

Mammoth Cave National Park Fire Management Plan



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SIGNATURE PAGE

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Organization of the Fire Management Plan

The documentation for the Mammoth Cave National Park (MACA) Fire Management Plan (FMP) is comprised of three major elements. Each element contains unique information which must be understood to successfully implement the park fire management program.

The three elements are:

1. MACA Fire Management Plan (FMP) Framework 2018. The purpose of the FMP Framework is to briefly describe the operational aspects of the fire management program, and to identify where additional detailed information can be found. The Framework is comprised of Chapters 1 through 4 of this document.
2. Environmental Assessment for the MACA Fire Management Plan and associated Finding of No Significant Impact (FONSI) 2018. The Environmental Assessment (EA) describes natural and cultural resources of the park relative to fire management activities, and lays out the justification for selected strategies that will be implemented. The EA and FONSI also contain mitigation strategies to ensure protection of sensitive resources. Links to the EA and FONSI can be found in Appendix C.
3. Three Mapsheets described below

Mapsheet 1: Fire Management Overview: Provides geographic context for the park, and adjacent land ownership/management, fire history and Fire Management Unit (FMU) details. Lists overall park goals and objectives related to fire management.

Mapsheet 2: Park Resources and Treatment Planning: Provides information on park natural and cultural resources and values along with protection measures, and details fuels management approach, vegetation/fuel models, along with expected fire behavior, and includes a provisional multi-year fuels treatment plan.

Mapsheet 3: Operations: Provides information and general references to park property, terrain, facilities, landscape features and adjacent property to facilitate safe and efficient suppression of wildfires within the park and for additional fire management operations as well as provide key information in support of incident communication and to identify safety concerns for fire crews and the public.

1 INTRODUCTION, LAND MANAGEMENT PLANNING, and COMMUNICATION

This plan updates and supersedes the 2001 version of the MACA FMP.

National Park Service (NPS) wildland fire management programs must follow national wildland fire management policy and NPS wildland fire program guidance developed in Director's Order 18 and Reference Manual 18. As noted in *NPS Management Policies*, Section 4.5: 2006:

“Park units with vegetation capable of burning will prepare a fire management plan that is consistent with federal law and departmental fire management policies and that include addressing the need for adequate funding and staffing to support the planned fire management program.” (Section 4.5, NPS Management Policies, 2006).

NPS units cover a variety of landscapes. Director's Order 18 *Wildland Fire Management* details the conditions which if present in a park require the park to have a wildland fire management plan.

“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.” (National Park Service, 2014. Reference Manual 18 – Wildland Fire Management. U.S. Department of the Interior, National Park Service, Washington, DC.)

The MACA Fire Management Plan is a strategic plan that defines a program of work to manage wildland fire (includes prescribed fire and wildfire), and non-fire fuel treatments (mechanical, manual and chemical), and is based on direction contained in existing park unit planning documents. The MACA Fire Management Plan provides for firefighter and public safety as a first priority, and includes strategies for managing wildland fire.

Park managers also want to develop a fire management program that meets the goals and objectives concerning fire's role in the park and clearly displayed in a single document: the fire management plan.

1.1 Program Organization

Park Staff

- Responsible for wildland fire management within the park including completing an annual fire management plan review
- Designating a Unit Fire Coordinator (UFC)
- Responsibilities listed in the Zone Inter-park Agreement (Appendix F-1)
- Assist and support the Zone fire management office as needed

Mississippi River Zone Fire Management Officer (ZFMO)

- Works with park UFC to coordinate fire program needs including fuel projects, wildfire response, fire reporting, and other duties as described in the MACA Inter-Park Agreement.(Appendix F-1)

1.2 Environmental Compliance

An Environmental Assessment for the FMP was completed and a finding of No Significant Impact was issued in 2019. Links to these documents can be found in Appendix C.

This plan meets the requirements of:

- The National Environmental Policy Act (NEPA)
- Section 7 of the Endangered Species Act (ESA),
- Section 106 of the National Historical Preservation Act (NHPA)

Links to the FONSI, State Historic Preservation Office (SHPO) 106 and ESA Sec 7 decision documents from the Environmental Assessment are included in Appendix C: *Compliance for FMP*.

1.3 Park Unit Resource Management Planning

1.3.1 MACA Foundation Document (2014)

The park has a Foundation Document (MACA Foundation Document, 2014) that identifies fundamental resources and values, and then identifies key issues along with planning needs. Research and management proposals are developed within a NPS web-based program called the Project Management Information System. These proposals are reviewed at multiple levels within NPS and when ready can compete at the regional or national level for funding.

The foundation document identifies fire and its role as a natural disturbance force in the park and its importance in some vegetation zones within the park. The foundation document also notes necessary agreements with other agencies for wildland fire support and recognizes the needs of fire research within park boundaries. The foundation document also recognizes challenges that utilization of wildland fire can have on park resources.

1.3.2 How the Fire Management Plan Will Support the General Management Plan (1983) and the MACA Foundation Document (2014)

Wildland fire has played a significant historical role in Mammoth Cave NP, leading to sections of the park containing fire adapted species and associated ecosystems. The General Management Plan (GMP) for MACA was completed in 1983. It delineates the following management objectives relating to wildland fire management (October 1983, pages 3-5):

- Promote in undeveloped lands the re-establishment of natural conditions and processes in areas previously disturbed by human uses.
- Preserve unique surface features, archeological sites, and lesser-used caves pending the acquisition of scientific knowledge that will define acceptable parameters of use and preservation.

- Protect and maintain a stable and healthy surface wildlife population through appropriate monitoring and control techniques as necessary to ensure a balanced ecosystem.
- Protect and preserve the park's historic structures, their appearance, and their settings, as well as archeological sites and objects in accordance with legislative and executive requirements and the Service's historic preservation policies.
- Cooperate with local, state, and federal governmental bodies in protecting the park's resources from intrusive developments, incompatible uses of adjacent lands, and water pollution.

This FMP will support the foregoing objectives of the Foundation Document in two principal ways:

- The first objective of wildland fire management is *protection*, with protection of human life as the highest priority. (NIFC 2012, Foundation Document: *Visitor Use*). The Foundation Document notes that protection of park resources—historical (Foundation Document: *Cultural Resources Preservation*), cultural (Foundation Document: *Cultural Resources Preservation*), and natural (Foundation Document: *Natural Resources Management*)—is the next highest priority.
- The second objective of wildland fire management is to maintain or enhance natural ecosystems in a manner that exhibits the least evidence of manipulation by man. The natural occurrence of wildland fire in southern forests once played a variety of roles in maintaining what is often referred to as a “fire climax ecosystem.”

1.4 Collaborative Planning

The development of the fire management plan utilized an interdisciplinary park team representing key staff and program areas. The Environmental Assessment developed to analyze alternatives for the park’s fire management program will provide opportunity for input and comment by the public, cooperators, and other stakeholders.

Implementation of many fire management actions require continuing cooperation and support from many local cooperators as well as support from Mississippi River Zone and Southeast Regional staff. A list of key operational cooperators is found on Mapsheet 1: Fire Management Overview, Kentucky/Mammoth Cave NP Interagency Coordination.

1.4.1 Agreements

Formal Agreements and Memorandums of Understanding with local and regional cooperators can be found in Appendix J of this document.

Other nationwide Master Agreements can be found at:

http://gacc.nifc.gov/sacc/cooperative_agreements.php

1.5 Communication and Education

The park will utilize Reference Manual (RM) 18 Communication and Education chapter 21 for recommendations and additional direction.

Additional resources for planning and implementing fire information activities can be found at: http://www.nifc.gov/prevEdu/prevEdu_communicatorGuide.html.

Park actions concerning communications during wildfires and prescribed fires are:

- During a wildfire or prescribed fire the Public Information Officer is responsible for dispersing information to the public.
- The visiting public and local population will be made aware of local conditions during periods of high fire danger. This can be accomplished primarily through signing and the issuance of press releases.
- Post-fire information will be issued in accordance with park public information guidelines.
- Timely and accurate information will be provided to the media and public regarding the status of fire management actions, suppression efforts, and fuels treatments.
- Potential smoke impacts to roads should be communicated to the Superintendent's office, the park's information officer, and the appropriate state or county agencies.
- Adjacent landowners will be notified when fire, particularly wildfire, is a threat to residential areas.

2 WILDLAND FIRE PROGRAM GOALS, OBJECTIVES, and MANAGEMENT ACTIONS

2.1 National Fire Management Goals

Interagency fire management goals adopted under the National Cohesive Wildland Fire Management Strategy (2014) are incorporated into the park's fire management goals. The goals of the cohesive strategy are:

- **Restore and Maintain Landscapes:** Landscapes across all jurisdictions are resilient to fire-related disturbances in accordance with management objectives.
- **Create Fire-Adapted Communities:** Human populations and infrastructure can withstand a wildfire without loss of life and property.
- **Respond to Wildfire:** All jurisdictions participate in making and implementing safe, effective, efficient risk-based wildfire management decisions.

National fire management goals as implemented by the Department of Interior (DOI) are located at the following website: <https://www.doi.gov/wildlandfire/fire-policy>.

Park fire management goals which are tiered from national, department and agency goals, and objectives specific to the park are listed in Table 1; *MACA Fire Management Goals and Objectives* and on Mapsheet 1: *Fire Management Overview, Section: KY-MCP Fire Management Goals and Objectives*.

2.2 Objectives

Fire management objectives are in Table 1; MACA *Fire Management Goals and Objectives* and listed on Mapsheet 1: *Fire Management Overview, Section: KY-MCP Fire Management Goals and Objectives*.

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Table 1: MACA Fire Management Goals and Objectives

Goals	Objectives
1. Firefighter and public safety will receive the highest priority during every fire management activity	<ul style="list-style-type: none"> • No fire management operations will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions, current fire season conditions and current and predicted fire weather and behavior. • Fire management operations will be carried out only by fully qualified individuals that promote the safe and skillful application of fire management strategies and techniques, and who are familiar with the fuel and expected fire behavior. • Neighbors, visitors and the local residents will be notified of all planned and unplanned fire management activities that have the potential to impact them. • Park closures will be imposed at the discretion of the Superintendent to ensure public safety. • Conduct post-fire critiques to evaluate firefighter safety
2: Utilize the strategy of “Use of wildfire for resource benefits” where appropriate and suppress all wildland fires regardless of ignition source when there is a need to protect the public, check fire spread onto private property, and protect the natural and cultural resources of MACA.	<ul style="list-style-type: none"> • Suppress fires at minimum cost, considering firefighter and public safety, benefits, and values to be protected, consistent with resource objectives. • Employ minimum impact strategy and tactics (MIST). Avoid adverse impacts to the natural and cultural resources. • Limit off road vehicle use in closed areas unless human life or private or public property are threatened. Limit heavy equipment use unless human life or private or public property are threatened. • Avoid adverse impact to water resources. • Do not use foam or retardant unless approved by the Superintendent or their representative.
3: Facilitate reciprocal fire management activities through the development and maintenance of cooperative agreements and working relationships with local fire management agencies.	<p>Develop and maintain fire agreements with the following agencies:</p> <ul style="list-style-type: none"> • U.S. Fish and Wildlife Service • Kentucky State Department of Forestry • The Nature Conservancy

	<ul style="list-style-type: none"> Local Fire Departments/Districts <p>Conduct training on an interagency basis to the fullest extent possible.</p>
<p>4: Use prescribed fire where and when appropriate as a tool to manage vegetation within park boundaries, and where acceptable, across park boundaries to attain resource and fire management objectives.</p>	<ul style="list-style-type: none"> Conduct all fire management operations in accordance with approved plans. Utilize prescribed fire to achieve resources management goals including the following: <ul style="list-style-type: none"> Hazardous fuel reduction around Wildland Urban Interface (WUI) areas to reduce wildfire severity Restoration of natural fire regimes Restoration and maintenance of unique landscapes Promoting desired species Restoring native plants and animal communities Reduction of exotic species Monitor and evaluate the effects of fire management on the ecosystem in order to determine if objectives are met and utilize monitoring information as it becomes available to modify fire program objectives, strategies, and prescriptions. Prescribed fire implementation and locations will incorporate ecological and economic factors as well as social values. Cooperatively manage prescribed and wildfires across park boundaries when and where appropriate.
<p>5. Modify fuel complexes around developed areas, along wildland-urban interface boundary areas and in proximity of cultural sites to reduce fire behavior and intensity to a manageable level in order to protect critical sites.</p>	<ul style="list-style-type: none"> Use non-fire fuels reduction methods to reduce hazard fuel accumulations around boundaries and structures to reduce fire intensity and severity and to allow improved access by fire fighting resources i.e. fire engines, all terrain vehicles, utility task vehicles and personnel on foot. Use mechanical means to reduce accumulations of hazard fuel around vulnerable cultural and historic sites for protection from fire damage.
<p>6: Promote public understanding of wildland fire management programs and objectives.</p>	<ul style="list-style-type: none"> Develop a public information program in a way that the environmental message is not confused with the wildfire prevention message. . Cooperate with other agencies to create a consistent fire management message and theme.

<p>7: Manage wildland fires in concert with federal, state, and local air quality regulations to protect the air quality of the local and adjacent airsheds.</p>	<ul style="list-style-type: none"> • Address air quality as a part of the go-no-go decision process for all fire management actions. • Address air quality as a part of the alternative development and selection decision process using the Wildland Fire Decision Support System. • Incorporate air quality objectives in each prescribed burn plan. • Develop and implement smoke impact mitigation measures in prescribed burn plans and all wildland fire management actions.
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2.3 Approved Wildland Fire Management Actions

MACA - Allowable Actions by FMU (see mapsheet for additional details)

FMU 1 - *Ecosystem FMU*

Manage fire for multiple objectives including cost, safety, and resource benefit

Mechanical and manual fuel treatments to reduce hazardous fuels

Herbicide treatment to reduce hazardous fuels and prevent invasive species

Prescribed fire operations to reduce hazardous fuels and restore ecosystem function

FMU 2 –WUI FMU

All wildfires will be suppressed.

Mechanical and manual fuel treatments to reduce hazardous fuels

Herbicide treatment to reduce hazardous fuels and prevent invasive species

Prescribed fire operations to reduce hazardous fuels and restore ecosystem function

The park may use all fire management actions/strategies allowable by NPS policy for managing wildland fire in the park (NPS Reference Manual 18).with an emphasis on utilizing MIST procedures to reduce fire management operational impacts (see Appendix Q).

2.3.1 Management of Wildfires

The park may use the full range of responses to a wildfire including monitoring, confine, contain and full control strategies. Definitions of these terms are found in Appendix B: *Definitions*. One or more strategies may be used on a single fire to achieve park management objectives. Use of wildfire to obtain resource and other benefits is allowed in the *Ecosystem FMU*.

Fire management staff may use strategic suppression tactics for any wildfire in MACA that meets approved prescriptions for providing resource benefits and does not create unacceptable risk to human life, property, or natural/cultural resources.

“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.”
(Interagency Standards for Fire and Aviation Operations (Redbook) Chapter 1)

Further discussion of wildfire management occurs on Mapsheet 3: *Operations*, Sections: *KY-MCP Response Options*, table, *Suppression Strategies*, text box and the *KY-MCP Restricted Fire Management FMU Summary* table.

2.3.2 Management of Fuel Treatments

Fuels management activities include prescribed fire, mechanical and manual fuels reduction, and herbicide applications to control unwanted vegetation, where appropriate and approved under NEPA for the restoration of natural ecosystems and reduction of hazard fuels within the boundaries of the park.

Potential fuels reduction projects are located in wildland urban interface areas, adjacent to park infra-structure, areas of invasive species concentrations, and areas where fuels have accumulated to levels that could result in a fire of undesirable intensity.

A list of allowable fuels treatment options is found on Mapsheet 2: *Resources and Treatment Planning*, Section: *KY-MCP Fuels Management and Treatment Options*

A table of the park's multi-year fuels treatment projects is found on Mapsheet 2: *Resources and Treatment Planning*, Section: *KY-MCP Multi Year Prescribed Fire Fuels Treatment Plan* and in Appendix D: *Multi-year Fuels Treatment Plan*.

2.3.3 Defensible Space

The park's structures were inventoried and evaluated for their risk of damage from wildfire by structure assessment teams. Their findings were documented in a MACA Facility Wildfire Risk Assessment (2017) and will be summarized in Appendix F7. MACA staff utilized the assessment to determine what facilities require fuels reduction treatments to reduce their risk of damage from wildfire, and will coordinate with Zone staff to implement fuels treatments as needed.

The Facility Wildfire Risk Assessments can be accessed on the Wildfire Risk Assessment website: <https://sites.google.com/a/firenet.gov/wildfireriskassessments/>

The NPS has adopted the International Code Council's (ICC's) International Urban-Wildland Interface Code (2015) that contains descriptions of defensible space and maintenance requirements for urban wildland interface areas. MACA will follow these recommendations for the development of defensible space around park buildings. A link to the 2015 International Wildland Urban Interface Code follows.

<http://codes.iccsafe.org/app/book/toc/2015/I-Codes/2015%20IWUIC%20HTML/index.html>

3 WILDLAND FIRE OPERATIONAL GUIDANCE

3.1 Response to Wildfire

MACA fire management response to wildfire is always predicated upon the safety of firefighters, employees and the public. Mapsheet 3: *Operations*, Sections: *KY-MCP Response Options* and *KY-MCP Safety Issues and Mitigation Measures* covers wildfire response.

3.1.1 Wildfire Response Planning

Wildfire response planning is accomplished through interagency cooperation. MACA has active agreements with the Mississippi River Zone and local fire stations/districts. These agreements are listed in Appendix J: *Cooperative and Interagency Agreements*.

3.1.1.1 Expected Fire Behavior

A discussion on MACA fuels occurs on Mapsheet 2: *Resources and Treatment Planning: KY-MCP Vegetation and Fire Regime Group Crosswalk* and Appendix T: *Fire Behavior Analyst Information*

3.1.1.2 Minimum Impact Strategy and Tactics

Where feasible utilization of MIST as described in RM 18 Chapter 2 is the policy for all NPS units. Links to MIST are located in Appendix Q *Minimum Impact Strategy and Tactics*. The requirements were developed as mitigation for potential resource impacts through the environmental compliance process and included as part of the Environmental Assessment for the FMP.

3.1.2 Wildfire Response Objectives

Incident objectives will be developed by the Incident Commander (IC) and approved by the Superintendent or their designee for implementation.

Extended response will require the development of a Wildland Fire Decision Support System (WFDSS) decision document, which will contain specific objectives approved by the Superintendent. (See; Interagency Standards for Fire and Aviation Operations (Redbook) Appendix N, and the WFDSS website (http://wfdss.usgs.gov/wfdss/WFDSS_Home.shtml).

3.1.3 Wildfire Response Procedures

3.1.3.1 Initial Wildfire Report and Dispatch

- Initial report of ignitions or smoke may come from visitors, neighbors, or park staff via radio, phone calls to the park, calls to 911, or personal notification of park staff in the field or at the Visitor Center or other locations
- On initial report of an ignition, park staff will immediately contact the Ranger on Duty to initiate initial size-up and response.
- The Ranger on Duty will coordinate the response with the responding fire department(s) and the park UFC.
- The UFC will notify the Mississippi Zone Duty Officer (DO).

