU 228
13	TN	Housing	Sugarlands Quarters, SU 227
13	TN	Housing	Sugarlands Quarters, SU 494
13	TN	Housing	Sugarlands Quarters, SU 495
13	TN	Housing	Sugarlands Quarters, SU 496
13	TN	Housing	Sugarlands Quarters, SU 497
13	TN	Shelter	Mt. Collins Shelter
13	TN	Shelter	Ice Water Springs Shelter
14	East Prong Little River		Total - 44
14	TN	Building	ND PG 640 WALKER SISTER'S CABIN
14	TN	Building	ND PG 641 WALKER SISTER'S CORN CRIB
14	TN	Building	ND PG 642 WALKER SISTER'S SPRINGHOUSE
14	TN	Building	ND PG 129 LITTLE GREENBRIER SCHOOL
14	TN	Building	ND EL 611 AVENT CABIN @ ELKMONT
14	TN	Building	Metcalf Bottoms PA Comfort Station, MB 553
14	TN	Building	Metcalf Bottoms PA Comfort Station, MB 554
14	TN	Building	Metcalf Bottoms PA Comfort Station, MB 555
14	TN	Building	Metcalf Bottoms PA Comfort Station, MB 556
14	TN	Building	Metcalf Bottoms PA Comfort Station, MB 557
14	TN	Building	Metcalf Bottoms Picnic Pavilion, MB 568
14	TN	Building	Metcalf Bottoms Maint. Storage Building, MB

14	TN	Building	Metcalf Bottoms Pump house, MB
14	TN	Building	Wears Valley Storage Building, WV
14	TN	Building	Elkmont Firing Range Storage Building, EL 103
14	TN	Building	Elkmont Maintenance Offices and Break Room, EL 602
14	TN	Building	Elkmont Maintenance Storage Building, EL
14	TN	Building	Elkmont Maintenance Work Shops, EL
14	TN	Building	Elkmont Wastewater Plant Lab Building, EL 609
14	TN	Building	Elkmont Pump house, EL 537
14	TN	Building	Elkmont Campground Kiosk, EL 664
14	TN	Building	Elkmont Campground Comfort Station, EL 539
14	TN	Building	Elkmont Campground Comfort Station, EL 540
14	TN	Building	Elkmont Campground Comfort Station, EL 541
14	TN	Building	Elkmont Campground Comfort Station, EL 542
14	TN	Building	Elkmont Campground Comfort Station, EL 543
14	TN	Building	Elkmont Campground Comfort Station, EL 572
14	TN	Building	Elkmont Campground Comfort Station, EL 573
14	TN	Building	Elkmont Campground Comfort Station, EL 574
14	TN	Building	Elkmont Campground Comfort Station, EL 575
14	TN	Building	Elkmont Campground Comfort Station, EL 576
14	TN	Building	Elkmont Campground Comfort Station, EL 577
14	TN	Building	Elkmont Campground Comfort Station, EL 578
14	TN	Building	Elkmont Tack Room
14	TN	Building	Elkmont Campground Sink Building @ EL540, ND
14	TN	Building	Elkmont Campground Sink Building @ EL541, ND
14	TN	Building	Elkmont Campground Sink Building @ EL542, ND
14	TN	Housing	Wears Valley Quarters & Ranger Station, WV 673
14	TN	Housing	Elkmont Quarters, EL 434
14	TN	Housing	Elkmont Apartments, EL 600 - 1 & 2
14	TN	Housing	Elkmont Apartments, EL 463 - 1, 2 & U
14	TN	Shelter	Silers Bald Shelter
14	TN	Shelter	Mount Collins Shelter
14	TN	Shelter	Double Spring Gap Shelter
15	Middle Prong Little River		Total - 16
15	TN	Building	Picnic Shelter, TR 1125
15	TN	Building	Kitchen and Dining Hall, TR 1127
15	TN	Building	Office and Carpenter Shop, TR 1107
15	TN	Building	Dormitory, TR 1126
15	TN	Building	Utility Building, TR 355-U
15	TN	Building	Lumber Storage Shed, TR 1130
15	TN	Building	Oil and Paint Storage Shed, TR 1129

