

National Park Service  
U.S. Department of the Interior  
FLAGSTAFF AREA NATIONAL MONUMENTS, ARIZONA  
WALNUT CANYON NATIONAL MONUMENT  
WUPATKI NATIONAL MONUMENT  
SUNSET CRATER VOLCANO NATIONAL MONUMENT



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**FIRE MANAGEMENT PLAN**  
**Environmental Assessment/Assessment of Effect**  
**August, 2005**

**Environmental Assessment**  
**Assessment of Effect**

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**WILDLAND FIRE MANAGEMENT PLAN**  
**FLAGSTAFF AREA NATIONAL MONUMENTS**  
**• ARIZONA •**

**Summary**

The Flagstaff Area National Monuments collectively refer to Walnut Canyon National Monument, Wupatki National Monument, and Sunset Crater Volcano National Monument, which are all managed by the National Park Service (NPS). NPS policy requires that any park unit with combustible vegetation prepare a Fire Management Plan (FMP). The NPS is therefore proposing to develop an FMP for the Flagstaff Area National Monuments. The plan would guide and direct the wildland fire program for the three park units and would support the accomplishment of resource management objectives.

With the relative absence of wildland fire for several decades, natural fuels have begun to accumulate. Wildland fire in these increased fuels may threaten life and property as well as sensitive resources. Increased management intervention would reduce fuel accumulations, restore the ecological role of fire as a natural disturbance force, and protect sensitive resources.

Two alternatives were considered for the Flagstaff Area National Monuments' FMP:

- Alternative A - No-Action: continued current program of suppressing wildland fires.
- Alternative B - NPS preferred alternative: a fire management program of appropriate management response to wildland fires, which would include various suppression strategies. In addition, prescribed fire and manual thinning (using manual tools and/or hand-carried mechanical equipment only) would be used for fuels management.

Under the preferred alternative, the Flagstaff Area National Monuments would conduct manual pre-thinning of wildland fuels to protect sensitive resources and restore forest stand structure on about 1,350 acres of ponderosa pine vegetation. Afterward, prescribed fires would be used to maintain this area, along with an additional 50 acres of montane meadow vegetation. Up to 156 acres of ponderosa pine-dominated vegetation would be manually thinned around NPS facilities and visitor-use areas to create defensible areas in the event of a wildfire. In addition, up to 335 acres within a variety of fire-prone vegetation types would be manually treated to protect archaeological sites from fire damage.

Under each alternative, suppression operations would include an appropriate response to wildland fires to achieve effective control for the protection of human life and property with the least amount of damage to the monuments' natural and cultural resources.

Five other alternatives were considered but dismissed from detailed analysis. A "wildland fire use for resource benefit" alternative was considered but dismissed, because the Flagstaff Area National Monuments are not large enough to sustain free-burning fires without substantial risk to

park values and park neighbors. It is also unlikely that qualified personnel would be readily available to the monuments within the time periods required by policy. A “no prescribed fire” alternative was considered but, under this strategy, several resource management objectives could not be attained. A “no manual thinning” alternative was dismissed because of the potential risk to resources that would result if thinning could not be used to create defensible spaces around sensitive resources. A “mechanical thinning using motor vehicles off of existing roads” alternative was dismissed because it would have too great an impact on archaeological sites and areas with fragile natural resources. A “no management” alternative allowing all fires to burn without intervention was also dismissed.

This environmental assessment/assessment of effect analyzes the impacts of the alternatives considered on geology and soils, vegetation, wildlife, special status species, water resources, wetlands, air quality, cultural resources, health and safety, park neighbors, Native American traditional values, visitor experience, park operations, and wilderness character. Measures to mitigate adverse effects on natural and cultural resources are identified in the description of alternatives. The cumulative effects of each alternative are described. Based on the analysis, there would be no direct, indirect, or cumulative major effects to resources resulting from the preferred alternative.

### **Public Comment**

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

Please address comments to:  
Superintendent  
Flagstaff Area National Monuments  
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**WILDLAND FIRE MANAGEMENT PLAN  
FLAGSTAFF AREA NATIONAL MONUMENTS**

**Environmental Assessment/Assessment of Effect**

**PURPOSE AND NEED**

**Background**

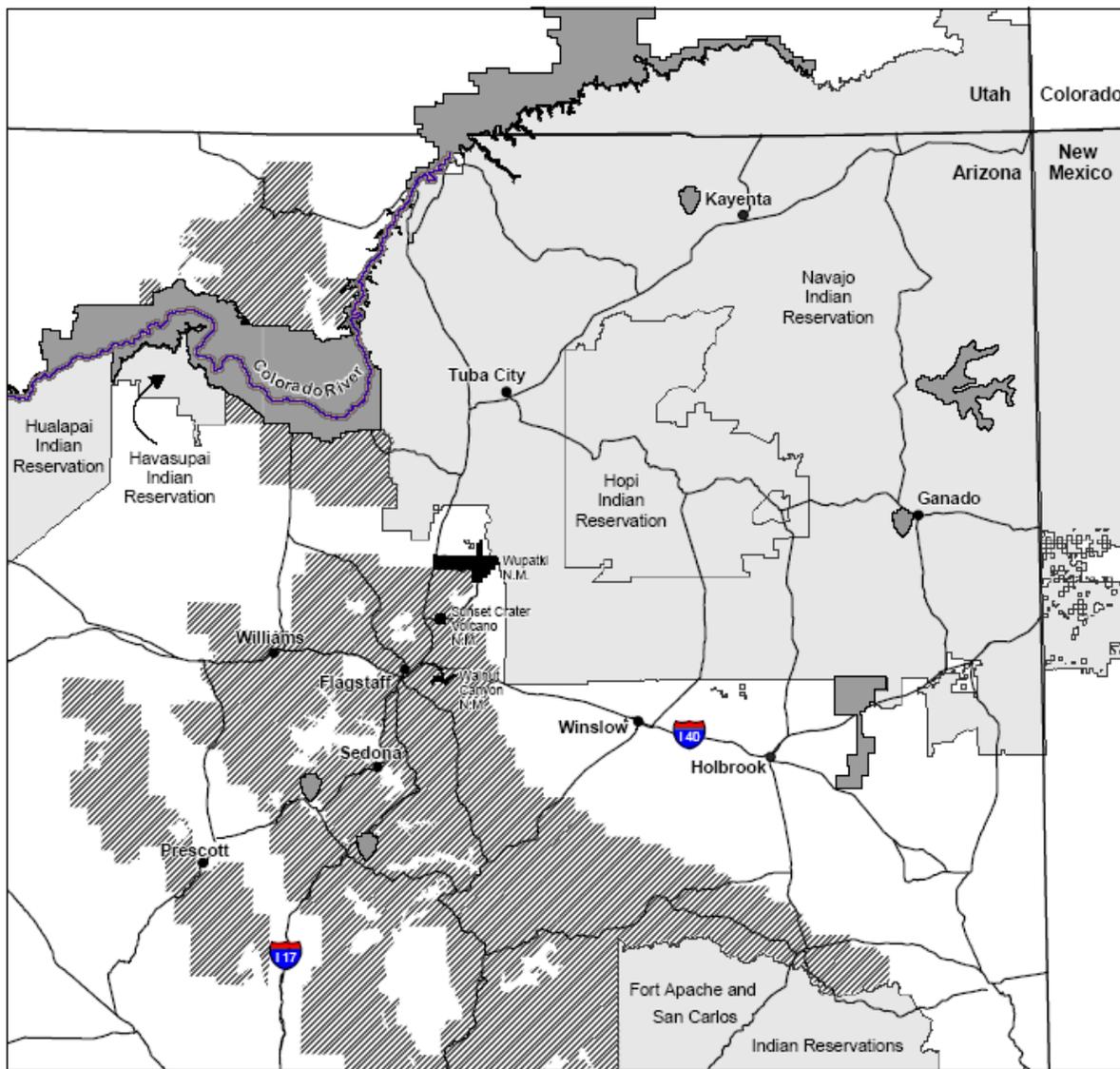
Walnut Canyon National Monument, Wupatki National Monument, and Sunset Crater Volcano National Monument are collectively referred to as the Flagstaff Area National Monuments. The Flagstaff Area National Monuments are located in Coconino County, Arizona, generally north and east of Flagstaff, as shown on Figure 1. The following are descriptions of the three Flagstaff Area National Monuments, as found in resource management planning documents (USDI 2002):

Walnut Canyon National Monument is located in the north-central portion of Arizona, seven miles east/southeast of Flagstaff. Situated on the Mogollon Rim Plateau, the monument lies within the Little Colorado River Watershed. The monument encompasses 3,541 acres, with elevations ranging from 6,200 to 6,800 feet. The 400-foot-deep canyon cuts through the forested limestone plateau from west to east through the monument. The monument was established by Presidential Proclamation No. 1318 on November 30, 1915, to preserve the prehistoric ruins of ancient cliff dwellings. The monument was enlarged by Presidential Proclamation No. 2300 on September 24, 1938, and by P.L. 104-333 on November 12, 1996.