3.1.3.2 Initial Response Procedures

Initial response procedures will be consistent with firefighter, employee, and public safety, recognizing the values to be managed (protected or enhanced).

MACA uses a full range of response strategies:

- Full suppression – strategy developed to achieve control of a fire and prevent it from exceeding a defined perimeter.
- Point/Zone protection – a variety of suppression strategies taken to protect a specific point or areas from fire, usually by tactics which constrain

progressive fire encroachment away from identified values at risk.

- Monitor/Confine/Contain – management actions conforming to a strategy that periodically checks the fire to ensure it continues to meet established objectives.

National fire policy allows multiple objectives to be considered on each wildfire. 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 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.

When multiple fires are reported in the park, fires occurring in the WUI FMU or within ½ mile of the park boundary that have potential to exit the Park, will receive the highest priority. Elsewhere, fires will be prioritized based on potential threats to Park resources and visitor safety.

The following criteria will be utilized in determining the strategic fire response during single and multiple fire events:

- Public and firefighter safety – threat to human life
- Protection of cultural, historic, and natural resources
- Protection of MACA improvements and private property
- Threat to endangered species or sensitive habitats
- Minimum Impact Suppression Tactics
- Available suppression resources and response times
- Long and short term fire danger
- Potential benefits or harm to the ecosystem

The UFC will coordinate with the DO to determine the initial response strategy to wildfires in MACA. The UFC and or DO shall ensure a complexity analysis has been performed and that the appropriately qualified incident commander is assigned to each incident. If a qualified Incident Commander is not available, one will be requested through the Kentucky Interagency Coordination Center (KICC).

3.1.3.3 Decision Support

For all fires that exceed initial attack or are being managed for multiple objectives, the Superintendent will ensure the development of ‘Published Decisions’ within the WFDSS. Decisions should be developed in conjunction with staff specialists and be consistent with the objectives and requirements contained in the Park’s Fire Management Plan (*NPS Reference Manual-18, Chapter 2*).

Current direction on Decision Support pertaining to the NPS can be found in the *Interagency Standards for Fire and Fire Aviation Operations (Red Book) in Chapters 3 and 11*.

WFDSS goals and objectives for inclusion into the WFDSS incident management decision process may be found in Appendix K, WFDSS Objectives and Requirements.

3.1.3.4 Transition to Extended Response

Extended response occurs when a fire has not been controlled by the initial response forces and continues either until transition to a higher level incident management team is completed or until the fire has been controlled.

The criteria for transitioning from initial response to extended response are as follows:

- the fire cannot be contained with initial response resources within two operational periods (48 hours) of fire detection
- fire behavior exceeds capability of initial response resources to contain the fire

When complexity levels exceed initial response capabilities, the appropriate Incident Command System (ICS) positions should be added commensurate with the complexity of the incident. The Incident Complexity Analysis and use of the WFDSS decision process (which includes a relative risk assessment and organizational needs analysis) will assist the manager in determining the appropriate management structure to provide for safe and efficient fire suppression operations. When additional resources are required to manage wildfires, the UFC or DO will coordinate resource ordering with the IC and the Kentucky Interagency Coordination Center.

The IC with assistance from Zone and MACA staff will complete a WFDSS derived periodic assessment and documentation as required. The Superintendent will approve WFDSS decision documentation and any revisions.

A unified command structure will be a consideration in all multijurisdictional incidents.

In the event an Incident Commander or Incident Management Team is ordered from outside MACA, the transfer of responsibility for suppression actions on the fire will be documented through a Limited Delegation of Authority signed by the Superintendent or designated acting official. A draft copy is included in the annual preparedness plan which is included in Appendix F-8: Transfer of Command Package from MACA Superintendent.

Equipment and Land Use Agreements will be executed prior to using any non-federal equipment or occupying non-federal properties used to manage incidents. Agreements must be negotiated by a warranted Contracting Officer (CO) and follow requirements contained in the Interagency Incident Business Management Handbook Chapter 20,

A unified command structure will be a consideration in all multijurisdictional incidents.

3.1.4 Mobilization

3.1.4.1 In-Park Assignments

A pre-approved roster of firefighters available to respond to wildfires will be maintained by the UFC and posted on the MACA Fire Google Drive. When a report of a wildland fire is received, the UFC designates an Incident Commander, and potential firefighters are contacted based on type and number needed.

3.1.4.2 Out-of-Area Assignments

When firefighters or other wildfire suppression resources are needed for interagency assignments, the UFC will coordinate with the Kentucky Interagency Coordination Center regarding resource availability.

3.2 Fuel Treatments

The fuels management activities proposed in the fire management plan will be planned and implemented in accordance with Reference Manual 18, Fuels Management chapter 7, the Interagency Prescribed Fire Implementation Guide, and the Red Book.

3.2.1 Fuels Planning

The fuels management program is designed to achieve MACA and NPS fire management and resource management program goals and objectives, including:

- Maintain fire dependent ecosystems
- Reduce hazard fuel accumulations
- Reduce threats to wildland urban interface from wildfires
- Control non-native plants

The following process will be used to plan annual prescribed burning and non-fire treatments:

- The UFC, in coordination with park Science and Resource staff, will lead the development of the annual fuels program in conjunction with the Mississippi Zone fire staff. Planned fuels treatment will utilize any available fire effects monitoring data in the adaptive management process.
- Zone Fire Staff with assistance from park staff will identify specific areas to be treated, develop burn objectives, determine who will; write the various burn plans, write or

review burn plans written by others, ensure monitoring is conducted in accordance with established guidelines, and identify research project needs.

- The list of proposed projects will be submitted to the park interdisciplinary team noted below
- The interdisciplinary team composed of the Superintendent, Division Chiefs and Technical Representatives as requested/designated by the Superintendent, will meet annually to review the fire management program, review proposed treatments, and schedule burns if possible.
- Additional compliance needs will be identified and assignments made for follow-up. The park will consult with U.S. Fish and Wildlife Service (USFWS) for effects to federally listed species when developing individual prescribed burn plans. The park will also consult with the Kentucky SHPO and when necessary complete an archeological survey of treatment areas for cultural resources.
- The multi-year treatment plan in Appendix D and Mapsheet 2: Park Resources and Treatment Planning will be revised annually.
- The Zone fire staff will assist in preparing and reviewing treatment plans.
- Proposed fuels treatments will be entered into the National Fire Plan Operations and Reporting System (NFPORS) by the Mississippi River Zone fire staff, and updated annually.

3.2.1.1 Project Prioritization

Projects at MACA are prioritized using the following criteria:

- Potential hazard fuel loading near values at risk will elevate the project to a high priority
- Deviation from natural fire return interval
- Potential for interagency treatments.
- Desired future condition
- Logical project sequence and other factors

3.2.1.2 General Fuels Management Implementation Procedures

The fuels management activities proposed in the fire management plan will be planned and implemented in accordance with [Reference Manual 18, Fuels Management chapter 7](#), the [Interagency Prescribed Fire Implementation Guide](#), and the [Interagency Standards for Fire and Aviation Management \(Red Book\)](#).

3.2.1.3 Multi-year Fuels Treatment Plan

MACA will develop a multi-year fuels treatment plan representing a multi-year moving “window” of fuels projects. This plan is updated as part of the annual fire management plan review process.

The current multi-year fuels treatment plan is found on Mapsheet 2: Resources and Treatment Planning, Section: Multi-year Prescribed Fire Fuels Treatment Plan and Appendix D: Multi-year Fuels Treatment Plan.

3.2.1.4 Non-Fire Fuel Treatments

Mechanical, manual, and chemical treatments complement prescribed burning to reduce fuels that might sustain large-scale, high-intensity fires or to create defensible space around park resources, improvements, and boundaries. Such treatment requires compliance with NEPA and a Superintendent-approved implementation plan.

Requirements for planning and implementing non-fire fuel treatment projects are similar to prescribe fire projects and are listed in the multi-year fuel treatment plan.

More discussion of non-fire fuels treatments is found on Mapsheet 2: *Park Resources and Treatment Planning*, Sections: *Treatment Planning Guidelines and KY-MCP Fuels Management and Treatment Options*.

3.2.2 Fuels Management Goals and Objectives

Fuels management goals and objectives are consistent with the *MACA Foundation Document* and agency policies. Goals and objectives are listed in Section 2, Table 1 and Mapsheet 1: *Fire Management Overview*: Section: *KY-MCP Fire Management Goals and Objectives*.

3.3 Preparedness

Fire preparedness is the state of being ready to provide a response to wildfires based on identified objectives. Preparedness is the result of activities that are planned and implemented prior to fire ignitions. Preparedness requires identifying necessary firefighting capabilities and implementing coordinated programs to develop those capabilities.

Preparedness requires coordination between MACA and the Zone to implement a continuous process of developing and maintaining firefighting infrastructure, predicting fire activity, implementing prevention activities, identifying values to be protected, hiring, training, equipping, pre-positioning, and deploying firefighters and equipment, evaluating performance, correcting deficiencies, and improving operations. Preparedness activities will focus on developing wildland fire operations capabilities and on performing successful wildland fire operations.

3.3.1 Preparedness Activities

3.3.1.1 Coordination and Dispatching

MACA is a member of the NPS Mississippi River Fire Management Zone. Dispatching for MACA resources is accomplished through the Kentucky Interagency Coordination Center

(KICC - 859-745-3171 or 3172) MACA is a signatory on the *Kentucky Interagency National Fire Danger Operating Plan*, a copy of which is on file at the park.

3.3.1.2 Duty Officer

The Mississippi Zone Fire Management Officer is responsible for providing DO coverage during any period of predicted incident activities.

The DO will assist with monitoring local conditions and fire indices, coordinating wildfire response, and assisting with wildfire documentation and reporting

Further discussion of the DO position occurs in Appendix I: *Duty Officer Manual*, with a hard copy located in the MACA Emergency Operations Plan, located at the zone fire management office.

3.4 Post-Fire Programs and Response

Natural recovery after a wildfire is preferable if immediate stabilization and rehabilitation needs have been met or are assessed to not be necessary. In situations where a burned area emergency exists and it is possible to restrict access to protect life and safety or where valid uses will significantly interfere with emergency treatment objectives or delay recovery, administrative closures should be the first consideration. Treatments should be disallowed if they are experimental or proven to be ineffective.

Current direction for post-fire programs and response are found in *RM 18: Chapter 19* and the *Red Book*.

MACA is responsible for taking prompt action after a wildfire to minimize threats to life or property, and to prevent unacceptable degradation to natural and cultural resources per available fund sources listed below.

Management of damages resulting from wildfires is addressed through four activities (see RM 18 and Red Book):

Suppression Repair: the intent is to repair suppression damages and is the responsibility of the Incident Commander. This activity is paid for from wildfire suppression funding.

Emergency Stabilization: the intent is to protect life and property and critical resource values, and is the responsibility of the Superintendent. This activity is paid for from Emergency Stabilization (ES) funding.

Rehabilitation: the intent is to repair wildfire damaged lands that are unlikely to recover naturally to management approved conditions, or to repair or replace minor facilities damaged by wildfire. This activity is paid for from Burned Area Rehabilitation (BAR) funds.

Restoration: the intent is to continue the rehabilitation efforts started in the BAR process beyond the time period limitation set by the department. This activity is paid for from regular non-fire program funds.

Southeast Region Standard Operating Procedures for developing and submitting post-fire Burned Area Emergency Response (BAER) requests are included as Appendix M.

3.5 Air Quality/Smoke Management

3.5.1 Air Quality Issues

Mammoth Cave NP is designated as a Class I Area under the Clean Air Act, as amended in 1977 and 1990 (National Park Service). Detailed information on smoke management is found in Appendix P *Smoke Management Plan*.

The most explicit legislation pertaining to NPS air resources management is the Clean Air Act, as amended, which defines the authority and duty of the National Park Service to protect park resources from air-pollution-related adverse effects. The Clean Air Act establishes specific air quality management programs that provide special protection for many national parks and NPS wilderness areas.

Sections 160 through 169 of the Clean Air Act establish a program to Prevent Significant Deterioration (PSD) of air quality in "clean air areas" of the country (i.e., attainment areas), which include many national park units. Among the purposes of the PSD program are "to preserve, protect and enhance air quality in national parks, monuments, national seashores, and other areas of special national or regional natural, recreational, scenic or historic value."

Smoke is comprised of gases, particles, and ash. Many of the gases are toxic—carbon monoxide gas can cause suffocation in enclosed/unventilated areas. Other gases, nitrogen oxides and volatile organic compounds, contribute to the formation of ozone, a pollutant that impairs respiratory function. Nutrients such as nitrates, phosphates and sulfates are volatilized from burning soils and vegetation into the air, while metals and other elements remain as ash. Ash and large smoke particles sink to the ground near a fire while fine, microscopic particles can be transported hundreds of miles in the air before depositing on the ground. These fine smoke particles (especially those 2.5 micrometers in diameter or less) contribute to haze and pose the greatest health risk.

Mammoth Cave NP monitors air quality for a variety of issues. The following list represents major issues for the park concerning air quality:

- Compliance with National Ambient Air Quality Standards for ozone and particulate matter.
- Visibility impairment on park resources.
- Minimizing impacts from atmospheric deposition of air pollutants (Wet and Dry).
- Minimizing air quality impacts from park operations and projects to the public is important.
- Minimizing air quality impacts on park cultural and natural resources.

The fire management program will comply with all requirements of The Clean Air Act, 42 U.S.C. - 7418.

3.5.2 Smoke Management Activities

The Commonwealth of Kentucky and the Kentucky Prescribed Fire Council are currently developing a state-wide enhanced smoke management program. Mammoth Cave NP, as per NPS Management policy, will incorporate and implement future smoke management strategies developed by the Commonwealth of Kentucky, national strategies recommended by the Environmental Protection Agency, and service-wide strategies by the National Park Service.

The smoke management actions and tactics detailed in Appendix P will help mitigate impacts to park visitors and neighboring communities.

3.6 Data and Records Management

3.6.1 Wildfire Reporting

All electronic documents generated by MACA will be included in the case incident report Incident Management Analysis and Reporting System (IMARS) or in the incident file with the ZFMO.

Each wildfire action requires the submission of an Individual Fire Report, submitted via Wildland Fire Management Information (WFMI) system. A WFMI report is required regardless of who takes action. When Park staff take or assist in initial attack off Park lands, the agency with jurisdiction will file a report. The Park must also file a report to document the Park support action and to support potential billing to non-federal entities for trespass fires. The following types of fires must be reported within 10 days of a fire being declared out:

- All wildfires on NPS and NPS-protected lands
- Wildfires threatening NPS lands on which we take action
- All escaped planned ignitions, where a wildfire declaration is made
- All false alarms

Wildland fire reporting will follow guidelines established by NPS policy and Director's Order 18 and the associated reference manual, NPS RM 18, Chapter 11: Wildland Fire Reporting. The primary record is a hardcopy wildland fire report, and it is a permanent record of wildland fires on NPS lands and/or fire responses completed by the NPS. The hard copy is maintained at the park until transfer to archival storage. The report includes descriptive and statistical information such as fire name, date, location, cause; resources dispatched, fire size, etc. The initial report format is the NPS Wildland Fire Report Form which covers the basic fire information needed to size-up a wildfire. The park UFC will coordinate with the Zone to input fire reports into the Wildland Fire Information System Fire Reporting Module, and the park will follow all required protocols for keeping and maintaining fire records.

It is the responsibility of the IC to provide the information necessary to complete the fire report and the Zone FMO's job to ensure they are entered into the system. The Zone Fire

Program Management Assistant (FPMA) will complete the actual data entry for all wildfire information into WFMI as well as the data entry for all planned ignitions.

Other required reports include:

- *ICS-209* for extended attack fires (over 100 acres) will be submitted daily through the 209 system on the internet by the fire dispatcher or ZFMO office
- *Close of Business (COB)* report (forwarded to the Kentucky Interagency Coordination Center). This COB will be submitted by the ZFMO office and will include information for fires that occur on Park property (fire size, status, start date, discovery time and resources assigned).

3.6.2 Geospatial Data Management for Wildland Fire Projects

Park/Incident Geographic Information System (GIS) coordinator will ensure that GIS Standard Operating Procedures are understood and followed. Reference to: *GIS Standard Operating Procedures on Incidents*, Chapter 2, *File Naming and Directory Structure*. In-depth direction found at the following link:
<http://www.nwcg.gov/pms/pubs/GSTOP7.pdf>

3.6.3 Wildland Fire Qualifications Management

The Zone FPMA will enter and maintain all MACA Incident Qualification and Certification System (IQCS) records for fire management. The MACA UFC or designee will provide documentation of completion of a fire refresher, appropriate physical fitness test, and medical clearance as needed to the Zone FPMA. The Mississippi Zone FMO will authorize task books and sign all Incident Qualifications Cards (*Red Cards*)

A current list of MACA wildland fire qualified personnel is maintained in the Mississippi Zone Fire Management Office on the MACA Fire Google Drive.

4 PROGRAM MONITORING and EVALUATION

4.1 Monitoring the Use of Wildland Fire

Monitoring is the primary means of assessing whether the fire program is meeting management goals and objectives. Park staff utilizes monitoring results in annual assessment of the fire management program. Fire effects data is maintained at the park, and a copy is also available at the NPS Data Store (<https://irma.nps.gov/DataStore/>).

The Fire Ecologist and fire effects staff based out of the Mississippi Zone fire office support fire effects monitoring at MACA.

Fire monitoring at MACA is covered in more detail in Appendix E: *Fire Monitoring Plan*. Monitoring is described in *RM 18 - Chapter 8* with specific details in the *NPS Fire Monitoring Handbook*.

4.2 Science and Uncertain Future Conditions

4.2.1 Science

Research focused on similar lands has generated and will continue to generate results that can be applied to the MACA fire management program.

4.2.2 Changing Long-term Weather Conditions (Changing Weather Conditions???)

MACA fire management is aware there may be potential impacts from changing long-term weather conditions. At present there is a need to conduct specific research that will project the types of changes of fire regimes and the impacts those changes will have on the overall wildland fire program.

4.3 Annual Program Evaluation and Fire Management Plan Review Process

4.3.1 Fire Management Plan Review:

This plan will be reviewed annually in accordance with RM 18 - Chapter 4 in order to incorporate new knowledge, program adjustments/refinements and updates as needed. This review/update requires Superintendent's approval and is accomplished through the checklist in NPS RM-18 Chapter 4 exhibit 2.

The Zone FMO will forward the signed copy to the Southeast Regional Fire Planner who will make the update available to the National Office and ensure it is uploaded to the NPS Datastore. Changes requiring approval will be submitted with a new FMP cover sheet for signatures and dates, which will then replace the original cover sheet.

4.3.2 Wildfire Review:

All wildfires and fire-related incidents will be reviewed in accordance with NPS RM 18 - Chapter 17 and the Interagency Standards for Fire and Aviation (Redbook).