15	TN	Building	Water Quality Laboratory, TR Pump House
15	TN	Building	Ranger Station and Office, TR 317-B
15	TN	Housing	Tremont Seasonal Quarters, TR 355-2
15	TN	Housing	Tremont Seasonal Quarters, TR 355-3
15	TN	Housing	Tremont Seasonal Quarters, TR 355-1
15	TN	Housing	Tremont Seasonal Quarters, TR 355-4
15	TN	Housing	Tremont Quarters, TR 317-A
15	TN	Housing	Tremont Quarters & Garage, TR 356
15	TN	Shelter	Derrick Knob Shelter
16	West Prong Little River		(none)
17	Little River (lower) Little River Combined		(none)
18	White Oak Sink		(none)
19	Hesse Creek		(none)
20	Cane Creek		(none)
21	Abrams Creek		Total – 85 Structures
21	TN	Building	CC 352 EQUIPMENT STORAGE BUILDING
21	TN	Building	CC 444 VISITOR INFORMATION KIOSK
21	TN	Building	CC 167 ELIJAH OLIVER SPRINGHOUSE
21	TN	Building	CC 168 ELIJAH OLIVER SMOKEHOUSE
21	TN	Building	CC 169 ELIJAH OLIVER CABIN
21	TN	Building	CC 170 ELIJAH OLIVER CORN CRIB
21	TN	Building	CC 171 ELIJAH OLIVER BARN
21	TN	Building	CC 172 BECKY CABLE HOUSE
21	TN	Building	CC 173 JOHN P CABLE GRIST MILL
21	TN	Building	CC 174 JOHN P CABLE BARN
21	TN	Building	CC 175 JOHN P CABLE CORN CRIB
21	TN	Building	CC 176 HENRY WHITEHEAD HOUSE
21	TN	Building	CC 177 HENRY WHITEHEAD SMOKEHOUSE
21	TN	Building	CC 178 PETER CABLE CABIN
21	TN	Building	CC 179 PETER CABLE SMOKEHOUSE
21	TN	Building	CC 180 PETER CABLE GRANARY
21	TN	Building	CC 181 TIPTON OLIVER HOUSE
21	TN	Building	CC 182 TIPTON OLIVER CORN CRIB
21	TN	Building	CC 184 TIPTON OLIVER APIARY
21	TN	Building	CC 185 TIPTON OLIVER BLACKSMITH SHOP
21	TN	Building	CC 186 JOHN OLIVER CABIN
21	TN	Building	CC 219 PRIMATIVE BAPTIST CHURCH
21	TN	Building	CC 220 METHODIST CHURCH
21	TN	Building	CC 221 MISSIONARY BAPTIST CHURCH
21	TN	Building	CC 296 TIPTON OLIVER SMOKEHOUSE
21	TN	Building	CC 318 TIPTON OLIVER WOODSHED
21	TN	Building	CC 331 CARTER SHIELDS CABIN
21	TN	Building	CC 459 JOHN P CABLE BLACKSMITH SHOP

21	TN	Building	CC 460 JOHN P CABLE DRIVE THRU BARN
21	TN	Building	CC 461 JOHN P CABLE SMOKEHOUSE
21	TN	Building	CC 668 TIPTON OLIVER BARN
21	TN	Building	CC 472 CAMPGROUND STORE BUILDING AND
21	TN	Building	CC 690 CAMPGROUND BICYCLE SHOP & VEN
21	TN	Building	Ranger Station and Office, AC 399-B
21	TN	Building	Comfort Station, AC 409
21	TN	Building	Abrams Creek Pump Station / Water Lab, AC
21	TN	Building	Storage Building, CC 166
21	TN	Building	Chlorinator Building, CC
21	TN	Building	Air Quality Monitoring Station, CC
21	TN	Building	Horse Barn and Storage Building, CC 353
21	TN	Building	Cades Cove Offices and Carpenter Shop, CC 471
21	TN	Building	Cades Cove Auto Shop and Storage, CC 337
21	TN	Building	Paint Storage Building, CC 209
21	TN	Building	Sand Shed, CC 329
21	TN	Building	Storage Building, CC TRP1
21	TN	Building	Storage Building, CC TRP2
21	TN	Building	Storage Building, CC TRP3
21	TN	Building	Storage Building, CC TRP4
21	TN	Building	Storage Building, CC TRP5
21	TN	Building	Storage Building, CC TRP6
21	TN	Building	Storage Building, CC TRP7
21	TN	Building	Storage Building, CC TRP8
21	TN	Building	Storage Building, CC TRP9
21	TN	Building	Storage Building, CC TRP10
21	TN	Building	Storage Building, CC TRP11
21	TN	Building	Tool Storage Building, CC
21	TN	Building	Cable Mill Visitor Center, CM 686
21	TN	Building	Old Chlorinator Building, CM
21	TN	Building	Backup Generator Building, CM
21	TN	Building	Sewer Building, CM 692
21	TN	Building	Comfort Station, CM 691 Const. Material
21	TN	Building	Generator Building, CM Const Material
21	TN	Building	Pit Toilet, CM 225
21	TN	Building	Storage Building, Cable Mill Area
21	TN	Building	Interp & Visitor Services Offices, CC 354
21	TN	Building	Ranger Station and Campground Kiosk, CC 336-A
21	TN	Building	Water System Pump House, CC
21	TN	Building	Covered Picnic Shelter, CC 187
21	TN	Building	CG Comfort Station - C Section, CC 334
21	TN	Building	CG Comfort Station - C Section, CC 335