Wupatki National Monument is located in the north-central portion of Arizona and is 34 miles northeast of Flagstaff. The monument was established by Presidential Proclamation No. 1721 on December 9, 1924, as a two-piece area to preserve the Citadel and Wupatki prehistoric pueblos. Since 1924, several Presidential Proclamations and Acts of Congress expanded and reduced the monument area to its present 35,422.13 acres. The monument lies between extensive high elevation national forest lands to the southwest and the desert mesas of the Hopi and Navajo Indian Reservations to the northeast.

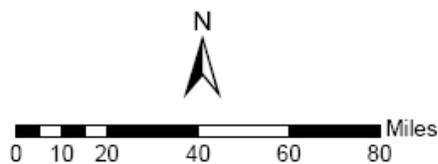
Sunset Crater Volcano National Monument is located 18 miles northeast of Flagstaff and 20 miles southwest of Wupatki National Monument. The monument, consisting of 3,040 acres, was established by Presidential Proclamation No. 1911 on May 26, 1930, for the purpose of preserving and protecting the Sunset Crater Volcano, Bonito Lava Flow, and associated geological features. The monument name was changed November 16, 1990, to Sunset Crater Volcano National Monument by the Smith River National Recreation Act, P.L. 101-612.

# Vicinity Map Flagstaff Area National Monuments Arizona



**Federal Lands**

- Flagstaff Area National Monuments
- Other National Park Service Areas
- Indian Reservations
- National Forest
- Cities



Data Source: NPS, USGS  
 Projection & Datum: UTM 12N, NAD 1927  
 Date: 7/1/2003

Prepared By: National Park Service  
 Flagstaff Area National Monuments  
 Division of Resources Management

**Figure 1**

## **Purpose**

The purpose of this planning effort is to develop a fire management plan (FMP) for the Flagstaff Area National Monuments. As required by the National Environmental Policy Act (NEPA), this Environmental Assessment/Assessment of Effect (EA/AEF) was developed to analyze fire management program alternatives and their direct, indirect, and cumulative impacts on the environment. Subsequent to this EA/AEF, an alternative will be selected for implementation, and a separate FMP document will be developed based on that selected alternative. The FMP is an operational document providing overall direction to the fire management program.

## **Need**

The National Park Service's *Management Policies* (2001) and Director's Order 18 – Wildland Fire Management – require that each park area with vegetation capable of sustaining fire develop a plan to manage fire on its lands. To comply with NPS policy, the Flagstaff Area National Monuments need to have a comprehensive fire management program that protects natural and cultural resources, the public and employees, and park facilities. The existing FMPs for the three monuments are over 10 years old and outdated. There is a need for a plan that includes current and appropriate fire and fuel management strategies and addresses continuing fuel build-up in certain areas of the monuments, and supports the policy of establishing appropriate fire frequency cycles based on vegetation type. A FMP that satisfies DO-18 requirements will be completed for the selected alternative.

## **Scope of the Fire Management Plan**

The scope of the FMP is confined to lands within the authorized boundaries of the three national monuments of the Flagstaff Area (41,705 acres total area). The three monuments are included in a single multi-park plan because they are managed by the same staff, generally have similar affected environments, and have some planning documents collectively prepared for the group of NPS units (e.g., Resource Management Plan). This EA/AEF considers impacts within the monuments and adjacent areas that could be impacted by the proposed fire management actions.

The FMP will identify Zones of Cooperation where fire management objectives and tactics would be developed in cooperation with neighboring land management agencies and private property owners. In these areas, the NPS and adjacent landowners share protection responsibilities for certain values (public, private, cultural, and natural) inside or outside of NPS administered areas (e.g., Sunset Crater Volcano Administrative Site).

Throughout the document, when specified conditions, information, or actions refer to all three monuments, then the conditions, information, and actions are said to be relevant to the “Flagstaff Area National Monuments.” Where conditions, information, or actions are specific to one national monument, that national monument is referred to by name (e.g., Wupatki National Monument).

## **Fire Planning Considerations**

The preferred alternative will be implemented based on a 10-year program of work for manual vegetation/fuels treatments and prescribed burning activities included in the FMP (Appendix A). Under the FMP, implementation projects would remain actively programmed for national fire program funding purposes. On an annual basis, the Flagstaff Area National Monuments fire plan implementation team would evaluate monitoring data on fuel and resource conditions, treatment progress and results, funding availability, and other issues to determine if the 10-year treatment schedule and/or FMP need to be updated. The schedule and FMP updates should be consistent with program objectives and the selected alternative defined in the FMP and the EA/AEF. In this way, the fire program incorporates an adaptive management approach into its planning and program implementation. To ensure on-going compliance with specific laws such as the National Historic Preservation Act and the Endangered Species Act, requisite consultation for resource impacts is performed on a project-by-project basis where a programmatic agreement has not been developed.

It is possible that during the annual FMP and treatment schedule evaluation and update, changes in park conditions or in policy and law may indicate that the FMP needs substantial revision. It is also possible that objectives, resource conditions, or new scientific knowledge may necessitate treatments that are inconsistent with scope of environmental effects under the selected alternative and EA/AEF. If subsequent fire program updates result in a new direction whose impacts were not considered in the original FMP EA/AEF, additional NEPA analyses would be required. Regardless of whether substantial changes are made to the plan or treatments, if new regulatory requirements, threatened and endangered species listings, or changes to the environment have occurred since the original EA/AEF, additional compliance actions may be required to continue implementing the program.

## **Fire History and Fire Ecology**

Based on fire incident reports, there have been 55 ignitions/wildfires at the monuments over last 20 years (1984–2004). Five of these were 0.1 to 5 acres in area; five were 5 to 100 acres in area (all but one at Wupatki National Monument); and six exceeded 100 acres in area (all at Wupatki National Monument). The remaining 39 fires were assumed to be less than ¼ acre in size. The following provides a brief fire history and fire ecology for each monument.

### **Walnut Canyon National Monument**

The fire ecology within ponderosa pine forest above the Walnut Canyon National Monument rim is well studied. Wood wedge sections were taken from 18 large, fire-scarred trees. Multiple fire scar rings were readily found in the wedges, and some had twenty or more scars. Between 1566 and 1880, fires burned every seven years on average, and each tree was burned at least every 3 to 15 years. Suppression of fire over the past century has led to the absence of periodic fire events, and ponderosa pine stands have changed, with a shift to forests with higher tree densities, characterized by dense understory and litter accumulation. This increases the risk of more intense crown fires, although none has occurred in the monument over the past 20 years.

The eastern third of Walnut Canyon is dominated by pinyon-juniper woodland. Very few fire scars were found in this vegetation type, but pinyon typically decomposes within a decade after fire and does not provide long-term evidence. Burned and charred juniper snags, stumps, and branches gave evidence of infrequent stand-replacing fires. Although no fire history study on the Walnut Canyon slopes or floor have been completed, many trees at the bottom of the canyon have basal scars, some with multiple scars. There is a record of numerous lightning strikes each thunderstorm season, and charred stumps, branches, and snags are evident within all vegetation types in the monument.

The NPS began prescribed burning at Walnut Canyon in 1986. Two small burns, Walnut Fire #1 (10 acres, October 1986) and Walnut Fire #2 (15 acres, May 1987) were carried out to help refine prescriptions and operations and also served as certification burns for the Burn Boss. Along with these two small certification burns, 4 other broadcast burns have been completed under the current fire program. In May 1995, 86 acres was burned in the Cabin Burn Project; 80 acres was burned in October 1996 in the Rim Burn Project; and in January 1999, 65 acres was burned in the Meadow Burn Project. These three projects involved 231 acres on the canyon's north rim and surrounded the historic Ranger Cabin. In October 1999, 151 acres were burned on the south rim of the canyon in the Pictograph Burn Project. Figure 2 is a map of completed prescribed fire projects at Walnut Canyon.