The park Superintendent or designee will conduct a post-fire critique of every wildfire, involving as many personnel who participated in the incident as possible. The critique will follow NPS RM-18 guidelines, and will cover all aspects of the incident, including safety, tactics, difficulties encountered, areas needing improvement, and whether specified objectives were met. The information gathered from these critiques will be used to continually improve the effectiveness and efficiency of the fire management program. The

critique will be attached to the associated DI-1202 fire report as a permanent record, and stored in park fire files.

Any incident that results in human entrapment, serious injury, fatalities, or near-misses, will be investigated and reviewed, with appropriate administrative action taken based upon investigation results.

The Southeast Region FMO will conduct an in-depth review of wildfires involving a type I or type II team.

Additionally, the park Superintendent may request a regional-level review of any incident in which:

- The fire crosses park boundaries into another jurisdiction without the approval of the adjacent landowner or agency.
- The park receives adverse media attention.
- Significant property or resource damage occurs.
- Controversy involving another agency occurs

All wildland fires and fire-related incidents will be reviewed in accordance with RM 18 - Chapter 17 and the Redbook.

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Appendix G: Communication and Education Plan

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Appendix J: Cooperative and Interagency Agreements

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Appendix L: Contracts for Prescribed Fire and Suppression Resources

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Appendix N: Serious Injury or Death Procedure

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Appendix Q: Minimum Impact Strategy and Tactics

Appendix R: Spatial FMP Crosswalk

Appendix S (PARK ADDED): Fire Management Units

Appendix T (PARK ADDED): Fire Behavior Analyst Information

List of Mapsheets

Mapsheet 1: *Fire Management Overview*

Mapsheet 2: *Resources and Treatment Planning*

Mapsheet 3: *Operations*

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Appendix A: *References Cited*

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Appendix B: *Definitions*

The list of pertinent fire management definitions may change over time as new definitions are added and obsolete definitions are replaced, therefore a list of current definitions are found using the following link:

www.nwcg.gov/pms/pubs/glossary

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Appendix C: Compliance for FMP

Consultation and Coordination:

The following individuals and organizations were consulted during the plan development:

Contributors:

The following persons contributed directly in the preparation of this Fire Management Plan:

Lora Peppers, Chief Ranger, MCNP, KY

Rick Olson, Ecologist at MCNP, KY

Bob Carson, Retired Chief of Science and Resource Management, MCNP, KY

Tim Pinion, Chief Science and Resource Management, MCNP, KY

Rick Smedley, Senior Fire Management Specialist: ELYON International, Vancouver, WA

NEPA

MACA prepared an Environmental Assessment (EA) with the associated Finding of Non-Significant Impacts (FONSI) signed on DATE. The MACA EA and associated FONSI can be found at:

<http://www.nps.gov/macallearn/management/firemanagement.htm>

NHPA (Section 106)

ESA (Section 7)

Appendix D: MACA Multi-Year Fuels Treatment Plan

Table: Append. D-1: MACA Multi-Year Fuels Treatment Plan

MACA Multi-Year Fuels Treatment Plan (FY2019 - 2023)				
Fiscal Year	Planned Treatment Units	Acres	Last Treatment FY	Target Implementation
2019	4	28	2007 (prescribed fire) 2011 (thinning)	Oct - Sept
	Barrens North	10	N/A	Oct - Sept
	Barrens West	81	N/A	Oct - Sept
	Barrens East	61	N/A	Oct - Sept
	Woolsey North	722	N/A	Nov - March
	Total Acres for FY2019	902		
2020	Onyx Hotel Meadow	30	2010	Nov - March
	Flint Ridge West	411	N/A	Nov - March
	Woolsey South	744	N/A	Nov - March
	Total Acres for FY2020	1185		
2021	New Job Corps	93	N/A	Nov - March
	Collie Ridge Northwest	402	N/A	Nov - March
	Collie Ridge Northeast	486	N/A	Nov - March
	Total Acres for FY2021	981		
	Old Job Corps	26	2012 (Mastication)	Nov - March
	Crystal Cave	580	2012 (Prescribed Fire)	Nov - March
	Lick Log	585	N/A	Nov - March
	Total Acres for FY2022	1191		
2023	Barrens Chaumont	28	Planned 2019	Oct - Sept
	Barrens North	10	Planned 2019	Oct - Sept
	Barrens West	81	Planned 2019	Oct - Sept
	Barrens East	61	Planned 2019	Oct - Sept
	Woolsey North	722	Planned 2019	Nov - March
	Total Acres for FY2023	902		

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Appendix E: MACA Fire Monitoring Plan

The park has developed a short and long term monitoring program to assess the effectiveness of fire management activities on natural resources. The NPS Fire Monitoring Handbook protocol was used to fulfill monitoring plan requirements. Other valid monitoring strategies and protocols developed locally as part of a Fire Monitoring Plan for the park may be substituted for standard monitoring protocols to meet specific management and information needs. Such protocols should complement those used by cooperators or be used in conjunction with joint monitoring efforts. See the Prescribed Fire Section for further discussion.

Monitoring is not only part of the adaptive management process, but also a fundamental NPS management policy to be fulfilled. 2006 NPS Management Policies. Section 4.5, states *that*:

“Naturally ignited and human-ignited fires managed to achieve resource management and fuel treatment objectives.... Such fires will also include monitoring programs that record fire behavior, smoke behavior, fire decisions, and fire effects to provide information on whether specific objectives are met and to improve future fire management strategies.”

A fire effects monitoring program will be included as part of the prescribed fire program. Long-term monitoring will include the installation of permanent plots in representative habitats to determine the effects of prescribed fire. The program will ascertain if the quantifiable burn unit objectives identified in the individual burn plans have been achieved and if the desired long-term biological changes are occurring (e.g., conversion of brush fields to native grasses). Monitoring results will be used to validate the program, adjust prescriptions, and identify new units suitable for similar treatment.

All prescribed fire monitoring activities will follow the guideline in the NPS's Fire Monitoring Handbook (2003). The Resource Management Division in consultation with the Zone Fire Ecologist will determine the appropriate monitoring technique to be used to sample the permanent plots. All plots will be sampled prior to treatment and will be sampled after the treatment to gather data for both short-term and long-term effects.

Additional sites can be established at the discretion of the Chief, Division of Resource Management. As the program grows, the

Monitoring Plan will continue to be the basis for providing valuable information to park staff in assessing the effectiveness of the park fire management program.

Fire monitoring includes wildland fire, prescribed fire and non-fire fuels treatments and is described in RM-18 Chapter 8 with more details in the NPS Fire Monitoring Handbook.

The NPS Inventory and Monitoring (I&M) Program has developed a network system for monitoring park natural resource 'vital signs'. Some of these monitoring efforts may be relevant and complementary to the fire management program. The Zone Fire Ecologist will develop monitoring protocols in collaboration/coordination with the I&M program staff.

The monitoring plan for MCNP can be accessed

at: <https://drive.google.com/drive/folders/0B2dFY49fHPvLZC1zZHFEZWdZMDg>

Appendix F: *Preparedness Planning Documents*

- F-1: Annual MACA Inter-park Agreement
- F-2: Initial Response Plan
- F-3: Step-up plan/Staffing Plan
- F-4: Status and Location of Fire Danger Rating Operating Plan
- F-5: Status and Location of Job Hazard Analysis for Fire Management Program
- F-6: List of Current Wildland Fire Qualified Personnel
- F-7: Structure Protection Inventory and Needs
- F-8: Transfer of Command Package
- F-9: Yearly Readiness Checklist

F-1: *Inter-park Agreement*

The current Inter-park Agreement includes the Zone FMO and UFC Delegation of Authorities and is located in the Zone Fire Management Office with a copy in the MACA Superintendent's office

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Mammoth Cave National Park Mississippi River Fire Management Zone Inter-park Agreement



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Mammoth Cave National Park

Inter-park Agreement

Purpose

This agreement defines the responsibilities of fire management personnel from the Mississippi River Fire Management Zone (Zone) based at the Natchez Trace Parkway, and personnel from Mammoth Cave National Park (MACA) regarding wildland fire operations at MACA.

Funding

Zone or MACA staff will charge costs incurred to the appropriate account, using either a regionally supplied project or base account, or MACA account. Personnel working on a wildfire or fuels project will use the assigned account. Zone and MACA staffs must agree upon exceptions to this prior to expending funds.

Zone staff will submit requests for fuels treatment funding using the National Fire Plan Operations and Reporting System (NFPORS) by May for the following fiscal year.

MACA will submit requests for fire related equipment and supplies to Zone staff early in the fiscal year. These requests will be evaluated to determine whether they can be purchased using current year Zone funding, regional funding sources, or entered into the budget plan for the following fiscal year.

Term of Agreement

This agreement is valid for five years, starting from the MACA Superintendent's date of signing. The Zone Fire Management Officer (FMO) will provide copies of the fully signed ~~agreement to the~~ MACA Superintendent. The FMO and/or the MACA Superintendent may request amendments to the agreement at any time. When the amendments are agreed upon and all signatures are obtained, it will initiate new five year agreement term.

If new Superintendent transitions into MACA, he/she will review this agreement and coordinate with the Zone FMO to determine if any changes are required prior to completing an amended signing. This does not include Acting Superintendents or persons serving as Superintendent during temporary promotion.

If new Zone FMO transitions into the Mississippi River Fire Management Zone, he/she will review the agreement and coordinate with the MACA Superintendent to determine if any changes are required prior to completing an amended signing. This does not include Acting FMOs or personnel serving as FMO during a temporary promotion.

Mississippi River Fire Management Zone Staff Responsibilities:

Coordinate the development and implementation of prevention, preparedness, suppression, fuels management, rehabilitation, and fire aviation programs with MACA staff through site visits, phone calls, or other electronic means.

Guide the development, review, and revision of the Fire Management Plan (FMP). Zone staff will coordinate the completion of the annual FMP review and update with the Park.

Zone staff may perform or assist in program reviews, inspections, accident investigations, budget formulation, and training.

Zone staff will provide information on fire management policy as requested or required.

Assist with completing and submitting fire reports for all recordable incidents at MACA. Zone staff will generate fire codes and request fire accounts from the regional office (SERO).

Assist with coordination, through appropriate dispatch centers, for the mobilization of National Park Service personnel for fire assignments.

Preparedness planning and severity requests will be coordinated and submitted by Zone staff. Copies of these documents will be provided to MACA.

Assist with the coordination and implementation of prescribed fire, fuels treatments, fire ecology, and fire effects monitoring according to the approved fire management plan. Zone staff will enter and maintain the NFPORS records for MACA.

Provide summaries of short and long term monitoring data related to fire management activities. Review and revise fire objectives as needed to ensure fire operations are meeting MACA goals.

Monitor fire weather and local fire potential during the identified fire season and in support of prescribed burn projects.

Will assist MACA staff with fire suppression activities including response, policy guidance, post fire activity.

Notify MACA staff of fire-related training and development opportunities.

The Zone Fire Program Management Assistant (FPMA) will manage fire qualification and training records using the Department of Interior (DOI) Incident Qualifications and Certification System (IQCS). The Zone FMO is responsible for approving the issuing and completion of performance task books and the certification of individual Incident Qualification Cards (Red Card). The Zone FPMA and FMO will attempt to have Red Cards signed and returned to the Unit Fire Coordinator (UFC) within five (5) business days of receiving all required documentation.

The Zone FMO will ensure MACA red-carded staff are compliant with the DOI Wildland Firefighter Medical Standards Program, to include Risk Mitigation/Waiver processes. The MACA UFC should contact the Zone FMO for medical exam requests.

Zone staff will communicate with MACA staff prior to representing MACA at meetings, conferences, seminars and other functions. Zone staff will report information from these meetings to MACA staff.

Assist with developing cooperative agreements necessary to support fire management operations.

Provide guidance on pre-planned Wildland Fire Decision Support System (WFDSS) and ensure that MACA information is loaded into WFDSS.

The Superintendent is responsible for the Agency Administrator performance requirements as identified in Chapter of the *Interagency Standards for Fire and Aviation Operations* (see page 74).

Mammoth Cave National Park Staff Responsibilities:

The Superintendent will issue an annual Limited Delegation of Authority to the Zone FMO, as specified in the *Interagency Standards for Fire and Aviation Operations* (see page 80). The Superintendent will issue Limited Delegation of Authority to incoming Incident Commander Type 3's and Incident Management Teams for MACA fires that exceed initial attack.

The Superintendent will designate UFC who will serve as the primary point of contact to the Zone staff. The Superintendent will work with the Zone FMO to prepare an annual delegation of authority to the UFC (see delegated duties on page 12). If the UFC becomes unavailable for an extended time period, an Acting UFC will be selected and made known to Zone staff.

MACA staff will notify the Zone Duty Officer as soon as possible of any fires occurring on MACA property.

MACA staff will work with local cooperators to ensure that fire suppression activities adhere to existing agreements.

MACA staff will submit fire reports and related documentation to Zone staff in timely manner.

MACA staff will communicate with Zone staff prior to representing the Zone fire program at meetings, conferences, seminars and other functions.

MACA staff will work together to ensure that fire management activities are meeting park goals and objectives, and adhering to agency policy.

When possible, MACA staff will complete the appropriate annual preparedness reviews, as required by the *Interagency Standards for Fire and Aviation Operation*. Zone staff as needed will provide assistance.

Red-carded MACA personnel will assist with fire operations within the Zone when possible. The MACA Superintendent will make red-carded staff available for regional and national incident response when possible, especially during national Planning Levels and 5.

Mammoth Cave National Park

Agency Administrator Management Performance Requirements for Fire Operations

Taken from the *Interagency Standards for Fire and Aviation Operations* (NFES 2724)
CHAPTER 03

Release Date: January 2018

1. Take necessary and prudent actions to ensure firefighter and public safety.
2. Ensures sufficient qualified fire and non-fire personnel are available each year to support fire operations at level commensurate with the local and national fire situation. Ensures that all training and certification of fire and non-fire personnel is completed as required to support fire operations at the local and national level.
3. Ensure Fire Management Officers (FMOs) are fully qualified as identified in the Interagency Fire Program Management Qualification Standards.
4. Provide written Delegation of Authority (DOA) on an annual basis to individual(s) responsible for wildland fire management activities to ensure an adequate level of operational authority. Depending on park organizational structure, written delegations may be provided to the Chief Ranger, Natural Resource Specialist, FMO, designated Fire Coordinator, Park Group FMO, or to individuals from neighboring fire management organizations, provided written agreement or memorandum of understanding is in-place. Where applicable, an Inter-Park Agreement that specifies the reciprocal responsibilities of the Superintendent and Park Group FMO will be prepared. This Inter-Park Agreement will be accompanied by an annual Delegation of Authority. Both the DOA and Inter-Park Agreement will remain valid until rescinded by either party, updates are needed, or personnel changes necessitate revision and update. As appropriate, the DOA will specify multi-agency coordination (MAC) group authorities.
5. Ensure applicable park unit resource management objectives are included in the Fire Management Plan (FMP). The comprehensive 7-year review of the FMP is no longer required. Annual updates are required. The newly established FMP Update Checklist must be completed, signed by the Superintendent, and uploaded in the Integrated Resource Management Application (IRMA) under the established park unit name.

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6. Reviews and approves wildfire preparedness and fuels management funding based on an accurate and defensible readiness analysis. Ensure use of fire funds is in compliance with Department and Agency policies.
7. Develop fire management standards and constraints that are in compliance with agency fire policies.
8. Ensure compliance with the collection, storing, and aggregation of Wildland Fire Program Core geospatial data (<http://share.nps.gov/firegis>).
9. Management teams will meet once 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.
10. 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.
11. Ensure timely follow-up actions to program reviews, fire preparedness reviews, fire and fire aviation safety reviews, fire critiques, and post-season reviews.
12. Ensure fire and fire aviation preparedness reviews are conducted in all units each year. Parks must complete checklists applicable to their specific program scope and complexity and include appropriate program elements, such as prescribed fire. summary of the preparedness review findings including standards exceeded or needing improvement will be submitted to the Regional FMO before the fire season.
13. Ensure an approved burn plan is followed for each prescribed fire project; technical review, Prescribed Fire Go/No-Go Checklist (PMS486), and Agency Administrator Ignition Authorization (PMS 485) are completed; follow-up monitoring and documentation to ensure management objectives are met.
14. Meet annually with major cooperators and review interagency agreements to ensure their continued effectiveness and efficiency (may be delegated).
15. 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 (Regional Director may delegate).
16. Provide management oversight by personally visiting wildland and prescribed fires each year.
17. Provide incident management objectives, written delegations of authority and Agency Administrator briefings to Incident Management Teams. See Chapter 11, Agency Administrator Responsibilities.
18. Monitor wildfire potential and provide oversight during periods of critical fire activity/situations.
19. Ensures that resource advisors are identified, trained, available, and appropriately assigned to wildland fire incidents. Refer to Resource Advisors Guide for Wildland Fire PMS 313, NFES 1831, Aug 2017.
20. Convene and participate in annual pre- and post-season fire meetings.
21. Attends the Fire Management Leadership Course (geographic or national) and attains the Agency Administrator (AADM) qualification in the Incident Qualifications and Certification Mammoth Cave National Park Inter-park Agreement

System (IQCS) within two years of appointment to Superintendent. Ensures that their designated acting superintendents and supervisors of fire management officers (FMOs) attain and maintain the AADM qualification.

22. Ensure appropriate investigations are conducted for accidents (as defined in Chapter 18), entrapments, shelter deployments, and related events.

23. 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.

24. For all fires identified as requiring WFDSS decision in Chapter 11, ensure local unit staff specialists are involved in the development and that all decisions are consistent with the objectives and requirements contained in the Park's Fire Management Plan.

25. Ensure there is adequate direction in fire management plans to identify fire danger awareness with escalating fire potential.

26. NPS Superintendents, or other designated approving officials, will maintain WFDSS user profiles (as appropriate), allowing them to approve wildfire decisions in WFDSS.

27. Ensure compliance with Departmental and agency policy, as well as Regional Office direction for prescribed fire activities and ensure that periodic reviews and inspections of the prescribed fire program are completed.

28. Review prescribed plans and recommend or approve the plans depending upon the delegated authority. Ensure that the prescribed fire plan has been reviewed and recommended by qualified technical reviewer who was not involved in the plan preparation.

29. Serves as the Management Official (MO) within the DOI Wildland Firefighter Medical Standards Program.

MACA staffing may not have the number of qualified resources to meet "sufficient" level. MACA defers to the Natchez Trace Superintendent to ensure the Zone Fire Management Officer (FMO) is fully qualified.

Reference to Delegation of Authority is assumed to infer Limited Delegation of Authority. Superintendent will personally visit wildland and prescribed fires each year in the park, if applicable.

MACA will only select Resource Advisors that are qualified in IQCS.

Some MACA acting superintendents may not have AADM qualification.