21	TN	Building	CG Comfort Station - B Section, CC 338
21	TN	Building	CG Comfort Station - B Section, CC 339
21	TN	Building	CG Comfort Station – Group Area 1, CC 340
21	TN	Building	CG Comfort Station – Group Area 2, CC 342
21	TN	Building	Picnic Area Comfort Station, CC 343
21	TN	Building	Picnic Area Comfort Station, CC 351
21	TN	Building	Comfort Station @ Riding Stables, CC 655
21	TN	Housing	Abrams Creek Quarters, AC 399
21	TN	Housing	Cades Cove Quarters, CC 321
21	TN	Housing	Cades Cove Quarters, CC 423
21	TN	Housing	Cades Cove Quarters (Trailer), CC 523
21	TN	Housing	Cades Cove Apartments, CC 493
21	TN	Shelter	Spence Field Shelter
21	TN	Shelter	Mollies Ridge Shelter
21	TN	Shelter	Russel Field Shelter
22	Panther Creek		(none)
23	Shop Creek		(none)
24	Tabcat Creek		(none)
25	Parson Branch		(none)
26	Twentymile Creek		Total – 2 Structures
26	NC	Building	Twenty Mile Quarters and Ranger Station, TM 80
26	NC	Building	Twenty Mile Utility Building and Garage, TM 163
27	Lost Cove Creek		Total – 1 Structure
27	NC	Shelter	Birch Spring Gap Shelter
28	Eagle Creek		Total – 3 Structures
28	NC	Shelter	Mollies Ridge Shelter
28	NC	Shelter	Russel Field Shelter
28	NC	Shelter	Spence Field Shelter
29	Hazel Creek		Total – 5 Structures
29	NC	Building	SD HA 311 KRESS / HALL CABIN
29	NC	Building	SD HA 83 CALHOUN HOUSE @ HAZEL CREE
29	NC	Building	Hazel Creek Utility and Storage Building, HA 680
29	NC	Building	Hazel Creek Upper Bunkhouse, HA 82
29	NC	Shelter	Silers Bald Shelter
30	Pilkey Creek		(none)
31	Chambers Creek		(none)
32	Forney Creek		Total – 7 Structures
32	NC	Shelter	Double Spring Gap Shelter
32	NC	Building	SD PG 160 FORMEY RIDGE COMFORT STATION
32	NC	Building	SD CDMS CLINGMAN'S DOME OBSERVATION TOW
32	NC	Building	Forney Ridge Generator Building, CD W1
32	NC	Building	Radio Equipment Building, PG
32	NC	Building	Forney Ridge Chlorinator Building