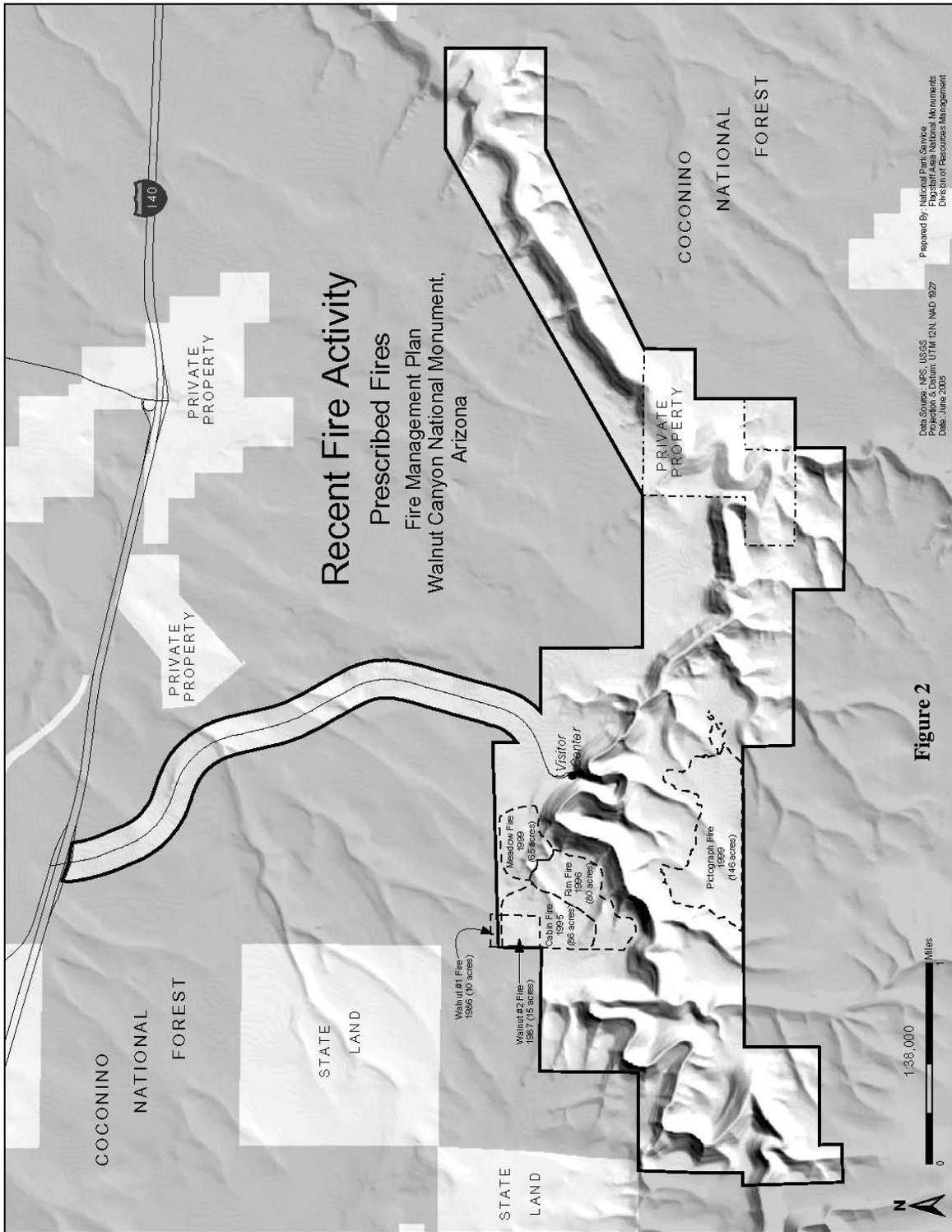
### **Wupatki National Monument**

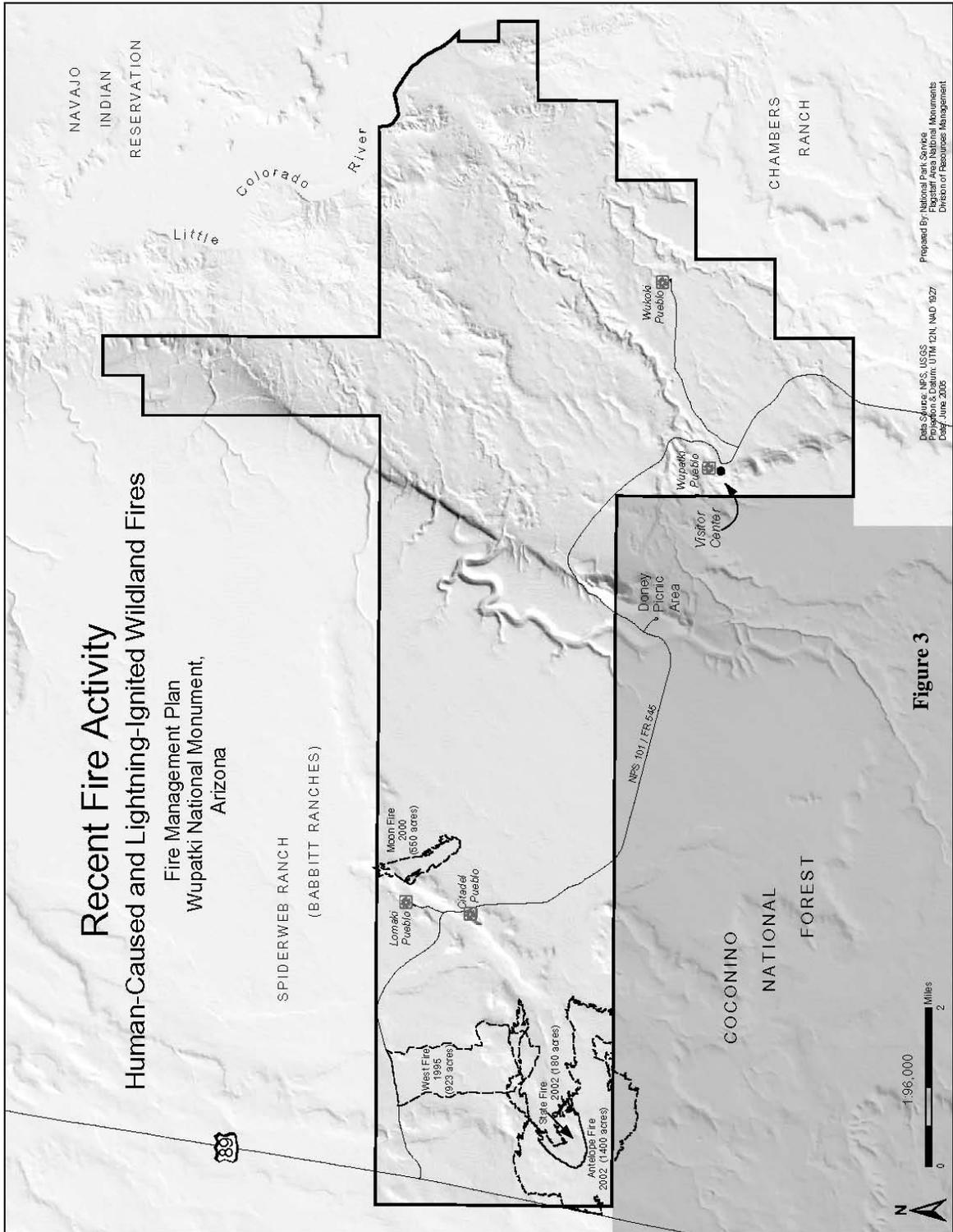
At Wupatki, livestock grazing dating back to the 1860s resulted in a loss of fine fuels and likely prevented grassland from sustaining wildfires during the 20th century. Photographic records covering 60 years show increase in juniper density on the grassland as a result of the lack of periodic fuels (Cinnamon 1988). A part of the western portion of Cedar Canyon burned in 1956, but no other information is known. Developing fire history based on tree rings is difficult because the only trees at Wupatki are juniper, most of them are less than 150 years old, and juniper is notoriously unreliable for tree ring dating studies.

An area just west of Highway 89 burned in a human-caused fire in 1989. Livestock were removed from Wupatki in 1989 and since 1995, 3,053 acres have burned in lightning and human-caused fires (see Figure 3). The largest fire on record is the Antelope Fire of 2002, which reached 1,400 acres in size.