ANNUAL DELEGATIONS OF AUTHORITY

Zone Fire Management Officer Delegation of Authority

The Zone Fire Management Officer will prepare the draft annual FMO Limited Delegation of Authority for review and approval by the MACA Superintendent. The actions defined in the Mammoth Cave National Park Inter-park Agreement

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Limited Delegation of Authority will be coordinated between the Zone staff and the MACA Superintendent or their designee. A work plan that provides more detail related to training, fuels management projects, or other fire-related activities may accompany this delegation. The Superintendent may issue additional limited delegations of authority to qualified Fire Managers when necessary to facilitate wildland fire operations.

MACA Unit Fire Coordinator Delegation of Authority

The MACA Superintendent will select the MACA UFC and work with the Zone FMO to revise the annual UFC Limited Delegation of Authority as needed.

Zone Fire Management Officer Limited Delegation of Authority

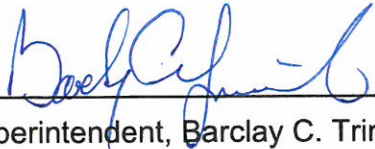
This delegation authorizes MS River Zone Fire Management Officer (FMO) Travis Neppl to act on my behalf for Mammoth Cave National Park (MACA) regarding the following duties:

Taken from the *Interagency Standards for Fire and Aviation Operations* (NFES 2724), Chapter 3, January 2018

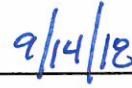
1. Maintain safety first as the foundation for all aspects of fire and fire aviation management.
2. Ensure completion of job hazard analysis (JHA) for fire and fire aviation activities so mitigation measures are taken to reduce risk
3. Ensure work/rest and length of assignment guidelines are followed during all fire and fire aviation activities. Deviations must be approved and documented.
4. Ensure that only trained and qualified personnel are assigned to fire and fire aviation duties.
5. Develop, implement, evaluate and document fire and fire aviation training programs to meet current and anticipated needs.
6. 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.
7. Develop and maintain an open line of communication with the public and cooperators.
8. Ensure that the fire and fire aviation management staff understand their role, responsibilities, authority, and accountability.
9. Organize, train, equip, and direct qualified work force. Establish "red card" certification/qualification process at the local level. Individual Development Plans (IDP) should be developed for all employees, but special emphasis must be on employees that do not meet standards.
10. Ensure fire and fire aviation policies are understood, followed, and coordinated with other agencies as appropriate.
11. Recognize when complexity levels exceed program capabilities. Increase administrative, managerial, and operational resources to meet the need.
12. Initiate, conduct, and participate in fire management related reviews and investigations, including prescribed fires declared wildfires.
13. Provide for and personally participate in periodic site visits to individual incidents and projects.
14. Utilize the incident complexity analysis to ensure the proper level of management is assigned to all incidents.
15. Review and evaluate performance of the fire management organization and take appropriate actions.
16. Ensure incoming personnel and crews are briefed prior to fire and fire aviation assignments.

17. For all fires identified as requiring WFDSS decision in Chapter 11, ensure local unit staff specialists are involved in the development and that all decisions are consistent with the objectives and requirements contained in the Park's Fire Management Plan.
18. Monitor fire season severity predictions, fire behavior, and fire activity levels. Take actions to ensure safe, efficient, and effective operations.
19. Provide fire personnel with adequate guidance and decision-making authority to ensure timely decisions.
20. Ensure written/approved plan based on current land use and/or fire management plans and/or project-level NEPA document exists for each prescribed fire or non-fire treatment. Plans shall be integrated with related vegetation management actions such as invasive species management.
21. Ensure effective transfer of command of incident management occurs and oversight is in place.
22. Develop and maintain agreements, annual operating plans, and contracts on an interagency basis to increase effectiveness and efficiencies.
23. Provide the expertise and skills to fully integrate fire and fire aviation management into interdisciplinary planning efforts.
24. Work with cooperators to identify processes and procedures for providing fire safe communities.
25. Develop, maintain, and annually evaluate the FMP to ensure accuracy and validity by completing review. Ensure applicable park resource management objectives are included in the Fire Management Plan (FMP).
26. Ensure budget requests and allocations reflect analyzed anticipated workload.
27. Develop and maintain current operational plans; e.g., dispatch, pre-attack, prevention.
28. Ensure that reports and records are properly completed and maintained.
29. Ensure Wildland Fire Program Core spatial data is collected, stored, and aggregated based on NPS standards (<http://share.nps.gov/firegis>).
30. Ensure fiscal responsibility and accountability in planning and expenditures.
31. 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.
32. Effectively communicate the role of wildland fire to internal and external agency audiences.
33. Complete trespass actions when unplanned human-caused ignitions occur.
34. Ensure compliance with National and Regional policy and direction for prescribed fire activities and ensure that periodic reviews and inspections of the prescribed fire program are completed.
35. Ensure all fire management actions and activities are consistent with those contained in the current Fire Management Plan and associated environmental compliance documentation.

36. Ensures compliance with DOI Wildland Firefighter Medical Standards processes to include Risk Mitigation/Waiver processes.



Superintendent, Barclay C. Trimble
Mammoth Cave National Park (MACA)



Date

Zone Fire Management Officer, Travis Neppi
Natchez Trace Parkway (NATR)

Date

Unit Fire Coordinator Delegation of Authority

The unit fire coordinator will be the primary point of contact for all wildland fire operations at MACA.

Program Management

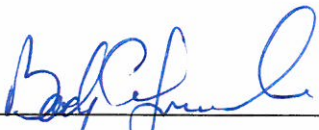
- The UFC will notify the Zone Duty Officer (DO) as soon as possible of any fire occurrences, proposed fire restrictions or closures, or fire support actions needed.
- The UFC will submit individual fire reports (DI-1202) and fire situation reports to the Zone Fire Program Management Assistant (FPMA).
- The UFC will update the DO with Firefighter availability as needed based on the MACA Step-Up Plan. Firefighters' supervisors must first approve the individual's availability.
- The UFC will be the primary point of contact for creating and revising prescribed fire plans and the Fire Management Plan, and will provide timely responses to requested information.
- The UFC is responsible for completing the appropriate annual preparedness reviews as required by the Interagency Standards for Fire and Aviation Operations. The Zone staff will provide assistance as needed.

Training and Incident Qualification and Certification System

- The UFC will coordinate with the Zone FPMA regarding all IQCS records. This includes submitting personnel training and experience records, requesting issuance of position task books, and requesting Incident Qualification Cards (Red Card).

Prescribed Fire

- The UFC will coordinate prescribed fire prep work completed by MACA staff, and will ensure that it is done to the required specifications as agreed upon with Zone staff.



Superintendent, Barclay C. Trimble
Mammoth Cave National Park (MACA)

9/24/18

Date

Unit Fire Coordinator, Lora Peppers
Mammoth Cave National Park (MACA)

Date

Mammoth Cave National Park /
Mississippi River Fire Management Zone
Inter-park Agreement Signature Page



Barclay C. Trimble
Superintendent, MACA

9/14/18

Date

Lora Peppers
Unit Fire Coordinator, Chief Ranger, MACA

Date

Travis Neppi
Zone Fire Management Officer

Date

Vacant
Fire Management Specialist, Prescribed Fire/Fuels

Date

Robert Vick
Zone Fire Operations Specialist

Date

Bob Boensch
Zone Fire Ecologist

Date

Scott Johnson
Zone Fire Program Management Assistant

Date

F-2: *Initial Response Procedures*

An Initial Response Plan will not be developed for MACA. All fire response will be determined by the Incident Commander in coordination with the MACA Unit Fire Coordinator and Zone Duty Officer after the fire has been sized up and a complexity analysis has been completed. Please refer to Section 3.1 of the Fire Management Plan for more information on Wildfire Response.

National Park Service and Interagency resources may assist with fire response at MACA, provided that they adhere to agency policies or existing agreements. Please refer to Appendix J for Cooperative Agreements with local fire departments.

A fire danger operating plan is available at KICC and is briefly discussed in Appendix F-3. A Step-Up Plan has been completed to facilitate preparedness actions that will improve fire response. Please refer to Appendix F-4 for the MACA Step-Up Plan.

F-3: *Kentucky Fire Danger Operating Plan*

MACA is a member of the NPS Mississippi River Fire Management Zone. Dispatching for MACA resources is accomplished through the Kentucky Interagency Coordination Center (KICC - 859-745-3171 or 3172) MACA is a signatory on the *Kentucky Interagency National Fire Danger Operating Plan*, a copy of which is on file at the park.

DRAFT

F-4: *MACA Step-up Plan*

MACA Step-up Plan

The MACA step-up plan is revised annually as part of the annual fire management plan update

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.

The unit'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.

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.

There are five staffing classes that describe escalations in preparedness responses to increased fire danger. NFDRS Fuel Model E (Hardwood Litter-Fall) has been selected as the most representative fuel type for the periods of highest fire danger. Staffing levels will be determined based on a matrix of Burning Index and 100 Hour Fuel Moisture levels. This matrix was developed by the Kentucky Fire Danger Committee and is part of the Kentucky Interagency Fire Danger Operating Plan. The Staffing Class is determined using the West Fire Danger Rating Area. The Step Up Plan indicates the actions to be taken for each of the five staffing classes.

Implementing this Step-Up Plan will require continued coordination between the BISO Superintendent, Unit Fire Coordinator (UFC) and the Mississippi River Fire Management Zone (MRZ) Duty Officer (DO) and Fire Management Officer (FMO). For the purposes of this plan, the term "Firefighters" will be used to reference employees with current NWCG red card fireline qualifications.

Staffing Class

WEST FDRA SPRING

BURNING INDEX	100 HOUR FM					
		22+	19-21	16-18	12-15	<=12
	0-7	I	I	I	II	II
	8-17	I	II	II	II	III
	18-27	II	II	III	III	IV
	28-37	II	III	III	IV	IV
	38+	III	III	IV	V	V

WEST FDRA FALL

BURNING INDEX	100 HOUR FM					
		21+	19-20	17-18	15-16	<=14
	0-7	I	I	I	II	II
	8-17	I	II	II	II	III
	18-27	II	II	III	III	IV
	28-37	II	III	III	IV	IV
	38+	III	III	IV	V	V

Preparedness Actions	Staffing Class				
	1	2	3	4	5
Administrative					
The MRZ DO is established daily	X	X	X	X	X
MRZ DO or designee will monitor fire weather forecasts and NFDRS indices	X	X	X	X	X
Increase one staffing class when significant NPS or cooperator resources are committed to an uncontained wildfire	X	X	X	X	X
Increase one staffing class if special events significantly increase human-caused risk, during SC 4 when lightning is forecast, during periods when the area is in drought, and during periods when fuel loading is heavier than normal	X	X	X	X	X
Submit situation reports to appropriate Interagency Coordination Center	X	X	X	X	X
Staff					
Notify the MRZ DO of any fire starts at MACA. The DO will help determine the appropriate fire response	X	X	X	X	X
Firefighters have PPE and fire gear readily available while on duty	X	X	X	X	X
Firefighters have 14 day bag assembled if approved to be listed as available for fire assignments	X	X	X	X	X
Availability of Firefighters is relayed to the MRZ DO			X	X	X
Extend Firefighters work weeks and/or tours of duty if deemed necessary after consulting with the MRZ DO or FMO				X	X
Assign Firefighters to patrol if deemed necessary after consulting with the MRZ DO or FMO			X	X	X
MRZ DO or FMO may place resource orders for additional staffing coverage				X	X
Equipment					
Availability and status of fire equipment is relayed to the MRZ DO			X	X	X
Staff fire equipment if determined necessary after consulting with the MRZ DO or FMO			X	X	X
Prevention Activities					
Post appropriate fire prevention signs at campgrounds and public use areas and key visitor use facilities				X	X
Interpretation and law enforcement staff will include fire messages in programs and contacts			X	X	X
Increase patrols by fire and law enforcement staff if deemed necessary after consulting with the MRZ DO or FMO				X	X

Issue news release and/or Public Service Announcements if deemed necessary after consulting with the MRZ DO or FMO				X	X
Implement fire restrictions on open fires and burning (may include stoves) if the heightened fire danger is forecast for an extended period of time				X	X
The MRZ FMO may request an emergency pre-suppression account if heightened fire danger is forecast for an extended period of time				X	X

DRAFT

F-5 Job Hazard Analysis for Fire Management Program

Job hazard analyses for the fire management program are located in the Mississippi Zone fire management office and the MACA Fire Google Drive.

DRAFT

F-6: *List of Current Wildland Fire Qualified MACA Personnel*

A current list of MACA wildland fire qualified personnel is maintained by the Zone FPMA. Copy of the list is at the Zone Fire Management Office.

DRAFT

F-7 Structure Protection Inventory and Needs

The following table summarizes a facilities wildfire risk assessment for MACA.

F-7 MACA Structures and Assessment Ratings and Scores

Administrative Buildings Community

Building Name	FMSS	Rating	Score
Bldg 028, CCC Constructed Housing Unit	5948	Low	42
Bldg 029, CCC Constructed Housing Unit	5858	Moderate	57
Bldg 030, CCC Constructed Housing Unit	5952	Low	35
Bldg 031, CCC Constructed Housing Unit	5949	Moderate	61
Bldg 032, CCC Constructed Housing Unit	5951	High	63
Bldg 033, CCC Constructed Housing Unit	5861	Moderate	50
Bldg 035, Administrative Annex	47317	High	65
Bldg 037, Interpretation & Fee Program Offices	5849	Low	33
Bldg 038, Piedmont Network Office (Supt Office)	5850	Low	39
Bldg 039, External Programs Office	5857	Low	35
Bldg 040, Administration & Human Resource Office	5855	Low	38
Bldg 041, Superintendents Office (Current Ranger Station)	5856	Low	38
Bldg 042, Environmental Education Office	5854	Low	37
Bldg 059, Automotive Mechanical Garage	5825	Low	29
Bldg 060, Paint Shop (Oil House)	5826	Low	36
Bldg 061, Storage Shed North End of Utility Area	50074	Moderate	55
Bldg 063, Facility Management Office	50075	Low	33
Bldg 064, Fitness Center/Evidence Locker	5837	Low	35
Bldg 065, Craft Shop	5846	Low	33
Bldg 095, Procurement Building and Warehouse	5833	Moderate	55
Bldg 096, Rangers Office and Training Center (CUPN & TC)	5848	Low	40
Bldg 102, Equipment Storage Building- Salvage Yard	5842	Low	44
Bldg 310, Projects Storage Building	5829	Moderate	54
Bldg 312, Oil and Gas Storage	6050	Low	24
Bldg 313, Science Resource Office (old warehouse)	5830	Low	25
Bldg 318, Rangers Storage Shed (Veh Wash House)	5782	Low	36
Bldg 319, Lumber Storage	5832	Low	33
Bldg 328, YCC Building	5828	Low	32
Bldg 333, Curatorial Storage	5843	Low	33
Bldg 403, Generator Building at Training Center (Generator only)	49134	Moderate	48
Bldg 404, Garage in Residence Area	49133	Moderate	61
Bldg 406, Raptor Aviary	46908	Moderate	48
Bldg 407, Phone Building at Seasonal Quarters	49136	Moderate	50
Bldg 413, Lift Station - Permanent Housing Area	49139	High	64
Bldg 445, Repeater House	91959	Moderate	59

Bldg 448, CEA Building	112706	Moderate	60
Bldg 450, Interpretation's Metal Storage Shed	226297		
Q-00000034 Bldg 034, Residence #34 (LE)	5860	High	72
Q-00000044 Bldg 044, Residence #44 (VIP House)	5852	Moderate	60
Q-00000097 Bldg 097, Seasonal Apartment #97	5966	Low	35
Q-00000098 Bldg 098, Seasonal Apartment #98	5965	Moderate	57
Q-00000099 Bldg 099, Seasonal Apartment #99	5975	Moderate	45
Concession Warehouse (Park storage Bldg 55)	49095	High	72
Boat Storage		Moderate	56
Trasporation Break Room (Bus Shack)		Low	36
Bldg 300 Concession Warehouse	49096	High	65
Bldg 043 Eastern National (CUPN)	5853	Moderate	56
Carport 3		Moderate	56
Bldg 052 Fire Cache	5824	Moderate	61
Carport 1		Moderate	56
Boat Storage 1		Moderate	56
Carport 2		Moderate	56
Recycling Shelter		High	64
Raptor Enclosure near Admin Office		Moderate	57
Storage Garage		Moderate	59
Old Chicken Coop		High	70
Bldg 301 Conc Storage current Boat Storage SRM	51433	High	65

Job Corps Community

Building Name	FMSS	Rating	Score
GRON Picnic Shelter		Low	29
GRON Storage Shed Bldg 17		Low	29
GRON Sewer Plant		Moderate	50
Luggage storage bldg 21		Low	25
Vocation Bldg #5		Low	25
Education Bldg #3		Low	28
Medical/Vocation Bldg #14		Low	25
Picnic Shelter		Low	29
Arts & Crafts Bldg #20		Low	25
Sewer Plant		Low	44
Garage		Low	40
Raider Dormitory Bldg #4		Low	28
Sewer Plant		Moderate	50
Carpentry Vocation Bldg #6		Low	25
Storage/Support Bldg #13		Low	30
Sewer Plant		Moderate	47
Admin/Medical Bldg #1		Low	28
Storage Garage		Low	28
Warehouse Bldg #10		Low	25
Storage Building		Low	28
Sewer Plant		Moderate	50
Welding Vocation Bldg #8		Low	27
Gym Bldg #9		Low	27
Sewer Plant		Moderate	50
Ranger Station Bldg #11		Low	28
Shirley Dormitory Bldg #7		Low	28
Picnic Shelter		Low	32
Vocational Office Bldg #15		Low	32
Flammable Storage Bldg #16		Low	25
Compactor Bldg		Low	28
Lumber Storage Bldg #18		Low	43
Garage		Low	28
Dugout		Low	43
Greenhouse Bldg #22		Low	28
Dugout		Low	36
Food Service Bldg #2		Low	28
Picnic Shelter		Low	32

Maple Springs Community

Building Name	FMSS	Rating	Score
Bldg 022, Maple Springs Kitchen/Classroom	49126	High	64
Bldg 322, Maple Springs Barn	5759	Moderate	62
Bldg 411, Maple Springs Bat House	46906	High	70
Bldg 441, Vault Restroom Maple Springs CG	88707	Moderate	53
Bldg 442, Vault Restroom Maple Springs CG	88709	Moderate	53
Bldg 443, Vault Restroom at Maple Springs Trail	88705	Low	40
Q-00000021 Bldg 021, Maple Springs Quarters	5756	Moderate	49
Q-00000306 Bldg 306, Maple Springs Bunkhouse	49124	Red	77