32	NC	Building	Air Quality Building
33	Noland Creek		(none)
34	Peachtree Creek		(none)
35	Deep Creek		Total – 13 Structures
35	NC	Building	Deep Creek Ranger and Maintenance Offices, DC 437
35	NC	Building	Deep Creek Changing Station - Women's, DC 438
35	NC	Building	Deep Creek Changing Station - Men's, DC 439
35	NC	Building	Deep Creek Campground Kiosk, DC 648
35	NC	Building	Deep Creek Maintenance Storage Building, DC 316
35	NC	Building	Deep Creek Picnic Shelter C Station, DC 349
35	NC	Building	Campground Comfort Station - C section, DC 430
35	NC	Building	Campground Comfort Station - C section, DC 431
35	NC	Building	Picnic Area Comfort Station, DC 462
35	NC	Building	Campground Comfort Station - D section, DC 552
35	NC	Building	Campground Comfort Station - D section, DC 558
35	NC	Building	Campground Comfort Station - D section, DC 559
35	NC	Housing	Deep Creek Seasonal Quarters / Bunkhouse, DC 519
36	Copper Creek		(none)
37	Oconoluftee River (lower)		Total – 56 Structures
37	NC	Building	SD OC 98 FLOYD BARN
37	NC	Building	SD OC 99 JIM BEARD CORN CRIB / GEAR SHE
37	NC	Building	SD OC 120 JOE QUEEN CORN CRIB
37	NC	Building	SD OC 121 C. JENKINS CHICKEN HOUSE
37	NC	Building	SD OC 124 JIM CONARD MEAT HOUSE
37	NC	Building	SD OC 125 J. CALDWELL SPRING HOUSE
37	NC	Building	SD OC 126 MESSER APPLE HOUSE
37	NC	Building	SD OC 127 GREGORY BLACKSMITH SHOP
37	NC	Building	SD OC 128 C. JENKINS PIG PEN
37	NC	Building	SD OC 230 JOE QUEEN HOUSE
37	NC	Building	SD OC 230-A JOE QUEEN WOODSHED
37	NC	Building	SD MM 150 MINGUS MILL
37	NC	Building	SD MM MINGUS MILL DAM, RACE,FLUME & PENS
37	NC	Building	SD SM 276 SMOKEMONT BAPTIST CHURCH
37	NC	Building	SD SM 85 SMOKEMONT CG COMFORT

			STATION-
37	NC	Building	SD SM 86 SMOKEMONT CG COMFORT STATION-
37	NC	Building	SD SM 87 SMOKEMONT CG COMFORT STATION-
37	NC	Building	SD SM 385 SMOKEMONT COMFORT STATION @ R
37	NC	Building	SD OC 162 OCONALUFTEE VISITOR CENTER
37	NC	Building	SD OC 364 & OC 689 OCONALUFTEE SAR CACH
37	NC	Building	Collins Creek Picnic Area Well House, OC 656
37	NC	Building	Collins Creek Picnic Area Covered Shelter, CL 413
37	NC	Building	Collins Creek Picnic Area Comfort Station, CL 414
37	NC	Building	Collins Creek Picnic Area Comfort Station, CL 415
37	NC	Building	Collins Creek Picnic Area Comfort Station, CL 416
37	NC	Building	Collins Creek Picnic Area Comfort Station, CL 417
37	NC	Building	Smokemont Sewer Plant Office / Laboratory, SM 82
37	NC	Building	Smokemont Campground Kiosk, SM 647
37	NC	Building	Smokemont Pump House, SM Pump
37	NC	Building	South District Ranger Station, SM 366
37	NC	Building	Smokemont CG Comfort Station- F section, SM 426
37	NC	Building	Smokemont CG Comfort Station- E section, SM 427
37	NC	Building	Smokemont CG Comfort Station - D Section, SM 428
37	NC	Building	Oconaluftee Maintenance Offices, OC 362
37	NC	Building	Oconaluftee Maintenance Warehouse, OC 361
37	NC	Building	Oconaluftee Vehicle Equipment Shed, OC 360
37	NC	Building	Oconaluftee Auto Shop - Equipment Garage, OC 359
37	NC	Building	Oconaluftee SD Ranger Offices, OC 660
37	NC	Building	Oconaluftee Vehicle Equipment Shed, OC
37	NC	Building	Oconaluftee Sand Storage Shed, OC 608
37	NC	Building	Oconaluftee B&U Shops, OC 376
37	NC	Building	Mingus Mill Comfort Station, MM 346
37	NC	Building	Towstring Horse Barn, 652
37	NC	Building	Smokemont Amphitheater Covered Shelter, SD
37	NC	Housing	Oconaluftee Apartments, OC 516 - 1 & 2
37	NC	Housing	Oconaluftee Apartments, OC 516 - 3 thru 6, U