### **Sunset Crater Volcano National Monument**

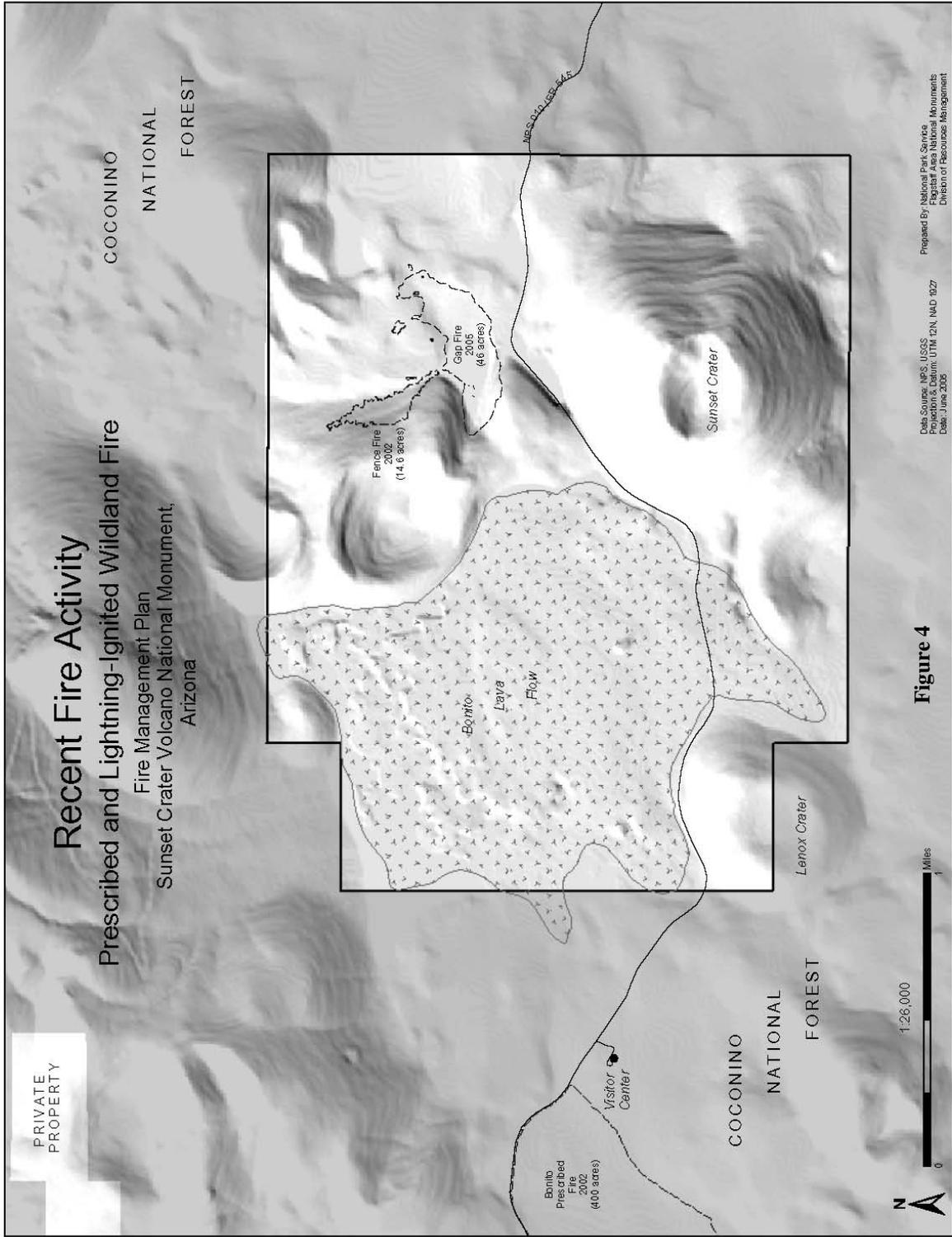
The presettlement fire history in the ponderosa forest surrounding Sunset Crater Volcano is not well known. The area experienced at least one large wildfire in the 1970s. Lightning strikes the area frequently, and there are numerous records of fires in the 0.10 to 10 acre range, as are ponderosa pines with evident lightning damage and/or fire scars. Fire suppression during the last century has led to increases in tree densities and litter in some of the ponderosa pine forests, which increases the risk of higher severity fires. However, since official fire records have been kept, the only documented wildland fires larger than 10 acres on the monument occurred in 2002, burning 14.6 acres, and in 2005, burning 46 acres (see Figure 4). A relatively large prescribed burn was completed just west of the monument on Coconino National Forest in 2002 (the Bonito Burn, 400 acres).





Data Source: NPS, USGS  
 Projection: S. Datum, UTM, 12N, NAD 1983  
 Date: June 2005  
 Prepared By: National Park Service  
 Flagstaff Area National Monuments  
 Division of Resource Management

**Figure 3**



Prepared By: National Park Service  
 Flagstaff Area National Monuments  
 Division of Resource Management

**Figure 4**

## Fire Regime Condition Class

Consistent with federal wildland fire policy and procedures, the concept of Fire Regime Condition Class (FRCC, or Condition Class) is being incorporated into the Flagstaff Area National Monuments’ fire management program. Condition class is a recent rationale adopted by federal agencies to document the extent to which the nation’s forests have deviated from healthy and sustainable ecological processes and forest structure. Condition class is a specific measure of vegetative conditions that qualitatively describe whether the vegetation community has been altered by human activities, such as fire suppression and livestock grazing. Condition class assessments are then used to evaluate how much that “departure” from a relatively pristine condition affects that vegetation community’s ability to withstand fire with effects that might have been seen had humans not intervened in the fire cycle (the fire regime portion of the concept).

Researchers have identified three condition classes based on a relative measure describing the degree of departure from natural (historical) fire regimes (Hann and Bunnell 2001, Hardy et al. 2001a, Schmidt et al. 2002). The three classes represent low (FRCC 1), moderate (FRCC 2), and high (FRCC 3) departure from the central tendency of the historical regime. Low departure is considered to be within the historical range of variability, while moderate and high departures are outside that range. All wildland vegetation and fuel conditions and wildland fire situations fit within one of the three condition classes. Table 1 summarizes the FRCC classifications.

<b>Table 1: Fire Regime Condition Class</b>		
<b>Condition Class</b>	<b>Fire Regime</b>	<b>Example Management Options</b>
1	Fire regimes are within historical range, and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within historical range.	Where appropriate, these areas can be maintained within the historical fire regime by treatments such as fire use.
2	Fire regimes have been moderately altered from their historical range. The risk of losing key ecosystem components is moderate. Fire frequencies have departed from historical frequencies by one or more return intervals (either increased or decreased), resulting in moderate changes to one or more of the following: fire size, intensity and severity, and/or landscape patterns. Vegetation attributes have been moderately altered from their historical range.	Where appropriate, these areas may need moderate levels of restoration treatments, such as fire use and hand or mechanical treatments, to be restored to the historical fire regime.
3	Fire regimes have been significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to one or more of the following: fire size, intensity, severity, and/or landscape patterns. Vegetation attributes have been significantly altered from their historical range.	Where appropriate, these areas may need high levels of restoration treatments, such as hand or mechanical treatments, before fire can be used to restore the historical fire regime.
Fire Regime Current Condition Class is a qualitative measure describing the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components, such as species composition, structural stage, stand age, canopy closure, and fuel loadings. One or more of the following activities may have caused this departure: fire suppression, timber harvesting, livestock grazing, introduction and establishment of non-native plant species, introduced insects or disease, or other management activities (Schmidt, K.M. et. al. 2002).		

Departure from the historical fire regime results in changes to one or more of the following key ecological components:

- Vegetation characteristics (species composition, structural stages, stand age, canopy closure, and mosaic pattern)
- Fuel composition
- Fire frequency, severity, and pattern
- Other associated disturbances (e.g., insect and diseased mortality, grazing, and drought)

Human activities that have contributed to altered forest condition (FRCC2 and FRCC3) include fire suppression, timber harvesting, livestock grazing, introduction and establishment of invasive, non-native plant species, and introduced insects and disease (Hardy et al. 2001a).

Figures 5, 6, and 7 depict the FRCC for the dominant vegetation classes found in the three Flagstaff area monuments. As can be seen on these figures, the vegetation within all three monuments is believed to be in either FRCC 1 or 2, with no FRCC 3 areas. This means that vegetation/fuel conditions and the potential effects of fire remain within the range of historic variability or are altered only moderately, and there is no high risk of losing key ecosystem components anywhere in the monuments.

## **Relevant Laws, Policies and Planning Documents**

A multitude of laws, regulations, and policies influence the development and implementation of a fire management program at NPS units. The following relate directly to the development of a FMP and EA/AEF:

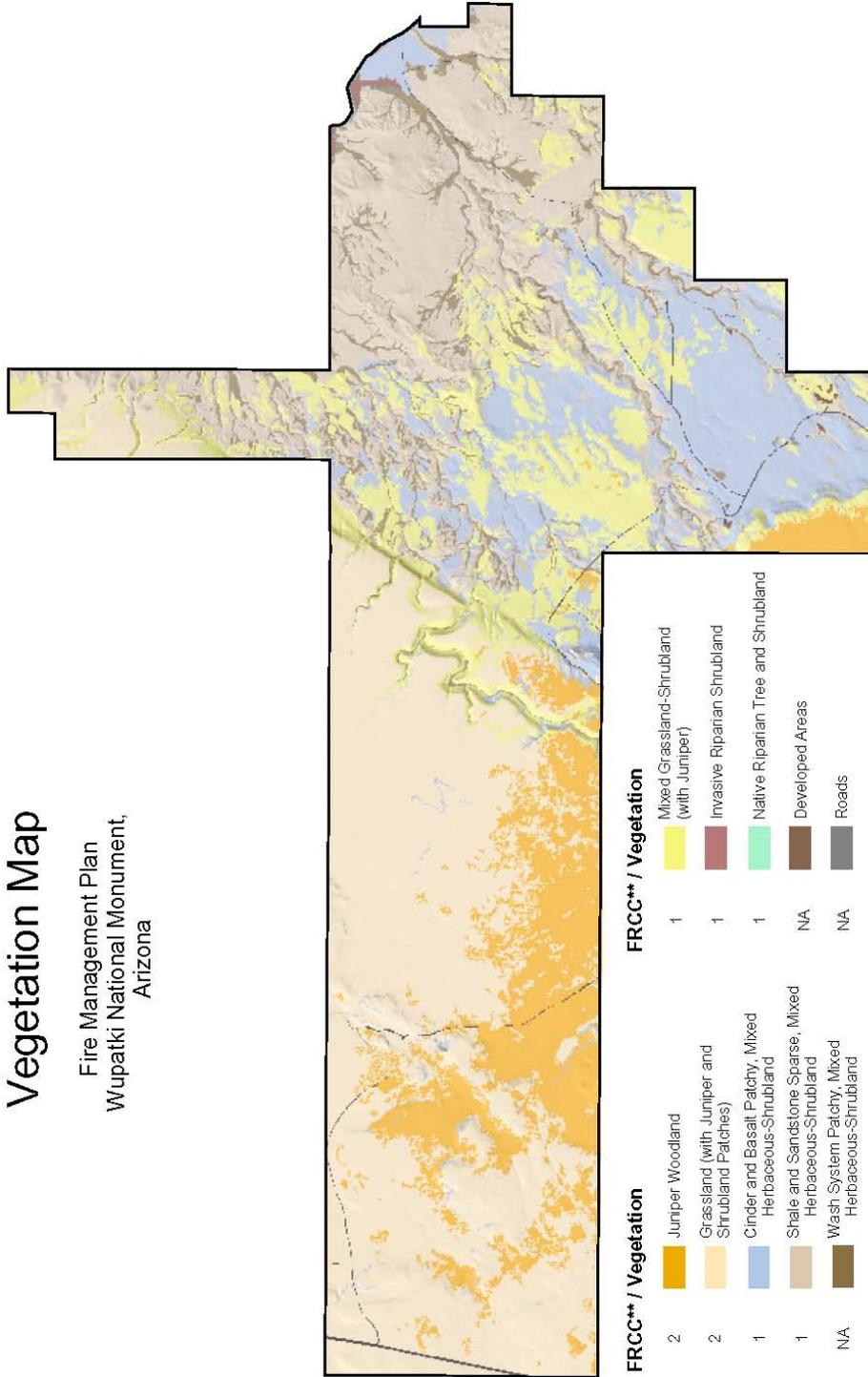
**NPS Organic Act of 1916** – Congress directed the U.S. Department of the Interior and NPS to manage units “to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations” (16 U.S.C. § 1). Congress reiterated this mandate in the Redwood National Park Expansion Act of 1978 by stating that the NPS must conduct its actions in a manner that will ensure no “derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress” (16 U.S.C. § 1 a-1).

**National Environmental Policy Act (NEPA)** – The purpose of NEPA is to encourage productive and enjoyable harmony between man and his environment; to promote efforts, which would prevent or eliminate damage to the environment and stimulate the health and welfare of mankind; and to enrich the understanding of the ecological systems and natural resources important to the Nation. NEPA requirements can be satisfied by completion of an Environmental Impact Statement (EIS) or EA with a decision document (Finding of No Significant Impact or Record of Decision), or by a Categorical Exclusion (CE).



# Vegetation Map

Fire Management Plan  
Wupatki National Monument,  
Arizona



### FRCC\*\* / Vegetation

- 2 Juniper Woodland
- 2 Grassland (with Juniper and Shrubland Patches)
- 1 Cinder and Basalt Patchy, Mixed Herbaceous-Shrubland
- 1 Shale and Sandstone Sparse, Mixed Herbaceous-Shrubland
- NA Wash System Patchy, Mixed Herbaceous-Shrubland

### FRCC\*\* / Vegetation

- 1 Mixed Grassland-Shrubland (with Juniper)
- 1 Invasive Riparian Shrubland
- 1 Native Riparian Tree and Shrubland
- NA Developed Areas
- NA Roads

### \*\*Fire Regime Condition Class:

- NA = Not Assessed
- 1 = Little or no alteration of historical natural fire regime
- 2 = Moderate alteration of historical natural fire regime



Data Source: NRS, USGS  
Prepared by: National Park Service  
Flagstaff Area National Monuments  
Division of Resource Management  
Projection & Datum: UTM 12N, NAD 1983  
Date: June 2005

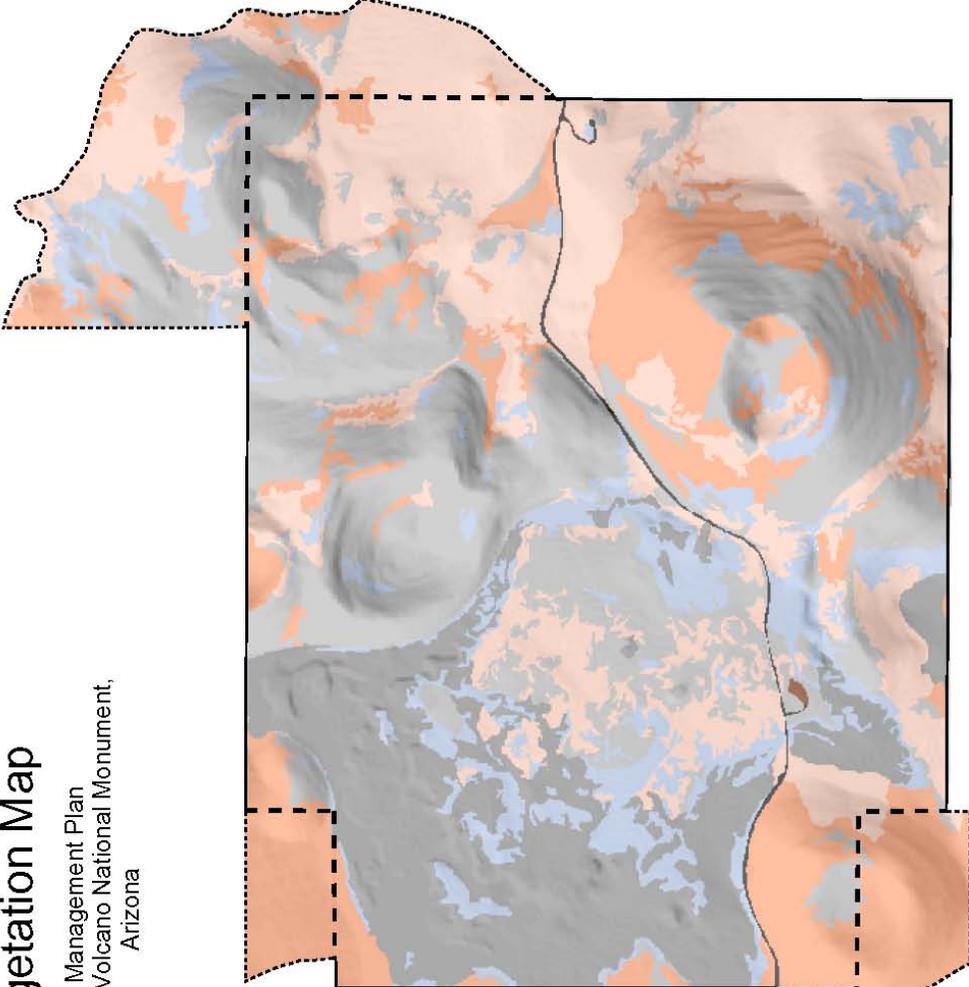
**Figure 6**

# Vegetation Map

Fire Management Plan  
Sunset Crater Volcano National Monument,  
Arizona

- FRCC\*\* / Vegetation**
- NA Cinder Terrain
  - NA Basalt Terrain
  - NA Cinder and Basalt Sparse Herbaceous-Shrubland
  - 1 Ponderosa Pine with Patchy Shrub-Herbaceous Understory and Needlecast
  - 2 Ponderosa Pine with Contiguous Shrub-Herbaceous Understory and Needlecast
  - 2 Montane Grassland
  - NA Developed Areas
  - NA Roads
  - NA Proposed Boundary Adjustment Area (Coconino NF)

- \*\*Fire Regime Condition Class:**
- NA = Not Assessed
  - 1 = Little or no alteration of historical natural fire regime
  - 2 = Moderate alteration of historical natural fire regime



**Figure 7**

Data Source: NPS, USGS  
Projection & Datum: UTM 12N, NAD 1983  
Date: June 2005  
Prepared By: National Park Service  
Flagstaff Area National Monuments  
Division of Resources Management

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

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

**Endangered Species Act (ESA)** –The ESA provides for the listing, protection, and recovery of endangered and threatened species and their critical habitats. Section 7 of the ESA requires Federal agencies to consult with the U.S. Fish and Wildlife Service if any listed species or their critical habitats may be affected by the proposed action.