Outlying Buildings

Building Name	FMSS	Rating	Score
Bldg 019, Frozen Niagara Shelter	49132	High	65
Bldg 024, Three Springs Pump House	6001	High	93
Bldg 025, Bransford Spring Pump House	6055	High	78
Bldg 026, Sewage Disposal Plant Chlorinator Hse	51437	High	108
Bldg 045, Mt. McKinley Cave Restroom (Surface Structure)	5707	Moderate	61
Bldg 046, Pump House, Mt. McKinley	5769	Moderate	62
Bldg 073, Crystal Cave Ticket Office	6042	Moderate	62
Bldg 074, Floyd Collins House	6044	High	75
Bldg 203, Elevator Building	5986	Low	39
Bldg 307, Great Onyx Meadows Shelter 1- Fire Place	49135	High	84
Bldg 308, Picnic Shelter-Houchins Ferry	5725	Moderate	52
Bldg 315, Houchins Ferry Operator House	50073	High	63
Bldg 321, Shelter for New Discovery Entrance	6054	High	80
Bldg 323, Houchins Ferry Storage	50078	Moderate	53
Bldg 400, Doyle Valley Rapelling Building	49098	High	69
Bldg 412, Lift Station - Sunset Point	49142	Moderate	50
Bldg 414, Lift Station - Point X	49141	Moderate	47
Bldg 427, Good Spring Baptist Church	51269	High	78
Bldg 428, Joppa Missionary Baptist Church	51267	Moderate	49
Bldg 429, Mammoth Cave Baptist Church	51268	Moderate	61
Bldg 439 - Air Quality Station #2	51543	Low	36
Bldg 447, Carmichael Shelter	112705	High	75
Bldg 451 Wondering Woods Bat Hibernaculum	235417		

Visitor Center & Lodge Community

Building Name	FMSS	Rating	Score
Bldg 001, Earth House	5953	Moderate	51

Bldg 005, Visitor Center/Admin	6153	Low	21
Bldg 006, Sunset Point Hose House	51279	High	73
Bldg 008 Deluxe Guest Cottage	49373	Moderate	48
Bldg 009 Deluxe Guest Cottage	49377	Moderate	52
Bldg 010 Deluxe Guest Cottage	49398	Moderate	48
Bldg 011 Deluxe Guest Cottage	49401	Moderate	48
Bldg 012 Deluxe Guest Cottage	49406	Moderate	48
Bldg 013 Deluxe Guest Cottage	49419	Moderate	48
Bldg 014 Deluxe Guest Cottage	49421	Moderate	48
Bldg 015 Deluxe Guest Cottage	49423	Moderate	48
Bldg 016 Deluxe Guest Cottage	49424	Moderate	48
Bldg 017 Deluxe Guest Cottage	49427	Moderate	48
Bldg 018, Amphitheater	6152	High	67
Bldg 048, Comfort Station Campground loop D	47881	Moderate	53
Bldg 049, Comfort Station, Campground Loop A	47879	Low	39
Bldg 050, Comfort Station Campground Loop C	49004	Moderate	46
Bldg 051, Comfort Station Camp Ground Loop B	49003	Moderate	50
Bldg 067 Woodland Cottage	49243	Moderate	46
Bldg 068 Woodland Cottage	49295	Moderate	46
Bldg 069 Woodland Cottage	49296	Moderate	46
Bldg 070 Woodland Cottage	49297	Moderate	46
Bldg 071 Woodland Cottage	49298	Moderate	46
Bldg 072 Woodland Cottage	49299	Moderate	26
Bldg 073, Woodland Cottage	49300	Moderate	46
Bldg 074 Woodland Cottage	49301	Moderate	46
Bldg 075 Woodland Cottage	49304	Moderate	46
Bldg 076 Woodland Cottage	49324	Moderate	46
Bldg 077 Woodland Cottage	49337	Moderate	46
Bldg 078 Woodland Cottage	49339	Moderate	46
Bldg 079 Woodland Cottage	49344	Moderate	46
Bldg 080 Woodland Cottage	49346	Moderate	46
Bldg 081 Woodland Cottage	49347	Moderate	46
Bldg 082 Woodland Cottage	49349	Moderate	46
Bldg 083 Woodland Cottage	49351	Moderate	46
Bldg 084 Woodland Cottage	49358	Moderate	46
Bldg 085 Woodland Cottage	49361	Moderate	46
Bldg 086 Woodland Cottage	49367	Moderate	46
Bldg 087 Woodland Cottage	49369	Moderate	46
Bldg 101, New Train Shelter	6135	Low	23
Bldg 104, Visitor Center Shelter A	242139	Low	21
Bldg 105, Visitor Center Shelter B	242140	Low	21

Bldg 106, Visitor Center Lantern Shed	242141	Low	17
Bldg 107, Visitor Center Kiosk	242143	Low	21
Bldg 108 Visitor Center Wild Cave Tour Shelter (Current Picnic Shelter)	242283	Moderate	52
Bldg 202 Sunset Lodge (10 Units)	49214	Moderate	45
Bldg 206 Sunset Lodge (10 units)	49240	Moderate	45
Bldg 208 Camp Store	6073	Low	21
Bldg 303 Picnic Shelter-EE Classroom	5960	Low	33
Bldg 304 Picnic Shelter, Upper Area	5957	Low	36
Bldg 305 Comfort Station, Picnic Area	47877	Low	32
Bldg 316 Picnic Shelter (Enclosed), Lower Picnic Area	5962	Low	29
Bldg 317 Comfort Station in Campground- Loop B Handicap	49091	Moderate	50
Bldg 324 Hotel Staff Lodging Dormitory	49212	Moderate	52
Bldg 415 Lift Station - Hotel Cottages	50542	Moderate	62
Bldg 425 Concession Dog Kennel	49093	Moderate	52
Bldg 431 Cat Kennel	51278	Moderate	49
Bldg 433 Windstream Telephone	51328	Moderate	55
Bldg 437 Campground Kiosk	51438	Low	36
Hotel Restaurant Complex	49238	Low	40

F-8: *Transfer of Command Package*

Agency Administrator's Briefing to Incident Management Team

General Information

Incident Name

Approx. Size @

Date

Time

Location

Date of Start

Overhead and Suppression Resources Currently on Incident And Present IC

General Fire Situation in Area

Resources Ordered

Other Organizations Requiring Coordination (Area Command, Expanded Dispatch, MAC, Buying Team, Payment Team, Tribal Government, Other Agency Jurisdictions)

Law Enforcement/Ongoing Investigations

Financial Considerations/Limitations

Fire Behavior Considerations

Weather Situation

Fuel Types

Topography

Fire Behavior

Appropriate Management Response Considerations Established Through and for the WFDSS Development Priorities

Environmental Constraints

Utility Corridors

Air Operations

Effectiveness

Hazards

Air Space Restrictions

Airports, Heliports, Helispots

Suppression Policies

Other

Environmental, Social, Political, Economic, and Cultural Resource Considerations

Environmental

Social

Political

Economic

Cultural Resource

Communications

Radio

Telephone

Electronic (Computers)

Expanded Dispatch

Procurement Arrangements

Agreements

Tribal Government

Infrared Status

Security Considerations

Incident Management Direction and Considerations

Wildland Fire Situation Analysis

Delegation of Authority

Agency Administrator's Representative

Incident Business Advisor

Resource Advisor

Suppression Priorities

Forest Supervisor/Incident Commander Contact

Time

Process

News Media and Incident Information Management

Training Considerations

Interagency/Private Property Considerations (costs, etc.)

Mop Up Standards

Rehabilitation Considerations

Initial Attack Responsibility

Support to Other Incidents

Disposition of Unit Resources on the Incident

Close Out and Debriefing

Human Welfare

Safety

Health

Civil Rights

Distribute Support Documents

WFDSS (Common WFDSS if Unified Command?)

Delegation of Authority Letter

Map & Photos

Fire Management, Pre-Attack, Land Management Plans

Weather Forecast

Special Management Area Documents

Phone Directory, Fax Number

Agreements

Incident Status Summary (ICS - 209)

Business Management Documents

Payments (Vendors and Casuals)

Claims

Injury Compensation

Incident Business Guidelines (ISOPS)

F-9: *Yearly Readiness Checklist*

In order to facilitate fire preparedness MACA park staff and Zone fire staff utilize yearly readiness checklists. The checklists are found at:

https://www.nifc.gov/policies/pol_ref_intgncy_prepcheck_NPS.html

DRAFT

Appendix G: *Communication and Education Plan*

A Communication and Education Plan for MACA does not currently exist. This is a future project.

DRAFT

Appendix H: *Fire Prevention Plan*

The park's goal will be to actively integrate fire prevention and the management of wildland fire for resource and other objectives in park operations. The park embraces the goal of wildland fire prevention programs of preventing unwanted human-caused wildfires.

As a long-range goal Mammoth Cave NP will work proactively to provide public education on the natural role of fire on the landscape and the prevention of unwanted wildfires. The park will distribute messages based on current and expected fire danger. In the humid climate of south central Kentucky, fire prevention messages become important during drought conditions and as the wildland urban interface expands along park borders. The park will work to insure public understanding of fire as a natural part of the ecosystem and as a restoration tool. The park will utilize recommendations displayed in RM-18 – Prevention as a guide for development of their prevention program.

Appendix I: Duty Officer Manual

October 1, 2018

[MS RIVER ZONE DUTY OFFICER (DO) STANDARD OPERATING PROCEDURES]

FY19 Mississippi River Zone Fire Management Duty Officer (DO) General Responsibilities

Policy Statement (From Interagency Standards for Fire and Aviation Operations)

Fire Management Officers (FMO) are responsible to provide fire Duty Officer (DO) coverage. DO responsibilities may be performed by any individual with a signed Delegation of Authority from the local Agency Administrator. The MS River Zone DO delegation will be signed by the NATR Superintendent and will cover all NPS units within the Zone. The required duties for all DOs are:

1. Monitor unit incident activities for compliance with National Park Service (NPS) safety policies.
2. Coordinate and set priorities for unit suppression actions and resource allocation.
3. Keep Agency Administrators, suppression resources and Information Officers informed of the current and expected situation.
4. Plan for and implement actions required for future needs.
5. Document all decisions and actions.

DOs will provide operational oversight of these requirements as well as any specific duties assigned by the FMO through the DO Standard Operating Procedure (SOP). DOs will not fill any ICS incident command functions connected to any incident. In the event that the DO is required to accept an incident assignment, the FMO/acting FMO will ensure that another authorized DO is in place prior to the departure of the outgoing DO. Specific DO qualifications may be assigned and tied to Staffing Class (SC) within the unit Step-Up Plan.

DO General Responsibilities:

- The DO staffing period is a 24 hour time period. The DO will be available by phone or radio for a 24-hour period beginning at 0800 and ending at 0800 the following day. The DO is also responsible for notifying the FMO if they become unavailable for any reason. If a new DO is needed and a transition occurs this must be communicated to all personnel on the DO notification list.
- The DO will serve as the primary point of contact for fires within the Zone.
- The DO will notify the FMO of any new fire starts within the Zone.
- Request FIRECODE and account number in collaboration with Zone Fire Program Management Assistant (FPMA) and communicate to Unit Fire Coordinators (UFC).
- Request aerial recon and preposition resources as necessary.
- Extend Initial Response staffing as needed based on the approved Step-up Plan. Brief personnel as soon as extended staffing decisions are made.

- During periods of multiple wildfire occurrences, the DO will prioritize incidents, allocate and assign resources.
- Assist in the briefing of Incident Management Teams.
- Notify fire management personnel and Agency Administrators of any accidents occurring on the Zone.
- Coordinate off District assignments for Zone staff with respective coordination centers.
- Assist FMO in developing severity requests.
- Order/demobilize out of area resources as fire response needs fluctuate.
- Coordinate with out of area resources: keep them informed of release dates and times.
- Visit ongoing fires as the agency representative to ensure safety practices and objectives are being met, as available.
- Solicit feedback from operational and dispatch resources in order to gauge the safety, effectiveness, and efficiency of fire/dispatch operations.
- Conduct AARs.
- Assist dispatchers in complex situations requiring subject matter expertise.
- The DO will assist Public Affairs Officers (PAO) for any media or public affairs issues. All media or public affairs issues will be referred to the respective PAO.
- The DO will also track Administratively Determined (AD) personnel who go out on incident through the ROSS.
- As requested by the Burn Boss, the DO will communicate relevant information to the management team.
- Track and file all Resource Orders within the MS River Zone FPMA Office.
- Ensure fire reports are documented within the Wildland Fire Management Information (WFMI) system in collaboration with the FPMA.

Appendix J: Cooperative and Interagency Agreements

MACA is not adequately staffed to manage all wildland fire that may occur at the park. Assistance from local cooperators may be required. MACA has entered into general agreements with local volunteer fire departments in order to more effectively and efficiently manage the park's wildland fire program. In addition, MACA may use existing NPS agreements, including the Southeast Region agreement with The Nature Conservancy, and Interagency Agreements with the U.S. Forest Service and U.S. Fish and Wildlife Service.

Agreements with VFDs

1. Kyrock VFD (has type VI engine) - Contact Edmonson County Dispatch 270-597-2729
2. Lincoln VFD - Contact Edmonson County Dispatch 270-597-2729
3. Park City VFD (has structure engine) - Contact Glasgow Police Dispatch 270-651-5151

The fire department having responsibility for fire suppression in the area of a reported fire will in all likelihood respond to incidents within their areas of jurisdiction (Fire District), as will the State of Kentucky Division of Forestry. The Kentucky Division of Forestry and the local responding fire department will manage wildfires occurring on private lands adjacent to National Park Service lands. The National Park Service, with assistance from cooperators will manage wildfires occurring on NPS lands.

The Park may directly request assistance for support from the Kentucky Division of Forestry or other agencies by contacting the Local Dispatch Center. Assistance from the various fire departments can be requested by calling the appropriate fire department.

Interagency meetings at the local level are held late Fall and early Spring to discuss topics of mutual concern and to coordinate prescribed fire and wildfire suppression activities during the upcoming fire season.

GENERAL AGREEMENT

G5460150014

BETWEEN

**THE UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE, SOUTHEAST REGION
AND
THE NATURE CONSERVANCY**

This Agreement is entered into by and between the National Park Service (hereinafter "NPS"), United States Department of the Interior, acting through the Southeast Regional Fire Management Officer (hereinafter "RFMO"), and The Nature Conservancy, acting through the Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, and Tennessee Chapters (hereinafter "TNC").

ARTICLE I – BACKGROUND AND OBJECTIVES

The primary objective of this Agreement is to facilitate the cooperation of the two parties in the use of prescribed fire on property owned and managed by the above named partners, and to provide for the sharing of information, personnel and resources concerning prescribed burning and ecosystem restoration techniques, when personnel, funding, cooperators policies, goals, and laws permit. In many instances prescribed burning programs by the parties are limited by personnel, equipment, or local weather. It is the intent of this cooperative effort that by uniting skills, tools, and abilities that the combined burning accomplished will exceed the total of the respective parties on their own.

All parties desire to promote the use of prescribed fire to manage environmental resources and to promote public understanding of the benefits of prescribed fire. It is to the mutual benefit of the parties and the public to share resources and expertise to maintain or restore wildlife habitats, ecosystems, and endangered or threatened species regardless of land ownership.

In addition to the cooperative prescribed fire efforts, partners to this agreement will make formal or informal training opportunities available to one another in the form of classroom instruction as space allows, and opportunities for additional practical experience during periods of increased fire danger or fire incidents for the purpose of attaining task book experience and increased fire qualifications.

ARTICLE II – AUTHORITY

This General Agreement is entered into pursuant to the following authorities:

Title 42 - The Public Health and Welfare – Effective date, January 3, 2012

Chapter 15A - Reciprocal Fire Protection Agreements

Subchapter I - Protection of United States Property

42 U.S.C. 1856a (a) Reciprocal Fire Protection Agreements

16 USC 594: Protection of timber owned by United States from fire, disease, or insect ravages. Effective September 22, 2015

54 USC 100101: Promotion and regulation – Effective September 22, 2015

Directors Order 20: Agreements – Effective July 23, 2003

ARTICLE III – STATEMENT OF WORK:

A. THE REQUESTING PARTY SHALL:

1. Give prior notice to other parties when a prescribed burn will be conducted and obtain permission for specific actions to be taken on lands owned by other parties.
2. Assume all responsibilities for prescribed burns conducted on its property or property for which it has management authority, including:
 - Preparing burn prescriptions
 - Preparing Burn Plan
 - Preparing contingency plans
 - Preparing smoke management and mitigation plans
 - Preparing site for burning and managing the burn
 - Ensuring that National Environmental Policy Act compliance is completed as required
3. Supply, prior to the burn, the following to other parties providing assistance with the burn:
 - Burn operations - plan and site map(s). Burn plan and maps will follow agency or TNC standards. Burn prescription will be provided if requested.
 - Safety and operational briefings
 - Radio access for each person as deemed appropriate by the Burn Boss
4. Make every effort to have its own Certified Burn Boss in charge of the burn. However, if the requesting party is unable to provide a qualified Burn Boss,

they will provide a representative who will serve in a unified command role with a certified Burn Boss from another party.

5. Manage any public relations and media contacts associated with any burning operations under this General Agreement.

B. THE ASSISTING PARTIES SHALL:

1. Agree to work under the direction of the requesting party or their designee(s).
2. Perform their duties in a safe and efficient manner.

C. EACH PARTY SHALL:

1. Ensure that any activity occurring on all covered entity's lands is in strict compliance with its rules, regulations and policies.
2. Ensure that safety of personnel and the public is the highest priority for all activities. Landowners shall close trails, roads and other facilities during prescribed burns as necessary to protect employees, volunteers and the public.
3. Take measures necessary to protect rare plants and animals within the prescribed burn area.
4. Provide personnel, equipment, and other resources for assistance in conducting prescribed fire as requested and if available. Release of personnel and equipment will be at the discretion of the affected party depending on station workloads, priorities, and fire danger. Personnel, equipment and resources may be used for:
 - Technical assistance including preparation or review of fire management plans
 - Prescribed burn plans.
 - Pre-burn preparations including vegetation and fuel load sampling, control line construction and maintenance, environmental monitoring, and fuels manipulation
 - Burn implementation including project supervision, ignition, holding, fire behavior and weather monitoring, and mop-up
 - Post-burn monitoring and evaluation
 - Training of staff and volunteers in fire management, invasive species control and other areas of natural resource management and stewardship
5. Ensure that all personnel assigned to fire activities are appropriately qualified to complete the assigned tasks. At a minimum training shall include National Wildfire Coordinating Group (NWCG) Courses:
 - S-130 – Basic Wildland Fire Suppression

- S-190 – Introduction to Wildland Fire Behavior
 - I-100 – Introduction to the Incident Command System
 - Standards For Survival
6. Be responsible for providing its own personal protective equipment (PPE) for its participating employees and volunteers. Required PPE minimums are:
 - Fire resistant shirt and pants
 - Hardhat
 - Leather gloves
 - Leather boots
 - Goggles
 - Fire shelter (per agency standard)
 - Hand held radio on a common frequency
 7. Costs for any rented or contracted private sector resources (equipment or personnel) will be paid for by the party ordering those resources.
 8. Provide for salary or wage costs of its own employees and operation and maintenance of its own equipment. Each party agrees that it will be responsible for repairs to its own equipment which may be damaged through negligent acts or normal wear and tear during the course of a prescribed burn or other land management activities.
 9. Mutually agree upon the party responsible for providing the prescribed burn boss and the prescribed burn plan. All parties will be given an opportunity to assist in the development and review of prescribed burn plans. Contingency planning in the event of an escaped fire will be an essential element of each plan.
 10. Honor each party's prescribed burn qualifications standards. TNC employees will adhere to Conservancy standards (PMS 310-1); NPS employees will adhere to NWCG standards.
 11. Designate a chief-of-party for the assisting party's employees and equipment. The chief-of-party will work closely with the prescribed burn boss. Prior to the burn, if the chief-of-party determines that the proposed burn is unsafe or has serious concerns about the advisability of burning, and is unable to reach a satisfactory agreement with the burn boss to rectify the situation, he or she retains the option of withdrawing the assisting party's resources.
 12. Appoint a project officer responsible for implementation of this agreement.
 13. Inform each other of upcoming training opportunities, conduct training jointly where mutual interests and benefits exist, and coordinate and give assistance to the other by providing facilities and instructors, as appropriate.