37	NC	Housing	Oconaluftee Apartments, OC 516 - 7 & 8
37	NC	Housing	Oconaluftee Quarters, OC 391
37	NC	Housing	Oconaluftee Quarters, OC 319
37	NC	Housing	Oconaluftee Quarters, OC 347
37	NC	Housing	Oconaluftee Quarters, OC 422
37	NC	Housing	Oconaluftee Quarters, OC 511
37	NC	Housing	Oconaluftee Quarters, OC 513
37	NC	Housing	Oconaluftee Quarters, OC 514
37	NC	Housing	Oconaluftee Quarters, OC 515
38	Oconaluftee River West		Total – 4 Structures
38	NC	Building	SD PG 159 NEWFOUND GAP COMFORT STATION
38	NC	Building	Smokemont Church, PG
38	NC	Shelter	Kephart Shelter
38	NC	Shelter	Ice Water Spring Shelter
39	Bradley Fork and Oconaluftee River		Total – 2 Structures
39	NC	Shelter	Kephart Shelter
39	NC	Shelter	Pecks Corner Shelter
40	Raven Fork		Total – 2 Structures
40	NC	Shelter	Pecks Corner Shelter
40	NC	Shelter	Tri-Corner Knob Shelter
41	Straight Fork		Total – 1 Structure
41	NC	Shelter	Laurel Gap Shelter
42	Stillwell Creek		(none)
43	Bunches Creek		Total – 6 Structures
43	NC	Building	SD HB 306 LCS BALSAM MT. CAMPGROUND COM
43	NC	Building	SD HB 332 LCS BALSAM MT. CAMPGROUND COM
43	NC	Building	SD HB 333 LCS HEINTOOGA PICNIC AREA COM
43	NC	Building	SD HB 350 LCS HEINTOOGA PICNIC AREA COM
43	NC	Building	Balsam Mountain Well House, HB 307 or 670
43	NC	Housing	Balsam Mountain Quarters & Ranger Station, HB 323
44	Little Cataloochee Big Cataloochee		Total – 25 Structures
44	NC	Building	SD CA 252 JARVIS PALMER BARN
44	NC	Building	SD CA 30 JARVIS PALMER HOUSE
44	NC	Building	SD CA 30-A JARVIS PALMER BLACKSMITH SHO
44	NC	Building	SD CA 251 JARVIS PALMER SPRINGHOUSE
44	NC	Building	SD CA 271 INDIAN CREEK (BEECH GROVE)

			SC
44	NC	Building	SD CA 272 HIRAM CALDWELL HOUSE
44	NC	Building	SD CA 272-A HIRAM CALDWELL SPRINGHOUSE
44	NC	Building	SD CA 273 HIRAM CALDWELL BARN
44	NC	Building	SD CA 277 LITTLE CATALOOCHEE BAPTIST CH
44	NC	Building	SD CA 310 PALMER CHAPEL METHODIST CHURC
44	NC	Building	SD CA 687 STEVE WOODY HOUSE
44	NC	Building	SD CA 688 STEVE WOODY SPRINGHOUSE
44	NC	Building	SD CA 693 WILL MESSER BARN
44	NC	Building	SD FURGUSON CABIN @ THE PURCHASE
44	NC	Building	SD CA 147 JIM HANNAH CABIN @ LITTLE CAT
44	NC	Building	SD COOK CABIN (RE-CONSTRUCTION) @ LITTL
44	NC	Building	Cataloochee Maintenance Office, CA 4
44	NC	Building	Cataloochee Pump house, CA 254
44	NC	Building	Cataloochee Maintenance Equipment Shed, CA 256
44	NC	Building	Cataloochee Campground Comfort Station, CA 369
44	NC	Building	Purchase Knob Learning Center, CA
44	NC	Building	The Purchase Lab / Restrooms
44	NC	Housing	SD CA 3 CATALOOCHEE QUARTERS & RANGER
44	NC	Housing	SD CA 253 CATALOOCHEE SEASONAL QUARTERS
44	NC	Shelter	Laurel Gap Shelter
45	Big Creek		Total – 6 Structures
45	NC	Building	Big Creek Pump house, BC
45	NC	Building	Big Creek Horse Camp Comfort Station, BC 395
45	NC	Building	Big Creek Picnic Area Comfort Station, BC 396
45	NC	Building	Big Creek Campground Comfort Station, BC 479
45	TN	Building	Big Creek Stock Shed, BC
45	NC	Housing	Big Creek Quarters & Ranger Station, BC 397
	Look Rock Area		Total – 10 Structures
	TN	Building	Look Rock Maintenance Storage Building, LR 535
	TN	Building	Look Rock Maintenance Building & Garage, LR 533
	TN	Building	Look Rock Pump House, LR 669
	TN	Building	Look Rock Air Quality Building, LR 536