**Director’s Order 18 (DO-18)** – DO-18, the NPS guidance for Wildland Fire Management, states, “Every NPS unit with burnable vegetation must have an approved Fire Management Plan.” DO-18 defines what an approved FMP must include, stressing that “firefighter and public safety is the first priority” and promoting “an interagency approach to managing fires on an ecosystem basis across agency boundaries.” Director’s Order 18 also directs parks to identify, manage, and reduce, where appropriate, accumulations of hazardous fuels. Procedures for completion, review, approval, and required contents for FMPs are provided in Reference Manual-18 (RM-18). Until the FMP is approved, NPS units must take suppression action on all wildland fires.

The federal Wildland Fire Management Policy and Program Review (USDI et al. 2001) and Wildland and Prescribed Fire Management Policy Implementation Procedures Reference Guide (USDA/USDI 1998) provide specific guidance on fire policy, planning and implementation. These policies require FMPs to recognize the full range of fire management actions to accomplish stated protection and resource management objectives. The policy states:

*Fire, as a critical natural process, will be integrated into land and resource management plans and activities on a landscape scale, across agency boundaries, and will be based upon best available science. All use of fire for resource management requires a formal prescription. Management actions taken on wildland fires will be consistent with approved fire management plans.*

Additional laws, Executive Orders, and policies relevant to this planning effort are listed in Table 1 by applicable impact topic.

The Flagstaff Area National Monuments’ FMP would be consistent with other approved plans for the units. The Flagstaff Area National Monuments’ Resources Management Plan (RMP), approved in 1996, provides resource management direction and objectives for the monuments. The RMP became outdated in 2001 and, under new national NPS policy guidance, will soon be

superseded by a Resource Stewardship Plan. The Draft GMP and Environmental Impact Statement (GMP/EIS) for Walnut Canyon National Monument was completed in 2001. The Final GMP/EIS for Wupatki National Monument and the Final GMP/EIS for Sunset Crater Volcano National Monument were completed in September 2002. The General Management Plan (GMP) for Wupatki National Monument states:

*...Until the last century, grassland and savanna areas of Wupatki likely experienced periodic wildland fires, which played a major role in plant dominance and succession in these natural systems... (USDI 2002b)]*

As previously mentioned, the existing FMPs for the three Flagstaff Area National Monuments are now over 10 years old and are outdated. NPS policy requires that the FMP be re-written according to new fire management policy and new scientific research information.

The Flagstaff Area National Monuments participate in two interagency agreements. The *Joint Powers Agreement* between the State of Arizona and the federal agencies of the Departments of Interior and Agriculture provides for the “closest available resources” to respond to fire emergencies on each participant’s jurisdiction and to recoup costs associated with such actions (authority provided in the Reciprocal Fire Protection Act (1955), National Park System General Authorities Act (1970), National Interagency Agreement for Fire Management (FS No. 97-S1A-004, Amendment No. 1), and the Department of Interior and Related Agencies Appropriations, as included in Public Law 105-277, Sec. 101 (e)). A structural fire protection agreement with the city of Flagstaff allows the fire department to extend fire protection beyond the city limits to include the NPS facilities at Walnut Canyon. Sunset Crater and Wupatki share a structural fire agreement [on file, Flagstaff Area National Monuments] with the Summit Fire District.

The Flagstaff Area National Monuments also participate in the Ponderosa Fire Advisory Council (1989), formed to provide guidance, cooperation between agencies, and support for the Flagstaff community and surrounding areas including the Flagstaff Area National Monuments in the event of a major wildfire threat. Over the last two years, the NPS has engaged in the collaborative planning process of the Coconino National Forest and the Greater Flagstaff Forest Partnership for the lands surrounding Walnut Canyon National Monument and Sunset Crater Volcano National Monument. Many concepts and resource impact concerns identified by the stakeholders in this collaborative process have been used to refine the ecological restoration strategies and mitigating measures in the preferred alternative. The proposed fire management direction is also consistent with the recently approved Community Wildfire Protection Plan for Flagstaff and Surrounding Communities in the Coconino and Kaibab National Forests of Coconino County, Arizona, prepared by the Greater Flagstaff Forest Partnership and the Ponderosa Fire Advisory Council.

## **Goals and Objectives**

The parks’ interdisciplinary team (IDT) developed fire management goals and objectives in consideration of the Flagstaff Area National Monuments’ Resources Management Plan (USDI 2002a), other park planning documents, resource protection laws, regulations, and agency

guidance and policies. All alternatives selected for detailed analysis must largely meet these objectives, as well as the purpose and need for action.

For each goal, there are related management objectives that will evolve during program implementation as part of the adaptive management process. It is recognized that achieving every goal to its fullest extent may not be possible because of inherent conflicts among the goals. That is, one goal cannot be completely emphasized to the exclusion of the other goals except in the case of human safety, which is the highest priority.

**Goal:** Human life and health are protected.

**Objectives:**

- Human safety and health are the highest priorities for all fire management activities.
- Fire management responsibilities and procedures for protecting human life are effective and clearly communicated.
- Vegetation/fuels are managed around NPS visitor use areas, administrative facilities, and adjacent private property to minimize the chance of a wildfire related accident, injury, illness, or death to visitors, NPS staff, and others.
- Fire management activities comply with applicable federal, state, and local regulations and air quality standards.

**Goal:** Private and public property and NPS facilities are protected from wildland fire.

**Objectives:**

- Fire management responsibilities and procedures for protecting property and facilities are effective and clearly communicated.
- A safe area is created around NPS facilities and adjacent private property where fire personnel and equipment may be deployed to protect structures and utilities from wildfire.
- Wildland fire originating within the Flagstaff Area National Monuments does not threaten adjacent structures or property.
- Cultural resource integrity, natural viewsheds, and the desired visitor experience are maintained around NPS facilities and visitor use areas.

**Goal:** Natural and cultural resources are preserved and protected.

**Objectives:**

- Cultural resources are protected at the landscape level over the long-term.
- Wildfire suppression tactics minimize impacts upon cultural sites, protected/sensitive species, and protected/unique habitats.
- Prescribed burning and manual vegetation/fuels management activities utilize methods which do not impact cultural sites, protected/sensitive species, and protected/unique habitats.
- Vegetation and fuels accumulation within and nearby archeological sites at Walnut Canyon National Monument are locally treated as needed to reduce wildland and prescribed fire intensity. Examples of high-risk sites include wooden historic structures, sites with flammable prehistoric materials (original wall plaster, wooden lintels and wall pegs and packrat middens), and sites with standing original architecture.

- Vegetation and fuels accumulation within and nearby archaeological sites with flammable prehistoric materials at Wupatki National Monument will be assessed and, if needed, locally treated to reduce wildland fire intensity.
- Appropriate fire management strategies and implementation guidelines to protect the Mexican spotted owl population and to conserve designated Critical Habitat at Walnut Canyon are developed in consultation with the U.S. Fish and Wildlife Service and in accordance with the Mexican Spotted Owl Recovery Plan.
- Vegetation and fuels around sensitive plant populations or wildlife habitats are cyclically assessed and, if needed, locally treated to reduce wildfire and prescribed fire intensity.

**Goal:** The ecological role of fire is restored within fire-dependent vegetation.

**Objectives:**

- The biotic communities within the Flagstaff Area National Monuments function within their natural range of variability for vegetation structure and cover, species composition and diversity, fuel loads, fire disturbance, and watershed function.
- Site-specific information on reference period conditions and natural historical fire regimes for each biotic community is used to guide the frequency, timing, severity, and extent of prescribed burning.
- Manual vegetation thinning and prescribed fires mimic the environmental effects of the natural historical fire regime.
- Invasive, non-native plant species are not introduced or spread by fire management activities.

**Goal:** Fire management activities are fully integrated with other NPS operations at the Flagstaff Area National Monuments and with other NPS areas that provide off-site fire management staffing expertise and support.

**Objectives:**

- Fire management activities mutually address other NPS operational objectives for safety, facility protection, resources management, and visitor-use at the monuments.
- Fire management project plans are developed by a team with expertise in a variety of professional disciplines, and off-site subject matter expertise is sought as needed to augment existing staff capabilities.
- Fire management projects are reviewed by the Flagstaff Area National Monuments' Management Team to identify and resolve any safety, staffing, budgetary, operational, and logistical issues.
- Other NPS areas provide support for fire management projects in a timely and effective manner.
- Employees are knowledgeable about fire's role in ecosystem management, and the scope and effect of fire management activities.
- Visitors gain an understanding of fire management within the park, and an appreciation for the role of fire in the regional ecosystem.

**Goal:** Citizens, adjacent land managers, neighbors, partners, and other stakeholders are informed and involved in fire program direction within the Flagstaff Area National Monuments.