14. Agree that it will be responsible for any and all risks of personal injury and property damage attributable to the negligent acts or omissions of itself and its officers, employees, and agents acting within the scope of their employment to the extent provided by law. Each party agrees that it will not be responsible for the acts of the other party and the results thereof. Nothing in this agreement shall be construed as an indemnification by one party of the other for liabilities to third persons for property loss or damage or personal injury arising out of and during the performance of this agreement, or arising from any other action that may arise as a result of this agreement. Any claims or any liabilities for property loss or damage or personal injury by a party or its officers, employees, and agents, arising out of and during the performance of this agreement shall be resolved according to applicable law.
15. Not be required to obligate or transfer any funds. Specific work projects or activities that involve the transfer of funds, or property among the various agencies and offices will require execution of separate agreements and be contingent upon the availability of appropriated funds. Such activities must be independently authorized by appropriate statutory authority. This General Agreement does not provide such authority. Negotiation, execution, and administration of each such agreement must comply with all applicable statutes and regulations

ARTICLE IV – TERM OF AGREEMENT

This General Agreement is effective from October 1, 2015 and will extend through September 30, 2020, unless it is terminated earlier by one of the parties pursuant to Article IX that follows. The agreement will be reviewed every two years and may be extended, renewed, supplemented or amended only when agreed to in writing by the NPS and TNC.

ARTICLE V – KEY OFFICIALS

- A. Key officials are essential to ensure maximum coordination and communication between the parties and the work being performed. They are:
 1. **For the NPS:**
 - a. Shawn Nagle
Regional Fire Management Officer
Southeast Region, NPS
100 Alabama St. SW
1924 Building
Atlanta, GA 30303
 - b. David Loveland

Fire Management Officer
Great Smoky Mountain NP
865-436-1247

c. Travis Neppl
(acting) Fire Management Officer
Natchez Trace Parkway
662-680-4028

d. Alton Anderson
Fire Management Officer
Cumberland Island NS
912-464-9453

e. Jackson Weer
(acting) Fire Management Officer
Everglades NP
305-242-7057

f. Jordan McKnight
Fire Management Officer
Big Cypress NP
406-544-7568

2. **For TNC**

a. Keith Tassin--Alabama
Director of Terrestrial Conservation
205-251-1155
ktassin@tnc.org

b. Zach Prusak--Florida
Central Florida Conservation Director
407-682-3664
zprusak@tnc.org

c. Erick Brown--Georgia
Fire Manager
404-253-7219
Erick_brown@tnc.org

d. Chris Minor--Kentucky
Director of Land Management/Fire Manager
606-3656-7223
cminor@tnc.org

- e. McRee Anderson and/or Bill Rivers—Louisiana and Mississippi
McRee Anderson, Director of Fire Restoration Program
501-804-3250
wanderson@tnc.org
Bill Rivers, CGC Stewardship Director
985-809-1414
brivers@tnc.org
- f. Margit Bucher—North Carolina
Fire Manager
919-794-4368
mbucher@tnc.org
- g. Tom Dooley—South Carolina
SC State Fire Manager
843-937-8807
tdooley@tnc.org
- h. Margit Bucher and Katherine Medlock—Tennessee
Katherine Medlock, East Tennessee Program Director
865-531-5883
kmedlock@tnc.org

- B. **Changes in Key Officials** – Changes to key officials will be communicated to all effected parties.

ARTICLE VI – PRIOR APPROVAL

Prescribed burns on NPS lands require environmental review under the National Environmental Policy Act. No burning on NPS lands will be allowed without programmatic NEPA compliance in place, an approved fire management plan, an approved burn plan and a current signed agency administrator authorization has been issued.

ARTICLE VII – REPORTS AND/OR OTHER DELIVERABLES

Not applicable

ARTICLE VIII – PROPERTY UTILIZATION

Unless otherwise agreed to in writing by the parties, any property furnished by one party to the other will remain the property of the furnishing party and will be returned at the completion of project or at the request of the furnishing party.

ARTICLE IX – MODIFICATION AND TERMINATION

- A. Any party may terminate this Agreement by providing the other parties with thirty (30) days advance written notice. In the event that one party provides the other parties with notice of its intention to terminate, the parties will meet promptly to discuss the reasons for the notice and to try to resolve their differences.

ARTICLE X – STANDARD CLAUSES

A. Civil Rights

1. During the performance of this Agreement, the participants agree to abide by the requirements of Executive Order 11246, as amended: Title VI of the Civil Rights Act of 1964 (78 Stat. 252:42 US 200d); and with all other federal laws and regulations prohibiting discrimination on grounds of race, color, national origin, handicap, religion, or sex in employment and in providing facilities and services to the public. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, sexual orientation, national origin, disabilities, religion, age, or sex.

B. Public Information Release – Publications of Results of Studies

No party will unilaterally publish a joint publication without consulting the other parties. This restriction does not apply to popular publication of previously published technical matter. Publications pursuant to this Agreement may be produced independently or in collaboration with others; however, in all cases proper credit will be given to the efforts of those parties contributing to the publication. In the event no agreement is reached concerning the manner of publication or interpretation of results, any party may publish data after due notice and submission of the proposed manuscripts to the others. In such instances, the party publishing the data will give due credit to the cooperation but assume full responsibility for any statements on which there is a difference of opinion.

C. NPS Appropriations

Pursuant to 31 U.S.C. § 1341, nothing contained in this Agreement shall be construed to obligate NPS, the Department, or the United States of America to any current or future expenditure of funds in advance of the availability of appropriations from Congress and their administrative allocation for the purposes of this Agreement, nor does this Agreement obligate NPS, the Department, or the United States of America to spend funds on any particular project or purpose, even if funds are available.

D. Limitations on Lobbying

To the extent that TNC commits in this agreement or any related agreement to raise funds from nonfederal sources for a particular purpose or project to benefit the NPS, the NPS and TNC agree they will not lobby for or otherwise seek the appropriation of funds from Congress to meet that commitment. TNC may not use any appropriated funds (including

property, utilities, or services acquired with, or supported by, appropriated funds) to lobby or attempt to influence Congress or any official of any government.

E. Waiver

No waiver of any provisions of this Agreement shall be effective unless made in writing and signed by the waiving party. No waiver of any provision of this Agreement shall constitute a waiver of any prior, concurrent or subsequent breach of the same or any other provisions hereof.

F. Member of Congress

Pursuant to 41 U.S.C. § 22, no Member of Congress shall be admitted to any share or part of any contract or agreement made, entered into, or adopted by or on behalf of the United States of America, or to any benefit to arise thereupon.

ARTICLE XI – SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date(s) set forth below:

FOR THE NATIONAL PARK SERVICE

Signature: Shawn K. Nagle

Name: Shawn K. Nagle

Title: Regional Fire Management Officer, NPS SER

Date: 10/8/15



ARTICLE XI – SIGNATURES

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on the date(s) set forth below:

FOR THE NATURE CONSERVANCY

Signature: Michelle Lakly

Name: Michelle Lakly

Title: Eastern US Division Director

Date: Oct 7, 2015

Signature: Rob McKim

Name: Rob McKim

Title: Central US Division Director

Date: Oct 2, 2015



This General Agreement (hereinafter "Agreement") is hereby entered into by and between the Park City Fire Department (hereinafter "Department") acting by and through the Fire Chief of said Fire Department, and the U.S. Department of the Interior, National Park Service, Mammoth Cave National Park (hereinafter "NPS") acting by and through the Superintendent.

ARTICLE I - BACKGROUND

The purpose of this Agreement is to hereby enter into an agreement with Park and Fire Department to provide mutual aid and assistance for the occurrences of structural, wildland, vehicular, and hazardous material fires and incidents on, within, or threatening the adjacent boundaries of Mammoth Cave National Park (hereinafter "Park"). The Park will respond in kind, within limits, to requests from nearby fire prevention agencies. The objectives of this agreement are:

- 1) To increase firefighter safety and enhance the fire protection capabilities of the Department.
- 2) To provide personnel and equipment required for the suppression and prevention of structural, wildland, vehicular, and hazardous materials fires and incidents on the lands within the NPS.
- 3) To recognize the mutual benefits to be derived by this Agreement and the public benefit by having reduced fire loss and the reduction of occurrence and the intensity of structural, wildland, vehicular, and hazardous materials fires and incidents.

ARTICLE II - LEGAL AUTHORITY

Whereas, NPS administers Mammoth Cave National Park that was established as a unit of the National Park System, United States Department of the Interior in 1941: and

Whereas, the Director of the National Park Service (his or her delegate) is required pursuant to 54 U.S.C 100101 to authorize only those uses of land within the Park which will not be a derogation of the values and purposes for which the Park was established, except as may have been or shall be directly and specifically provided by Congress: and

Whereas, 54 U.S.C. 102711 authorizes the Secretary of the Interior to render emergency fire fighting and cooperative assistance to nearby fire prevention agencies and for related purposes outside of the National Park System; and

Whereas, the Reciprocal Fire Protection Act of May 27, 1955, 69 Stat. 66: 42 U.S.C. 1856a-1856d authorizes reciprocal agreements for mutual aid for fire protection with agencies maintaining fire protection facilities in the vicinity of Service property and for the property for which said agency normally provides fire protection services; and

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VI. KEY OFFICIALS

A. Park – The Superintendent has the signature authority to enter this GA with the Department He/she may be contacted at (270)-758-2184. The Chief Park Ranger or his/her designee has the

B. For the term of this Agreement, the Department agrees to:

1. Respond to a report of a structural, wildland, vehicular, or hazardous materials fire or incident within the boundaries of the Park with a qualified crew and the equipment necessary to conduct initial attack fire suppression operations. The definition of a qualified crew is a crew that meets or exceeds state firefighter certification standards.
2. Cooperate with Park Staff in suppression or mitigation of either a structural, wildland, vehicular, or hazardous materials fire or incident.
3. Recognize that NPS policies and requirements may necessitate special or unique firefighting procedures. The Department will adhere to NPS requirements when requested to do so by the Park Superintendent or designated representative if the request does not endanger firefighter safety. These requirements would involve the preservation of natural, cultural, and scenic features, artifacts, historic structures, and archeological features.

C. For the term of this Agreement, NPS and non-Federal entity jointly agree as follows:

1. The parties to this Agreement will meet annually, along with other cooperators, for the discussion of matters related to the application of this Agreement, and will provide for other meetings as necessary for the discussion of matters relevant to the prevention and suppression of fires and responses to other all-risk incidents. The parties will exchange information necessary for the coordination of operations, including preparedness, planning, prevention, communications, training, etc.
2. Suppression personnel/equipment will be activated as follows:
 - a. The Department agrees to immediately notify the Park of such an incident, by contacting the Edmonson County, Kentucky 911 Dispatch Center.
 - b. The Park agrees to immediately notify the Department of such an incident, by contacting the Glasgow Police Department Dispatch (270)651-5151.
3. The parties to this Agreement grant permission to each other to monitor the radio frequencies of the other to communicate as needed.
4. Each party to this Agreement agrees to be responsible for the payment of all expenses and/ or costs incurred by it which may arise out of its performance under this Agreement or any other firefighting activities related thereto except for those additional contracts or agreements that may be in place that specifically authorize transfer and/ or payment for services rendered, provided that said responsibility on the part of NPS remains subject to availability of funds in accordance with Article XI, Part B.
5. Department employees and members shall not be considered federal employees or borrowed servants for any purpose while carrying out any activity authorized under this Agreement.
6. All Department firefighters will be suppression-qualified, and will meet state and local requirements. All NPS wildland fire qualified personnel will meet NPS requirements.
7. The Agencies will provide personal protective equipment to individuals of their respective agencies.

7. Educate employees and the public about the scope and effect of wildland fire management, including fuels management, resource protection, fire prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.
8. Initial action on trespass and human-caused wildfires will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. If the initial action is not successful and an updated decision is made to manage the fire, that decision will be documented as part of the official record. The updated strategy will be commensurate with firefighter and public safety, risk management, and values to be protected, with consideration for cost efficiency (RM-18, February 2014, Chapter 2 pg. 9)

2. Management Requirements

1. Initiate fire management operations only after all personnel involved receive a safety briefing describing known hazards and mitigating actions (LCES), current fire season conditions and current and predicted fire weather and behavior. Evacuate visitors from incident and potentially affected areas. Prevent visitors from entering the affected area (close access, terminate existing campground reservations, communicate with partners, sign / barricade Trail Head Access points).
2. Assign, for the duration of the incident, a qualified Information Officer if the incident is projected to last longer than one operational period.
3. During suppression actions a qualified Resource Advisor(s) (READ) will be assigned to all incidents projected to last longer than one operational period. READ will coordinate concerns regarding federally protected species, cultural and natural resource issues, and to serve as a liaison between the park Superintendent and the Incident Commander (IC)/Incident Management Team (IMT). They will be briefed on the intended suppression actions for the fire, and will provide input on which Conservation Measures are appropriate, within the standard constraints of safety and operational procedures. The IC has the final decision-making authority on implementation of Conservation Measures during fire suppression operations.
4. Use best management practices to minimize smoke impacts to sensitive airsheds and to the public.
5. Smoke Management Protocols
 - Throughout the management of a wildfire, fire managers will document smoke impacts on sensitive receptor sites.
 - Coordinate appropriate and timely smoke monitoring. Smoke monitoring may include; plume observation, digital photographs, and/or particulate monitoring.
 - Public information should be provided regarding potential smoke impacts and any concurrent preventive measures available to reduce smoke impacts on sensitive receptors.

- Wildfire management opportunities to reduce smoke impacts will be considered and documented in the course of action.
 - Establish and maintain communications with state smoke management agencies
6. Implement Best Management Practices for invasive weed prevention.
 7. Maximize use of long line sling operations to mitigate safety concerns and to reduce damage to vegetation by construction of helispots.
 8. Park closures or restrictions will be at the discretion of the Superintendent.
 9. Superintendent approval required for retardant use on NPS lands.
 10. Use fugitive retardant and water when deploying aerial firefighting resources (air tankers and helicopters).
 11. No off road vehicle traffic is permitted without approval of the Superintendent.
 12. Use the least intrusive BAER actions to mitigate actual or potential damage caused by wildland fire.

Appendix L: Contracts for Prescribed Fire and Suppression Resources

MACA currently does not have any contracts for prescribed fire or suppression resources.

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Appendix M: BAER, BAR and ES

The Burned Area Emergency Response 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. Fire suppression activity damage repair is not the responsibility of the BAER program. These are actions that are planned and performed primarily by the suppression incident organization as soon as possible prior to demobilization. However, some actions may need to be conducted by the local unit following containment and incident management team demobilization. For fires where the local agency administrator delegates the authority for fire suppression repair to an incident management team, the incident management team must document the fire suppression activity repair actions and those still needed to ensure that all planned actions are completed during transition back to the local unit. These actions will be paid for by account number for the suppression incident.
- Emergency Stabilization (ES) – 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 FMO and Natural and Resource Management Staff 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 FMO 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. Emergency stabilization actions must be taken within one year following containment of a wildfire and documented in a Burned Area Emergency Response Plan.
- Post-fire Burned Area Rehabilitation (BAR) – Post-fire 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. BAR consists of nonemergency 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 BAR are to (1) evaluate actual and potential long-term post-wildfire impacts to critical cultural and natural resources and 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 FMO and the Natural and Cultural Resources Staff 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 FMO. 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. All BAR and ES projects will be documented in the National Fire Plan Operating Reporting System (NFPORS).

- Restoration – Continuing the rehabilitation beyond the initial three years or the repair or replacement of major facilities damaged by the wildfire.

Table: Append. M-1: 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

BURNED AREA EMERGENCY RESPONSE (BAER)

STEPS FOR SUBMISSION OF EMERGENCY STABILIZATION (ES) OR BURNED AREA REHABILITATION (BAR) PLANS

Emergency Stabilization (ES) and Burned Area Rehabilitation (BAR), collectively referred to as Burned Area Emergency Response (BAER), programs are funded by the Wildland Fire Management appropriation to address consequences of wildfire on lands and resources.

Reference Manual 18 (Chapter 19) and the Red Book (Chapter 11) provide direction on current processes and timeframes for post-fire response.

STEPS FOR SUBMISSION OF AN ES and BAR PLAN

1. The Park will notify the SER Regional BAER Coordinator when an ES or BAR plan is under development. The SER Regional BAER Coordinator will notify the National Post Wildfire Programs Coordinator that a plan is under development and the expected timeline for submittal.

Emergency Stabilization (ES): is an extension of emergency actions and consists of planned actions taken to minimize threats to life and property resulting from the effects of a wildfire.

Burned Area Rehabilitation (BAR): consist 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.

- ✓ ES plans must be signed and approved within 21 days from ignition of the fire. Extensions may be granted by the National Post Wildfire Programs Coordinator.
 - ✓ BAR plans may be submitted at any time within the three-year anniversary of the containment date of the wildfire.
2. The Park will prepare the BAER plan including the project specification forms.
 3. The BAER plan is reviewed by the Park/Zone FMO and forwarded for review to the :
 - SER Regional BAER Coordinator/ National Post Wildfire Programs Coordinator
 - Southeast Regional FMO (SER RFMO).
 4. The Regional/National Coordinators will review the plan and send it back to the park with edits/comments.
 5. The park will use the BAER park approval to RD memo for approval by the Regional Directorate (RD).
 6. The memo to the RD and final plan will be sent to the SER Regional BAER Coordinator who will prepare the approval memo that will come from the RD back to the park.
 7. The SER BAER Coordinator and SER RFMO will facilitate RD signature and approval.
 8. The signed approval memo will be sent to
 - National Post-Fire Programs Coordinator
 - Southeast Region Fire Management Officer
 - Southeast Region BAER coordinator
 - Southeast Region Budget Analyst

- Zone Fire Management Officer
- Park BAER Coordinator

- ✓ ES funding is approved by the RD and is immediately available.
 - Funding is provided for no more than one year plus 21 days after the ignition date of a wildfire.
 - If ES treatments cannot be completed within one year, a local unit may request from the Bureau Director an extension based on factors such as climatic conditions or similar significant circumstances.
- ✓ BAR funding is approved by the RD, however it is competitive among bureaus and is based on proposed projects submitted through the National Fire Plan Operations and Reporting System (NFPORS) and evaluated using common criteria. Funds may not be immediately available.
 - Projects are funded in one-year increments, and activities or treatments are reviewed at the end of each fiscal year and funded with the next fiscal year funds, as appropriate.
 - BAR funding that has not been expended or obligated by the end of the fiscal year will be retained by the bureau and will not be considered in the distribution of the next year funds.
- ✓ The Park ES or BAR coordinator is responsible for tracking funding expenditures and ensuring funds are spent within the current timeframes established in Reference Manual 18 (Chapter 19) or superseding guidance. The Park is responsible for coordinating expenditures with the SERO Budget Analyst.
- ✓ Following the signed plan, the Park is responsible for requesting additional year BAR funds through the National Fire Plan Operations and Reporting System (NFPORS) by September 28.
- ✓ For each post-wildfire project, the park must prepare annual and final reports that document total funding approved and expended; treatments; and treatment effectiveness as determined through monitoring.
 - Annual reports are due to the SER Region Post Wildfire Coordinator by September 15 of each year until the project expires.
 - Additional funds will not be approved until accomplishment and monitoring reports are submitted.