	TN	Building	Look Rock CG Kiosk and Ranger Station, LR 651
	TN	Building	Look Rock Comfort Station, LR 530
	TN	Building	Look Rock Comfort Station, LR 605
	TN	Building	Look Rock Comfort Station, LR 606
	TN	Building	Look Rock Comfort Station, LR 607
	TN	Tower	Look Rock Observation Tower

The numbers and codes used in the above table correspond with the maintenance division's Facility Maintenance Management System Database. Below is a chart showing what areas the two letter codes indicate. Look Rock is located outside of the Park's watersheds, thus does not have a number.

CODE	AREA NAME	CODE	AREA NAME	CODE	AREA NAME
AC	Abrams Creek	EL	Elkmont	RF	Roaring Fork
BC	Big Creek	GR	Greenbrier	SD	South District
CA	Cataloochee	HA	Hazel Creek	SM	Smokemont
CC	Cades Cove	HB	Heintooga/ Balsam	SU	Sugarlands
CD	Clingman's Dome	LR	Look Rock	TM	Twentymile
CL	Collins Creek	MB	Metcalf Bottoms	TR	Tremont
CM	Cable Mill	MM	Mingus Mill	TW	Twin Creeks
CO	Cosby	ND	North District	WV	Wears Valley
CT	Chimneys	OC	Oconoluftee		
DC	Deep Creek	PG	Park General	*CG	*Campground

Appendix F Five Year Prescribed Fire Plan

Project Area	Treatment Unit	Size	Timeline
2010			
Cades Cove	Elijah, Tater, Sparks, Maple, Pump House, Martha's	588	Nov - Jan
Cataloochee	Canadian Top	4600	Mar - May
Sevier WUI	TC Pile Burn	3	ongoing
Sevier WUI	HQ Pile Burn	3	ongoing
2010 Acreage: 5194			
2011			
Cades Cove	Tipton, Increase, Methodist, Rowans, Cemetery	829	Nov - Jan
North of Abrams	Hatcher	2300	Mar - May
Blount WUI	Lynn Hollow	283	Mar - May
Sevier WUI	HQ Pile Burn	3	ongoing
Sevier WUI	TC Pile Burn	3	ongoing
2011 Acreage: 3418			
2012			
Cades Cove	Cable, Old Field, PBC, Tater, Pump House	661	Nov - Jan
South of Abrams	Gregory Ridge	925	Mar - May
Sevier WUI	Wear Cove Gap	200	Mar - May
Sevier WUI	HQ Pile Burn	3	ongoing
Sevier WUI	TC Pile Burn	3	ongoing
2012 Acreage: 1792			
2013			
Cades Cove	Elijah, Cemetery, Sparks, Maple, Martha's	635	Nov - Jan
North of Abrams	Stony / Arbutus	1565	Mar - May
Cataloochee	Wash Ridge	530	Mar - May
Sevier WUI	HQ Pile Burn	3	ongoing
Sevier WUI	TC Pile Burn	3	ongoing
2013 Acreage: 2736			
2014			
Cades Cove	Methodist, Increase, Tipton, Rowans	742	Nov - Jan
North of Abrams	Beardcane	1793	Mar - May
North of Abrams	North Hatcher	1173	Mar - May
Sevier WUI	HQ Pile Burn	3	ongoing
Sevier WUI	TC Pile Burn	3	ongoing
2014 Acreage: 3071			
5 Year Annual Acreage: 3370			

Additional prescribed burn units that could be added if additional funding is available and resources are available to complete them: Hannah Mtn. (5300ac.), Falls Branch (190 ac.), Mids Branch (697 ac.