**Objectives:**

- Fire management projects within the monuments are coordinated with and complement, to the greatest extent possible, similar activities on adjacent Coconino National Forest, Arizona Trust Lands, tribal, and private lands.
- Visitors are well informed about local fire danger ratings and measures to prevent unwanted fires.
- The NPS cooperates with the Coconino National Forest and other stakeholders to restore and maintain fire-dependent vegetation, wildlife habitats, watershed function, cultural landscapes, and scenic viewsheds across management area boundaries.

**Goal:** The fire management program at the Flagstaff Area National Monuments is informed by the best available science and technical information.

**Objectives:**

- An active program of scientific study and resource condition monitoring continues within the monuments to improve knowledge of the role that fire plays in local biotic communities and landscapes.
- Natural and cultural resource conditions are cyclically monitored to ensure that fire management objectives are being met.
- The adaptive management approach is used to assess and adjust fire management strategies as new scientific and technical information becomes available.

## Scoping Issues and Impact Topics

### Scoping

Scoping refers to the part of an environmental assessment process during which the Interdisciplinary Team (IDT) and the public review the purpose, need, and objectives of the plan and attempt to focus the analysis on the primary issues of interest. The Flagstaff Area National Monuments' IDT held an internal scoping meeting on November 13 and 14, 2002. The IDT conducted external scoping with tribal governments; local, state and federal agencies; and the interested and affected public from February 15 through July 30, 2003. Parties contacted during external scoping are listed in Chapter 4.

### Issues and Impact Topics

An impact topic is a resource, value, or condition that potentially could be affected by actions described in the alternatives. Issue statements describe potential concerns relevant to each impact topic.

Issues and concerns about this plan were identified during the scoping process. After scoping, the issues and concerns were categorized into distinct impact topics to facilitate the analysis of environmental consequences, providing for a standardized comparison between alternatives. A resource, value, or condition that is protected by federal/state/local laws and regulations; executive orders; and NPS policy can be an impact topic. An impact topic can

also be a unique or limited national, regional, or local resource or value. The following lists the impact topics and their associated issue statements for this plan:

**Geology and Soils:**

- Wildland fire may affect soil erosion, soil chemistry, and related processes.
- At Sunset Crater Volcano National Monument, fire management actions may affect cinder movement on the steep sides of the cinder cone.

**Vegetation:**

- Long-term drought and insect infestation may affect wildland fire.
- Wildland fire may affect plant species richness and plant community diversity at Walnut Canyon National Monument.
- Wildland fire may affect large-diameter ponderosa pines and other old trees.
- Impacts of wildland fire and fire management activities may affect non-native species.

**Wildlife:**

- Wildland fire may injure, kill, or stress wildlife and change wildlife habitat attributes.

**Special Status Species:**

- Wildland fire may affect listed species, including the Mexican spotted owl, and their habitats, either beneficially and/or adversely.

**Water Resources, Wetlands, and Riparian Areas:**

- Wildland fire potentially may affect water quality, since runoff from burned areas may affect sedimentation and nutrient loading in riparian systems.
- Wildland fire can result in damage or loss of wetland or riparian vegetation and associated wildlife.

**Air Quality:**

- Emissions from wildland fires may degrade air quality below state and local standards.

**Cultural Resources:**

- Wildland fire and fire management activities may affect cultural sites, features, materials, cultural landscapes, and historic sites and features.

**Health and Safety:**

- Wildland fire may affect the health of the public or firefighters.
- Managing fuels in certain areas may protect the health and safety of the public and firefighters.
- Smoke may cause respiratory problems in certain people.

**Park Neighbors:**

- Park neighbors may affect or be affected by wildland fire.

**Native American Traditional Values:**

- Wildland fire may affect ethnographic resources linked to Native American traditional values.

**Visitor Experience:**

- Wildland fire and/or reduced visibility from smoke may prevent visitors from experiencing all or portions of the monuments.
- Fire management activities and equipment produces unnatural sounds, potentially affecting the visitor experience.
- Loss of vegetation from wildland fire and fuels management activities may affect aesthetics.

**Park Operations:**

- Wildland fire and fire management activities may affect park operations.

**Wilderness Character:**

- Although there is currently no designated or recommended wilderness within any of the three monuments, Wupatki contains a large roadless area and has been the subject of discussion regarding wilderness designation. Therefore, the wilderness character of this area should be considered in developing a fire management plan.

## **Impact Topics Dismissed from Further Consideration**

NEPA and CEQ regulations direct agencies to “avoid useless bulk...and concentrate effort and attention on important issues” (40 CFR 1502.15). Some impact topics that are relevant to other kinds of proposals or projects are not relevant to the FMP alternatives considered in this EA/AEF or would experience only negligible to minor impacts. These topics are listed in Table 2 and below, along with a rationale for dismissing them from further consideration.

**Prime and Unique Farmlands:** In August 1980, the CEQ directed federal agencies to assess the impacts of their actions on farmland soils classified by the Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; or unique farmland specialty crops such as fruits, vegetables, and nuts. According to the NRCS, none of the soils on any of the Flagstaff Area National Monuments are classified as prime and unique farmlands. Therefore, this topic was dismissed from further analysis.

**Socioeconomics:** NEPA requires an analysis of impacts to the “human environment” which includes economic, social and demographic elements in the affected area. Implementation of fire management activities, particularly prescribed burning, may require temporary closures of project areas which may, in turn, inconvenience some park visitors. Such closures, however, are likely to be limited in size and of very short duration. Some fire management activities may bring a short-term need for additional personnel in the monuments, but that would not substantially affect local businesses or the economy. Thus, the alternatives would have a

negligible impact on local businesses and economy. Therefore, the socioeconomic environment was dismissed as an impact topic in this document.

**Environmental Justice:** Executive Order 12898, “General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high, adverse health or environmental effects of their programs on minorities and low-income communities. Executive Order 13045 requires federal actions and policies to identify and address disproportionately adverse risks to the health and safety of children. The FMP alternatives would not disproportionately affect the environment or health of minority or low-income populations or communities as defined in the Environmental Protection Agency’s Environmental Justice Guidance (1998). Therefore, environmental justice was dismissed as an impact topic in this document.

**Museum Objects:** Museum objects exist within the context of a built environment. An Emergency Operation Plan is currently being prepared for the Flagstaff Area National Monuments’ museum collections. During the interim, an informal agreement was established with the Museum of Northern Arizona (MNA). In the event of an emergency, the Flagstaff Area National Monuments’ museum collections will be transferred to MNA for short-term storage to avoid any adverse effect on the collections. Therefore, the topic of museum collection was dismissed from further evaluation in this document.

**Noise:** Noise is defined as an unwanted sound. Hazard fuels reduction, hazard tree removal, prescribed fires, and fire suppression can all involve the use of noise-generating equipment such as chainsaws, trucks and aircraft. Each of these fire management tools, especially chainsaws and helicopters, is quite loud (in excess of 100 decibels) and operators are directed to use hearing protection equipment. Generally, noise would be quickly dissipated in the open environments of the Flagstaff Area National Monuments and would have a negligible impact under all alternatives. Further, the use of such equipment would be infrequent at the Flagstaff Area National Monuments (hours or days per decade). Thus, it would not substantively interfere with human activities in the area or with wildlife behavior. The infrequent noise associated with fire management activities would not chronically impair the solitude and tranquility associated with the Flagstaff Area National Monuments. Also, noise is addressed under other impact topics as appropriate (wildlife, visitor experience, wilderness character). Therefore, this impact topic was dismissed from further analysis.

**Waste Management:** None of the fire management alternatives would generate hazardous material or solid wastes that require disposal in hazardous waste or general sanitary landfills. Therefore, this impact topic was dismissed from further analysis.

**Transportation:** The FMP alternatives would not substantively affect road, railroad, water-based, or aerial transportation in and around the Flagstaff Area National Monuments. There may be temporary closures of nearby roads during fire suppression or prescribed burning activities. However, as evidenced by recent fire history, such closures would be very infrequent and would not substantially impinge on local transportation. The impacts of all alternatives on transportation would be negligible. Therefore, this impact topic was dismissed from further analysis.

**Utilities:** Some projects included under the 10-year fuels management plan may temporarily impact telephone, electrical, natural gas, water, and sewer lines, potentially disrupting service to customers. Other projects may exert increased demand on telephone, electrical, natural gas, water, and sewage infrastructure, sources, and services, thus compromising existing services or creating a need for new facilities. None of the proposed alternatives would cause any of these effects. Therefore, this impact topic was dismissed from further analysis.

**Resource Conservation:** The NPS *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used such as resource conservation and recycling. None of the FMP alternatives would minimize or add to resource conservation or pollution prevention on the Flagstaff Area National Monuments. Therefore, this impact topic was dismissed from further analysis.