Appendix N: *Serious Injury or Death Procedure*

Serious Injury or Death Procedure

Wildland fire management programs routinely expose firefighters to risks. Risks are minimized through effective safety programs integrated into standard operating procedures for all wildland fire management operations. In spite of these efforts serious injuries and sometimes fatalities occur. At these times it is important that managers follow the procedures outlined in PMS 926 “Agencies Administrator’s Guide to Critical Incident Management”.

Agency administrators should review this guide with their fire management staff annually, insuring that pre-work is accomplished and standard operating procedures are known prior to the field season.

A current copy of the guide and procedures is found at:

<http://www.nwcg.gov/pms/pubs/pubs.htm>

It is important that administrators use the current version of the guide.

CRITICAL INCIDENT STRESS MANAGEMENT

Critical Incident Stress Management (CISM) provides an organized approach to the management of stress responses for personnel having been exposed to a traumatic event in the line of duty. The use of CISM may decrease post-traumatic stress disorder, acute stress disorder, workman’s compensation claims, fatalities, injuries, and suicide. The use of CISM does not prevent an employee from seeking individual consultation through the Employee Assistance Program or a trained Peer Supporter.

Appendix O: *Safety Program*

Safety Program/Plan utilized by the fire personnel is the MACA safety plan, a copy of which is located in the park.

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Appendix P: Smoke Management Plan

The smoke management program at MACA is generally discussed in Section 3.5 *Air Quality*.

Planning

- Detailed smoke management actions will be made part of each prescribed burn plan.
- Smoke trajectory maps will be developed and sensitive targets identified.
- Mitigation measures will be defined in the plan, and a contingency plan developed and arrangements made prior to ignition to insure designated resources are available if needed to implement the mitigation measures.
- A spot weather forecast will be requested the day of the burn from the National Weather Service (NWS) prior to ignition of any prescribed fire.
- Advanced notice will be provided to the local fire district, and the district will be provided the following information:
 - Location
 - Fuels to be treated.
 - Proposed ignition time
- Media releases will be used to inform the public and park visitors about wildland fire, informing them about potential smoke impacts, closures, or restrictions. Signs will be used throughout the park to inform visitors, and caution signs will be installed where smoke may impact transportation corridors inside and outside the park. If necessary, the superintendent will authorize temporary closure of some areas to the public and visitors.

Avoidance

- Prescribed burns will not be initiated unless ventilation, fuel loading, and distance to nearest downwind smoke sensitive area are within the limitations set in the Burn Plan.

Reduction

- If the smoke emissions are predicted to be within the guidelines prescribed in the Burn Plan, the burn can be initiated.
 - If the prescriptive criteria for smoke emissions are exceeded, the burn boss can mitigate the problem by breaking the burn into smaller parcels or waiting until better smoke dispersal conditions are present.
- Initiate aggressive mop-up, as needed.
- Interior fuel breaks may be established to limit the spread of a prescribed burn.
- Mechanical fuel reduction may be utilized to reduce fuel loading as needed and where practical.

Dilution

- All prescribed burning in the Park will be conducted under adequate smoke dispersion conditions.

Traffic Management and Public Safety

- Prescribed burn plans will contain specific monitoring requirements for nighttime monitoring of smoke on roads.

- If smoke from a fire obscures visibility below a limit defined by a state or creates a safety hazard, the following actions will be initiated:
- NPS Rangers will be requested to respond to the scene to provide for public safety.
- The appropriate State Highway Patrol and/or Department of Transportation and the appropriate county law enforcement agency will be notified of the smoke incident and requested to dispatch personnel to the scene to provide for public safety. NPS Ranges will assist as needed.
- If a park road is involved, the Ranger(s) on scene will determine what type of traffic control is needed and take immediate action. Additional rangers and/or fire management staff will assist as needed.

Appendix Q: *Minimum Impact Strategy and Tactics*

Minimum Impact Strategy and Tactics are used in all fire management operations at MACA. The intent of utilizing MIST is to safely and effectively complete the fire management operation with minimal impact to resources.

A more in-depth discussion of Minimum Impact Strategy and Tactics is found in NPS Reference Manual 18 Chapter 2 *Managing Wildland Fire*, Exhibit 2: *Minimum Impact Strategy and Tactics*

A link to the NPS fire management website and NPS Reference Manual 18 follows:

<https://www.nps.gov/fire/wildland-fire/about/nps-reference-manual-18.cfm>

Specific MIST procedures at MACA are:

- Any off-road use of vehicles, plows and other mechanized equipment must be approved by the Superintendent
- Any use of retardant will be reviewed by an assigned resource advisor and approved by the Superintendent
- Consider during mop-up: Cold-trailing fireline, using wetline or sprinklers as control line, using natural or human made barriers to limit fire spread, burning out sections of fireline, limiting width and depth of fireline necessary to limit fire spread
- Locate pumps and fuel sources to minimize impacts to streams
- Minimize cutting of trees and snags to those that pose safety or line construction concerns, prune lower branches to remove ladder fuels as opposed to falling the tree.
- Minimize bucking of logs to check/extinguish hot spots; preferably roll logs to extinguish and return logs to original position: scatter branches and other debris in accordance with guidelines contained in the Fireline Handbook (PMS 410-1)
- Utilize extensive cold-trailing and/or hot-spot detection devices along perimeter
- Use mop-up kits and other low pressure nozzles setting to prevent erosion
- Water bars will be placed on steep slopes

Tactics and equipment used for suppression and for holding operations on prescribed burns will be selected to minimize the impact commensurate with values at risk. Use of bull dozers or tractor plows is prohibited except with the permission of the Superintendent. In areas closed to public motorized use, vehicles will only be used when necessary for protection of sensitive resources, life, safety and private property. Snag falling will be limited to those trees necessary to secure control lines.

Appendix R: Spatial FMP Crosswalk

Table Append. R-1: FMP Framework Tracking Form

MACA National Park 2015 NPS FMP Framework Section	New Location of NPS Framework (2015 version)					Information Utilizing Spatial FMP Format			
	Map and Mapsheet Name	Text on Mapsheet	Table on Mapsheet	Chart or Graph on Mapsheet	Text in DOC	Table/Figure in DOC	Appendix to DOC	EA/EIS	Link
1. Introduction, Land Management Planning , and Communication					X				
1.1 Program Organization					X	X			
1.2 Environmental Compliance					X			X	
1.3 Park Unit/Resource Management Planning	Mapsheet 1 <i>Fire Management Overview</i>	X			X				
1.4 Collaborative Planning	Mapsheet 3 <i>Operations</i>	X			X	X			
1.5 Communication and Education					X		X		
2. Wildland Fire Program Goals					X				
2.1 Goals	Mapsheet 1 <i>Introduction</i>								
	Mapsheet 5 <i>Fuels</i>	X	X		X				X
	Mapsheet 2 <i>Resource Management</i>								

MACA National Park 2015 NPS FMP Framework Section	New Location of NPS Framework (2015 version) Information Utilizing Spatial FMP Format								
	Map and Mapsheet Name	Text on Mapsheet	Table on Mapsheet	Chart or Graph on Mapsheet	Text in DOC	Table/Figure in DOC	Appendix to DOC	EA/EIS	Link
2.2 Objectives	Mapsheet 5 <i>Fuels</i>	X	X		X				
2.3 Approved Fire Management Actions					X				
2.3.1 Management of Wildfires	Mapsheet 6 <i>Operations</i>	X			X				
2.3.2 Management of Fuels Treatments	Mapsheet 5 <i>Fuels Management</i>	X	X		X				
2.3.3 Defensible Space					X				X
3. Wildland Fire Operational Guidance					X				
3.1 Response to Wildfire	Mapsheet 6 <i>Operations</i>		X	X	X		X		X
3.1.1 Wildfire Response Planning					X		X		X
3.1.1.1 Expected Fire Behavior	Mapsheet 4 <i>Fire Environment Management</i>	X	X		X				
3.1.1.2 MIST	Mapsheet 6 <i>Operations</i>			X	X		X		X
3.1.2 Wilderness	Mapsheet 3 <i>Resource Management</i>	X		X	X		X		X
3.1.3 Wildfire Response Objectives	Mapsheet 6 <i>Operations</i>	X			X				

MACA National Park 2015 NPS FMP Framework Section	New Location of NPS Framework (2015 version) Map and Mapsheet Name	Text on Mapsheet	Table on Mapsheet	Chart or Graph on Mapsheet	Text in DOC	Table/Figure in DOC	Spatial FMP Format Appendix to DOC	EA/EIS	Link
3.1.4 Wildfire Response Procedures					X				
3.1.4.1 Decision Support	Mapsheet 6 <i>Operations</i>	X			X		X		X
3.1.4.2 Initial Response Procedures	Mapsheet 6 <i>Operations</i>		X	X	X		X		
3.1.4.3 Transition to Extended Response					X				
3.2 Fuels Treatments					X				
3.2.1 Fuels Planning					X				
3.2.1.1 Project Prioritization					X				
3.2.1.2 General Fuels Planning Implementation Procedures					X				
3.2.1.3 Multi-year Fuels Treatment Plan	Mapsheet 5 <i>Fuels Management</i>		X		X		X		
3.2.1.4 Non-Fire Fuels Treatments	Mapsheet 5 <i>Fuels Management</i>		X	X	X				
3.2.2 Fuels Management Goals and Objectives	Mapsheet 5 <i>Fuels Management</i>	X	X		X				
3.2.3 Prescribed Fire Staff Responsibilities					X	X			
3.3 Preparedness					X				

MACA National Park 2015 NPS FMP Framework Section	New Location of NPS Framework (2015 version) Map and Mapsheet Name	Text on Mapsheet	Table on Mapsheet	Chart or Graph on Mapsheet	Text in DOC	Table/Figure in DOC	Spatial FMP Format Appendix to DOC	EA/EIS	Link
3.3.1 Preparedness Activities					X				
3.3.1.1 Coordination and Dispatching					X				X
3.3.1.2 Duty Officer					X		X		
3.4 Post Fire Programs and Response					X				
3.5 Air Quality/Smoke Management	Mapsheet 7 <i>Zone Air Quality and Aviation</i>	X	X	X	X		X		X
3.5.1 Air Quality Issues	Mapsheet 7 <i>Zone Air Quality and Aviation</i>	X	X	X	X		X		X
3.5.2 Smoke Management Activities	Mapsheet 7 <i>Zone Air Quality and Aviation</i>	X	X		X		X		X
3.6 Data and Records Management					X				
3.6.1 Wildfire Report					X				
3.6.2 Geospatial Data Management for Wildland Fire Projects					X				X
3.6.3 Wildland Fire Qualifications Management					X		X		

MACA National Park 2015 NPS FMP Framework Section	New Location of NPS Framework (2015 version) Map and Mapsheet Name	Text on Mapsheet	Table on Mapsheet	Chart or Graph on Mapsheet	Text in DOC	Table/Figure in DOC	Spatial FMP Format Appendix to DOC	EA/EIS	Link
4. Program Monitoring and Evaluation					X				
4.1 Monitoring	Mapsheet 3 <i>Resource Management</i>		X	X	X		X		X
4.2 Science and Climate Change					X				
4.2.1 Science	Mapsheet 1 <i>Introduction</i>	X	X		X		X		
4.2.2 Climate Change	Mapsheet 1 <i>Introduction</i>	X			X				
4.3 Annual Program Evaluation and Fire Management Review Process					X				

Appendix S: Fire Management Units (PARK ADDED)

MACA has been divided into two Fire Management Units, (FMUs), 1: *Ecosystem Fire Management Unit*, and 2: *WUI Fire Management Unit*. The units were created taking such factors as firefighter and public safety, values to be protected, resource objectives and response time. Discussion of fire management units occurs on Mapsheet 1: *Fire Management Overview, KY-MCP Fire Management Units and Unplanned Ignitions* and Mapsheet 3: *Operations, FMU Summary* table.

Ecosystem Fire Management Unit

Ecosystem Fire Management FMU Approved Strategic Direction

Protection of Life and Property are the first and second priorities respectively.

Wildfires in this FMU, regardless of origin, can be managed for resource benefits; using a response to wildfire appropriate for the values at risk, which in many cases may be direct attack utilizing engines or hand crews. Prescribed fire (underburning and broadcast burning) will be used primarily to enhance fire dependent vegetative communities. Mechanical fuels manipulation Stage 1 strategies will be used to manage fuel loadings to a condition where wildland fire (wildfire and prescribed fire) occurring on the treated site will not create fire intensities of a degree that would impact the desired future condition for that site. .

Ecosystem Fire Management Actions

Safety: The fire management program will implement an integrated safety program. Safety briefings will be conducted prior to implementation of wildfire operations and all other fire management projects and debriefings will be utilized post project. Personnel will be qualified for positions as stipulated in PM 310-1.

Preparedness: Fire management program managers will schedule preparedness procedures designed to ready park fire management resources prior to the onset of fire season.

Management of Unplanned Ignitions: Wildfires may be used for resource benefits and an appropriate response strategy will be employed with guidance from the WFDSS planning process

Management of Planned Fuels Treatments: Prescribed fire and mechanical and manual fuels reduction strategies will be utilized to reduce wildland fuel concentrations and to meet desired future conditions for chosen sites.

Prescribed fire will be used to restore natural ecosystems within FMU 1.

Communications, education and prevention: An active fire prevention program will be implemented by park staff. Duties of park personnel will include fire prevention and with the

assistance of fire management staff notices concerning fire management activities will be delivered to the public when appropriate.

Adaptive management: Adaptive management is the cornerstone of the fire management program.

Ecosystem Fire Management FMU Goals and Objectives

- Ensure firefighter and public safety receives the highest priority during all fire management activities.
- Reduce heavy concentrations of wildland fuel with Stage 1 mechanical fuels treatments, preparing the site for future prescribed fire projects designed to meet a desired future condition for the site
- Utilize the management determined response to wildland fire during wildland fire suppression operations to protect the public, limit fire spread onto private property, and protect the natural, cultural, and historic resources of the Unit.
- Place emphasis on facilitating reciprocal fire management activities through the development and maintenance of cooperative agreements and working relationships with pertinent fire management entities.
- Use natural or existing man-made barriers to the greatest extent possible for control lines. (Minimum Impact Suppression Tactics [MIST] concept).
- Monitor and document results of fire management activities.

Relationship of *Ecosystem Fire Management* FMU Management to FMP Objectives

Fire management activities initiated in *Ecosystem Fire Management* FMU are designed to meet the following Fire Management Plan objectives.

- Firefighter and public safety will be the highest priority on all fire management activities.
- Use wildland fire when appropriate as a tool to manage and enhance natural resources and to reduce hazard fuel accumulations that may affect suppression efforts.
- Use fire when appropriate as a tool to manage cultural landscapes.
- Wildland fire will be suppressed in a cost-effective manner, consistent with firefighter and public safety and the values to be protected.
- Suppression strategies are designed to lessen the possibility of adverse impact to the environment, including air quality.
- Fire will be restored as an ecological process.

Management Objectives that are Tactical in Nature

- No fire management operation will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions (LCES), current fire season conditions, and current and predicted fire weather and behavior.
- Park neighbors, visitors and local residents will be notified of all fire management activities that may affect them.
- Response time will be appropriate to the values to be protected.
- Minimum impact suppression tactics will be used, as appropriate.
- Fire behavior and fire effects will be monitored and documented in accordance with NPS

guidelines.

- Interested publics will be informed of fire management activities and the role of fire in the natural process.
- Temporary area closures resulting from fire management operations will be implemented at the discretion of the Superintendent or his representative.

Ecosystem Fire Management FMU Description

This unit includes all park lands outside of Fire Management Unit 2. *Ecosystem Fire Management* FMU encompasses all of the vegetative types in the park, from fire dependent; Oak/Hickory and Barrens vegetation types to vegetation types which seldom have seen fire, such as the “Big Woods” This unit contains many trails, roads and other elements of park infrastructure, plus still unknown cultural resources.

Historically fire as had more impacts in the southern sections of the park. A special concern for this FMU is the potential for invasive plant species to become established on disturbed sites.

The fuels are fairly typical to those found in the WUI FMU. An overview of the fire history, fire effects, and expected fire behavior for Mammoth Cave NP can be found in Appendix T *Fire Behavior Analyst Information*.

A general listing of significant property, developments, improvements, and resources that must be protected from wildland fire include:

- Cultural and historic sites.
- Private property and other development adjacent to the Unit.
- Threatened and endangered species

Annual fire weather cycles are similar throughout the Park and are described in Appendix T: Weather Information. Of importance, is the long-term cyclic nature of the weather that can bring periods of drought. In the century just concluded, periods of drought lasting several years have been recorded that increased fire frequency and intensity, and contributed many additional acres to the national fire statistics. During periods of drought, wildland fires exhibiting extreme fire behavior can occur during the summer.

Table Append S-1: Ecosystem FMU Summary Table

<i>Ecosystem Fire Management Unit</i>	
Defining Characteristics	FMU contains all of the park lands outside of FMU 2. This FMU allows Use of Wildfire for resource benefits
Acres	
Approved Fire Management Strategies	Use of wildfire for resource benefits. Use of prescribed fire, mechanical and manual fuels reduction techniques to enhance ecological functions and reduce hazard fuels is allowed.
Constraints	Smoke management required, utilizing Kentucky State Implementation Procedures Restrictions on impacts allowed on state highways through operation protocols Protective measures required for known historical and cultural resources prior to operations No off-road heavy equipment or vehicle use allowed unless human life, private or public property is threatened Helicopters may not be used for ignition of prescribed fires
Associated Weather Stations	(WIMS ID #156501)
Interagency FMU Collaboration	USFWS, State of Kentucky, and Cave City, Chalybeate, Cub Run, Horse Cave, Kyrook, Lincoln, Park City, Rocky Hill Volunteer Fire Department
Dominant Vegetation or Fuels	Hardwood leaf litter

FMU Management Constraints and Guidance

- Smoke management reporting procedures for burning in Kentucky will be followed for all prescribed fire operations. The suppression response selected to manage a wildland fire will consider air quality standards.
- The safety of highway users will be a primary consideration in the development of prescribed burning plans, and will be addressed in the smoke management section.
- Protective measures for known historic and cultural resource must be assured and mitigated, if necessary before a prescribed burn project is initiated.
- No off road heavy equipment or vehicle use in closed areas unless human life or private or public property are threatened. Superintendent's approval required.
- No helicopter use except in emergencies. Superintendent's approval required.

FMU Safety Considerations

- Snags and dead trees with weak root systems
- Dehydration, heat exhaustion and heat stroke
- Heavy concentrations of fuel that can block escape routes
- Stinging insects and poisonous snakes and plants
- Traffic on Roadways
- “Old wells” and sink holes

WUI Fire Management Unit

WUI Fire Management Unit Approved Strategic Direction

All wildland fires in this unit regardless of origin will be suppressed; using the appropriate management response, which in some cases may be direct attack utilizing engines or hand crews. Prescribed fire and mechanical fuels reductions projects will be used primarily to manage hazard fuel in and around park interface areas as well as park boundary areas adjacent to wildland urban interface zones. Mechanical and manual fuels treatments could be used in a stage 1 entry to reduce fuel loadings and allow the use of prescribed fire in a stage 2 entry

WUI FMU Fire Management Actions

Safety: The fire management program will implement an integrated safety program. Safety briefings will be conducted prior to implementation of projects and debriefings will be utilized post project. Personnel will be qualified for positions as stipulated in PM 310-1.

Preparedness: Fire management program managers will schedule preparedness procedures designed to ready park fire management resources prior to the onset of fire season.

Management of Unplanned Ignitions: A full suppression strategy will be initiated for all wildfires in the WUI FMU.

Management of Planned Fuels Treatments: Prescribed fire, mechanical and manual fuels reduction strategies will be utilized for the enhancement of ecological functions and reduce hazard fuels concentrations in wildland urban interface zones.

Prescribed fire will be used to restore natural ecosystems where appropriate within WUI FMU.

Communications, education and prevention: An active fire prevention program will be implemented by park staff. Duties of park personnel will include fire prevention and with the assistance of fire management staff notices concerning fire management activities will be delivered to the public when appropriate.

Adaptive management: Adaptive management is the cornerstone of the fire management program.

WUI FMU Goals and Objectives

- Ensure firefighter and public safety receives the highest priority during all fire management activities.
- Reduce heavy concentrations of hazard fuel, especially along park boundaries and park infrastructure.
- Utilize the response to wildland fire during wildland fire suppression operations to protect the public, limit fire spread onto private property, and protect the natural, cultural, and historic resources of the Unit.
- Place emphasis on facilitating reciprocal fire management activities through the development and maintenance of cooperative agreements and working relationships with pertinent fire management entities.
- Use natural or existing man-made barriers to the greatest extent possible for control lines. (Minimum Impact Suppression Tactics [MIST] concept).
- Place emphasis on educating adjacent landowners regarding the risk of fire to property and effective strategies for reducing risks.
- Monitor and document results of fire management activities.
- Restricted helicopter use on prescribed fires, Superintendent approval needed.

Relationship of FMU Management to FMP Objectives

A special concern for this FMU is the reduction of hazardous fuel, particularly along boundaries and adjacent to structures within or adjacent to the boundaries. Fire management activities initiated in the **WUI FMU** are designed to meet the following Fire Management Plan Objectives.

- Firefighter and public safety will be the highest priority on all fire management activities.
- Fuel complexes along boundaries and adjacent to values at risk will be modified to reduce fire behavior to a more manageable level using one or more, or a combination the following methods:
 1. Fuel breaks and/or fire roads may be cut along critical sections of the boundary to allow access for fire suppression equipment needed to prevent wildland fires from crossing the Unit boundaries.
 2. Vegetation may be mechanically removed to reduce fuel loading to manageable levels to safely initiate prescribed burning.
 3. Periodic prescribed burning may be used to restore and maintain acceptable fuel levels.
 4. Prescribed fire may also be used to achieve resource management objectives documented in other park management plans.

Management Objectives that are Tactical in Nature

- No fire management operation will be initiated until all personnel involved receive a safety briefing describing known hazards and mitigating actions (LCES), current fire season conditions, and current and predicted fire weather and behavior.
- Park neighbors, visitors and *local* residents *will* be notified of all fire management activities that may affect them.
- Response time will be appropriate to the values to be protected.

- Minimum impact suppression tactics will be used, as appropriate.
- Fire behavior and fire effects will be monitored and documented in accordance with NPS guidelines.
- Interested publics will be informed of fire management activities and the role of fire in the natural process.
- Temporary area closures resulting from fire management operations will be implemented at the discretion of the Superintendent or his representative.

WUI FMU Description

The Unit includes a ¼ mile buffer around known Park values at risk. Included in the *WUI FMU* is all of the area within ¼ mile of the park boundary.

The result of the delineation of this FMU on the ground is a series of polygons distributed through the park. The park maintains records of values at risk for each polygon and resource managers will need to be included in determining fire management operations in this FMU.

There have been no recorded reports of wildfires occurring within the Unit (WFMI 2013). The fuels are fairly typical to those found in other units. An overview of the fire history, fire effects, and expected fire behavior for MACA can be found in Section 7.2.3.6.

The following are of special concern and will be given special consideration during fire management planning and operations:

- Private property and other developments within or adjacent to the Unit.
- Cultural, historic and administrative structures within the FMU.
- Threatened and endangered species.

Annual fire weather cycles are similar throughout the Park and are described in Appendix T: *Fire Behavior Analyst Information*.

Table Append S-2: WUI FMU Summary Table

WUI FMU	
Defining Characteristics	Full suppression of All wildfires in this FMU.
Acres	
Approved Fire Management Strategies	<p>Limited use of wildfire to achieve resource objectives.</p> <p>Prescribed fire can be used for ecosystem enhancement, hazard fuel reduction and achieving other resource objectives</p> <p>Mechanical and manual fuels reduction techniques can be used were appropriate</p> <p>Herbicide applications allowed where needed</p>
Constraints	<p>Smoke management reporting procedures for burning in Kentucky will be followed for all prescribed fire operations.</p> <p>The suppression response selected to manage a wildland fire will consider air quality standards.</p> <p>The safety of roadway users will be a primary consideration in the development of prescribed burning plans, and will be addressed in the smoke management section.</p> <p>Protective measures for known historic and cultural resource must be assured and mitigated, if necessary, before a prescribed burn project is initiated.</p> <p>No off-road heavy equipment or vehicle use in Park areas unless human life or private or public property are threatened</p> <p>Helicopter use on prescribed fires upon Superintendents approval only</p>
Associated Weather Stations	(WIMS ID #156501)
Interagency FMU Collaboration	USFWS, State of Kentucky, and Cave City, Chalybeate, Cub Run, Horse Cave, Kyrock,

	Lincoln, Park City, Rocky Hill Volunteer Fire Department
Dominant Vegetation or Fuels	Hardwood leaf litter
Lat/Long of Centroid (NAD 83)	

FMU Management Constraints and Guidance

- Smoke management reporting procedures for burning in Kentucky will be followed for all prescribed fire operations.
- The suppression response selected to manage a wildland fire will consider air quality standards.
- The safety of roadway users will be a primary consideration in the development of prescribed burning plans, and will be addressed in the smoke management section.
- Protective measures for known historic and cultural resource must be assured and mitigated, if necessary, before a prescribed burn project is initiated.
- No off-road heavy equipment or vehicle use in Park areas unless human life or private or public property are threatened

FMU Safety Considerations

- Snags and dead trees with weak root systems
- Dehydration, heat exhaustion and heat stroke
- Heavy concentrations of fuel that can block escape routes
- Stinging insects and poisonous snakes and plants
- Traffic on roadways
- “old wells”, sink holes

Appendix T: Fire Behavior Analyst Information (PARK ADDED)

Remote Automated Weather Stations (RAWS)

MACA maintains one permanent remote automated fire weather station, (RAWS) located at Houchin Meadow. Temporary stations may be set up as needed in advance of prescribed fire projects.

Table: Append. T-1: Station Catalog Information

Station ID	Station Name	Elevation	Aspect	Slope	Climate	NFDRS Fuel Model
156501	MACA2-NP	774	Flat	3	3	88/E/G

National Fire Danger Rating System

MACA monitors both short-term fire danger and long-term drought conditions via the Weather Information Management System (WIMS) as a service of KICC website.

Short term fire danger is tracked using the Burning Index (BI) generated by the 1988 version of NFDRS. The Burning Index (BI) represents the degree of difficulty suppression forces will have in controlling a fire should one start on that day.

Longer-term drought conditions are tracked using the Keetch-Byram Index (KBDI). The KBDI is a measure of soil moisture and is considered a good drought indicator. The Keetch-Byram Drought Index (KBDI) is calculated from ongoing weather measurements taken at the remote fire weather station 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.

Fire Danger Pocket Cards are included in the Annual Preparedness Plan which can be obtained from KICC.

The climate zone for the park is classified as Humid Subtropical, with hot and humid summertime conditions. The average annual high/low temperatures in nearby Bowling Green

KY range from 77.9 degrees F in July to #2.9 degrees in January, and the average monthly precipitation is 5.1 inches in March to 3.02 inches in October. (Source National Weather Service)

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 months of March, April and May, while the lowest average rainfall occurs during the fall months of September and October.

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.

Typical Fire Response Times

Typical response times to wildfires may vary depending on staffing and individual personnel work assignments. An effort will be made to respond to a wildfire within 30 minutes of receiving a report.

MACA Fuel Model Fire Behavior Discussion

Fire behavior is basically a function of fuel type, fuel load, fuel moisture content, topography, and local weather conditions. The differences in fire behavior are related to the fuel load and its distribution of fuel particle size classes. Fuel load and depth are significant fuel properties for predicting whether a fire will be ignited, its rate of spread, and its intensity (Anderson 1982).

There are two fire seasons in the Mammoth Cave area, one in spring from March 1st to May 15th and the other in fall from October 1st to December 15th. Given that many herbaceous plants remain alive and even bloom into late October (Seymour 1997), fuels are not as consistently dry in fall as in the spring, and leaves do not typically finish dropping until late October. Approximately 45% of the park is land that was cleared for agricultural purposes, including row crops and pasture. These old fields are now in early to mid-succession, and depending upon the habitat type range from low to high inflammability. Forest stands in some old fields on Floodplain Alluvium habitat have progressed through secondary succession rapidly, and have little fire potential. On the other hand, dense stands of successional eastern red cedar and virginia pine in Calcareous Sub-Xeric habitat within the large karst valleys, and Mesic to Subxeric habitats on the uplands, could sustain significant fire behavior under the right conditions.

Fuel types in the park have been classified according to the National Fire Danger Rating System (NFDRS) and the Northern Forest Fire laboratory Fire Behavior Prediction System fuel modeling system (FBPS) (Deeming et al 1978:30, Anderson 1982). These are summarized in Tables 3 and 4 on the following pages and will be discussed in order from most to least fire prone.

Small, mostly open fields supporting native prairie species exist in the park. These areas cannot be

regarded as prairie remnants since we do not yet know pre-settlement vegetation patterns in detail, but they are important refuges for species with almost no remaining habitat (PFAs S7C&D are examples - see Figure 3). These areas most closely match NFDRS Fuel Model L and FBPS Fuel Model 1. During spring especially, the standing dead grasses and forbs present are light fuels, which dry quickly following rain and can burn very rapidly when ignited.

Many stands of successional cedar-pine in the cores of old fields (Xeric-Mesic Coniferous Forest in Figure 3) are best categorized as NFDRS Fuel Model Q and FBPS Fuel Model 6. These stands are dense, but have a patchwork of more open savanna with highly flammable grasses and forbs. In dense areas, the forest floor is covered in moss and lichens with some needle litter and small branches. Dead low branches persist on trees providing ladder fuels for potential crown fire. Surface fires would be typically slow, but under windy conditions crown fire could result.

In dense, successional conifer stands in the park (especially virginia pine), with heavy accumulations of branches and downed trees from ice storms and wind throw, NFDRS Fuel Model G and FBPS Fuel Model 10 apply. The canopy openings created support grassy and herbaceous light fuels which in combination with the heavy dead branches and trunks could produce a very intense fire posing control difficulties.

On sunny steep limestone slopes, apparently virgin cedar/oak glades are found. The exposed bedrock benches with thinly scattered fuel generally results in low fire frequency and severity most consistent with NFDRS Fuel Model C and FBPS Fuel Model 9. Fuel in cedar-oak glades consists of sparse leaf and needle litter interspersed with thin patches of grass and forbs. Bedrock exposures interrupt fuel continuity and natural soil piping through the limestone results in thin soil where present. Fire Behavior in this fuel type will be greatly influenced by the discontinuity of fuels.

Most of the Virginia pine in the park is successional growth in old fields. However, dry sandstone cliff margins of Acid Xeric habitat type support mature virginia pine stands. Other than lowbush blueberries, there is little undergrowth, and the compact litter of needles is best represented by NFDRS Fuel Model H and FBPS Fuel Model 8. Fires are typically slow and confined to the surface except under unusually hot, dry, and windy conditions.

After leaf fall and before emergence of spring growth, four vegetation types fit Fuel Model E and FBPS Fuel Model 9. These are forest/savanna of the xeric-subxeric deciduous, upland mesic deciduous, and mixed deciduous-coniferous types, plus the mesic slope deciduous forest (see Figure 3 for distributions). Hardwood leaf litter of mesic oak-hickory forest is the basis for this fuel type along with mixed hardwood conifer types where hardwoods account for more than half the overstory. In sunny, dry habitats that fit NFDRS Fuel Model E, the thicker leaves of trees adapted to these xeric and sub-xeric sites, such as blackjack, post, chinkapin, and chestnut oaks, do not readily mat down or deteriorate. Therefore these leaves dry quicker, and the air spaces between leaves make this litter (and any other "fluffy" fuel) more flammable (Deeming et al 1978:8). Along the margins of old fields there are mixed deciduous and coniferous stands. With the exception of red maple, the tulip poplar, dogwood, and sweetgum trees interspersed with eastern red cedar and virginia pine produce litter of average flammability. However, the frequent association of this vegetation type with more flammable successional cedar-pine dominated stands in the cores of old fields should also be taken into consideration. At the moist end of the Fuel

Model E spectrum is leaf litter produced by the mesic slope/floodplain deciduous forest. These habitats are less exposed to sun than the drier sites, and are typified by sugar and silver maple, beech, box elder, and sycamore. Maple leaves especially mat down after rain and decay quickly, which, along with habitat-related cooler temperatures and lower evaporation rates, makes ignition less likely. Fires in deciduous leaf litter are typically confined to the surface. Rates of spread are usually slow, but on windy days fire can move faster than predicted due to wind-blown leaves.

Once the trees have leafed out, all of these savanna and forest types are classified as Fuel Model R and FBPS Fuel Model 8, which have a low probability of ignition except under extreme drought conditions. However, during such extremely dry periods these deciduous forest stands can develop rapid fires on drought prone sub-xeric slopes.

Table Append. T-2 below demonstrates anticipated fire behavior under “average” and “extreme” conditions and critical threshold values effecting fire controllability. The values were calculated using the BEHAVE (Andrews 1986) fire behavior prediction model utilizing weather inputs from the Park NFRS Weather station (15601). The weather data utilized cover the 10 year period from 1989-1999 and the weather indices were calculated using the Fire Family Plus (Bradshaw 1999) software package. It should be recognized that table values are based on models rather than on direct observation of fire behavior in these fuel types. As Park Managers have the opportunity to observe and monitor fire behavior, these values may be refined and the model calibrated to better reflect local fuel and weather conditions.

Table Append T-2. Potential Fire Behavior under Average and Extreme Conditions

NFRS Model	FBPS Fuel Model	Fuel Type/ Vegetation	Fire Behavior Average Conditions		Fire Behavior Extreme Conditions	
			Flame Length	Rate of Spread	Flame Length	Rate of Spread
L	1	Prairie grasses in old fields	3 feet	65 chains/hr	8 feet**	270 chains/hr
Q	6	Cedar/Pine in Old fields	6 feet	34 chains/hr	13 feet**	180 chains/hr
G	10	Dead pines from ice storms & wind	6 feet	12 chains/hr	13 feet**	61 chains/hr
C	9	Cedar-oak Glades*	3 feet	9 chains/hr	8 feet**	72 chains/hr
E	9	Hardwood leaf litter	3 feet	9 chains/hr	8 feet**	72 chains/hr
R	8	Hardwood litter (leafed out canopy)	1 foot	2 chains/hr	2 feet	5 chains/hr

**Exceeds direct attack capabilities = Flame lengths greater than 8 feet, indirect attack required
Average conditions = 1989-2000 NFRS station 156501 mean fire season weather conditions

Extreme conditions = 1989-2000 NFRDRS station 156501 97% percentile fire season weather conditions

Table Append. T-3 below outlines potential critical weather parameters that would result in fire behavior exceeding initial attack capabilities (flames lengths greater than 8 feet). These values were calculated using the RX Window Module of the BEHAVE program (Andrews 1986). Such values are useful both for facilitating recognition of potential extreme fire behavior conditions, as well as for assisting in prescription development for the prescribed fire program. It should be noted that generally 2 or 3 weather parameters must all be aligned in order for extreme conditions to result. It should also be noted that these are modeled values and should serve only as guidelines. Additionally, values have not been included for certain parameters such as live fuel moisture and 1000 hour fuel moisture as there has been little opportunity to date to observe fire behavior and associated weather in certain unique vegetation types. As the opportunity arises, fire monitoring data collection on both wildland fires and prescribed fires will facilitate refinement of these values as well as development of critical values for additional parameters. Lastly it should be note that while the values listed will potentially result in flame lengths greater than 8 feet, this does not imply sustained uncontrollable wildfire. They simply imply that direct attack is not a safe tactic. Additionally, these conditions, especially wind speed, may vary greatly in a short time period and be fleeting in nature.

Table Append T-3. Critical Weather Parameters resulting in Need for Indirect Attack

NFDR S Model	FBPS Model	Fuel Type/ Vegetation	Moisture of Extinction	Critical Weather Parameters Resulting in Fire Behavior exceeding Direct Attack Capabilities
L	1	Prairie grasses in old fields	12	1 hour fuel moisture < 7% AND Windspeed >15 MPH
Q	6	Cedar/Pine in old fields	25	Live Fuel Moisture< 100% Windspeed > 15 mph
G	10	Dead pines from ice storms & wind	25	1000 hr fuel moisture <15% Windspeed >15 mph
C	9	Cedar-oak Glades*	15	1 hour fuel moisture < 7% AND Windspeed > 15 mph
E	9	Hardwood leaf litter	25	1 hour fuel moisture <7% AND Windspeed > 15 mph

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