**Floodplains:** The term "floodplain" means the lowland and relatively flat areas adjoining inland and coastal waters including flood prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year (from Executive Order 11988, "Floodplain Management" of May 24, 1977).

The streams within the Flagstaff Area National Monuments are sufficiently high in the watershed, and high water events are effectively contained within existing stream channels. Flash flooding is not a common occurrence within the monuments. Under the preferred alternative, proposed treatment projects would be located well away from any existing floodplains, and therefore would not affect natural floodplain function. Further, the proposed action would not result in any development of lands within a floodplain, and would result in no increased flood hazards to existing developed property and visitor use areas in any of the monuments. Therefore, this impact topic was dismissed from further analysis.

**Indian Trust Resources:** Indian trusts are assets owned by Native Americans but held in trust by the United States. Indian trust resources do not occur within the Flagstaff Area National Monuments and, therefore, are not evaluated further in this document.

**Table 2. Summary of Impact Topics Retained or Dismissed**

<b>Impact Topic</b>	<b>Retained or dismissed from further evaluation</b>	<b>Relevant Laws, Regulations or Policies</b>
Health and Safety	retained	Director's Order #18; NPS <i>Management Policies</i>
Geology and Soils	retained	NPS Organic Act; NPS <i>Management Policies</i>
Air Quality	retained	Clean Air Act (CAA); CAA Amendments of 1990; NPS Organic Act; NPS <i>Management Policies</i>
Water Resources	retained	Clean Water Act; Executive Order 12088; NPS <i>Management Policies</i>
Floodplains and Wetlands	Floodplains dismissed Wetlands retained	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS Organic Act; NPS <i>Management Policies</i>
Vegetation	retained	NPS Organic Act; NPS <i>Management Policies</i>
Wildlife	retained	NPS Organic Act; NPS <i>Management Policies</i>

**Table 2. Summary of Impact Topics Retained or Dismissed**

<b>Impact Topic</b>	<b>Retained or dismissed from further evaluation</b>	<b>Relevant Laws, Regulations or Policies</b>
Special Status Species	retained	Endangered Species Act
Wilderness Character	retained	The Wilderness Act; Director’s Order #41; NPS <i>Management Policies</i>
Visitor Experience, Park Operations, and Park Neighbors	retained	Americans with Disabilities Act; NPS Organic Act; NPS <i>Management Policies</i>
Cultural Resources	Archeology, historic structures, cultural landscapes retained Museum Objects dismissed	Section 106 of National Historic Preservation Act; Archeological and Historic Preservation Act; Archeological Resources Protection Act; 36 CFR 800; NEPA; Executive Order 13007; Executive Order 11593; the Secretary of the Interior’s Standards and Guidelines for Archeology and Historic Preservation; Programmatic Memorandum of Agreement Among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers ((1995); Director’s Order 28; NPS <i>Management Policies</i>
Native American Traditional Values (includes ethnographic resources)	retained	Executive Order 11593; NPS Cultural Resource Management Guideline (DO-28); Executive Order 13007 on American Indian Sacred Sites; Presidential Memorandum (1994) on Government-to-Government Relations with Tribal Governments
Indian Trust Resources	dismissed	Department of the Interior Secretarial Orders No. 3206 and No. 3175
Noise	dismissed	NPS <i>Management Policies</i>
Waste Management	dismissed	NPS <i>Management Policies</i>
Transportation	dismissed	NPS <i>Management Policies</i>
Utilities	dismissed	NPS <i>Management Policies</i>
Socioeconomics	dismissed	40 CFR Regulations for Implementing NEPA; NPS <i>Management Policies</i>
Environmental Justice	dismissed	Executive Order 12898
Prime and Unique Farmlands	dismissed	Council on Environmental Quality 1980 memorandum on prime and unique farmlands
Resource Conservation	dismissed	NEPA; NPS <i>Guiding Principles of Sustainable Design</i> ; NPS <i>Management Policies</i>

## **ALTERNATIVES CONSIDERED**

Alternatives are an array of proposals that satisfy the purpose and need described in Chapter 1. Alternatives should be “reasonable” and meet project objectives. The alternatives described below were developed from information obtained from the scoping process, existing and approved park plans, agency guidance, the 2001 Federal Fire Policy, the National Fire Plan, and relevant literature.

Six total alternatives were identified by the IDT. One that fully meets NPS management objectives was carried through as the action alternative evaluated in this EA. The remaining five were considered, but dismissed from detailed analysis, as described at the end of this chapter. A no action alternative is included for analysis in compliance with NEPA.

### **Alternative A - No Action**

Under the No Action Alternative, existing fire management plans and policies would be continued, with no updates to existing FMPs. Without an updated FMP, all wildland fires would be fully and aggressively suppressed. Rapid assignment of firefighters with hand tools and, in some situations, mechanized equipment would be used to suppress all fires. However, in consideration of firefighter safety, an incident commander would carefully evaluate whether to send fire crews into areas with heavy vegetation and steep slopes, especially during severe fire seasons.

Suppressing wildland fires would be accomplished by depriving a fire of additional fuels (e.g., building a fire line that is cleared down to mineral soil) or by cooling the fire sufficiently to prevent further combustion (e.g., applying water to the flaming front).

The average annual acreage of wildland fire in the monuments is difficult to predict, since such predictions are based on climatic conditions, fuels conditions, locations of fires and other factors. However, fire occurrence data from 1984 indicates a total of 55 ignitions (wildland fires) over the three monuments. Of this total, five ranged from 0.1 acre to 5 acres in area, five were 5 acres to 100 acres (all but two occurring at Wupatki National Monument), and six exceeded 100 acres in area (all at Wupatki National Monument). The remaining fires (39) were assumed to be less than ¼ acre in size. Given this fire history, the analysis is based on the prediction that approximately 14 wildland fires of an average size range of approximately 9 to 16 acres would occur within a typical 5-year period.

Although Alternative A is a suppression-only fire management program, it nevertheless may be necessary to perform prescribed burns or manual thinning treatments on a limited basis to protect human life, property, and cultural and natural resource values, or to reduce fuels. These treatment projects are not included in this document as part of the No Action Alternative and would require a separate implementation plan, NEPA compliance documentation, and decision records.

## **Alternative B – NPS Preferred**

Under Alternative B, the fire management program would include suppression of wildland fires with appropriate management response (AMR), with use of prescribed fire and manual thinning (using hand tools and/or hand-carried mechanical equipment) for fuels management. No wildland fire use would be permitted.

Under Alternative B, suppression operations on all unplanned wildland fires would be conducted with the AMR commensurate with values to be protected, human safety, and suppression costs. For example, where an assessment of an initiating fire indicates a potential to threaten identified values or to cross monument boundaries, a prompt and aggressive suppression action would be taken to minimize such threats at minimum cost, similar to Alternative A. However, under Alternative B, the manager has the discretion (based on criteria in the FMP) to use natural barriers (e.g., rock outcroppings, breaks in vegetation) and human-made features such as roads, trails, etc., as fire breaks to minimize disturbance to resource values, and therefore to minimize use of ground-disturbing aggressive suppression techniques. In all cases, Minimum Impact Suppression Techniques (MIST) would be followed (see Appendix B).

### **Fire Management Units**

A Fire Management Unit (FMU) is defined as any land management area definable by objectives, topographic features, access, values to be protected, political boundaries, fuel types, or major fire regimes that set it apart from management characteristics of an adjacent unit. The proposed FMUs for each monument were identified based on recently completed vegetation maps and fire regime-condition class assessments for the entire 42,000-acre area (refer back to Figures 5 through 7 in Chapter 1 for condition class [FRCC] assessment and vegetation information). The following figures (Figures 8, 9, and 10) depict the FMUs that were delineated for the three monuments. These are described below and presented in more detail on Tables 3, 4, and 5. Each FMU is labeled by the monument acronym and number. For example, Walnut Canyon National Monument FMU 1 would be “WACA-FMU-1”. More FMUs could be established based on dominant vegetation and fuel model types, but in keeping with NPS RM-18 guidance to reduce the number of FMUs whenever possible, the proposed FMUs are primarily based upon assumptions about natural historical fire regimes and proposed fire management strategies.

**FMU 1:** Areas where human life and public or private property are particularly at risk. All fires are unwanted and would be fully suppressed. Manual thinning treatments would be used to protect infrastructure, areas of heavy public use (e.g., visitor centers, housing, maintenance facilities, utility corridors, frontcountry trails, adjacent privately-owned structures, etc.), and the cultural resources within these areas.

**FMU 2:** Areas of vegetation that, based upon the best available fire ecology and land-use history information, are maintained by a frequent fire regime. Existing vegetation composition and structure remains similar to documented presettlement conditions, and prescribed fire can be effectively used to restore ecosystem function. Site-specific manual thinning treatments may be used to protect cultural and natural resources at risk (e.g., selected archaeological and historic

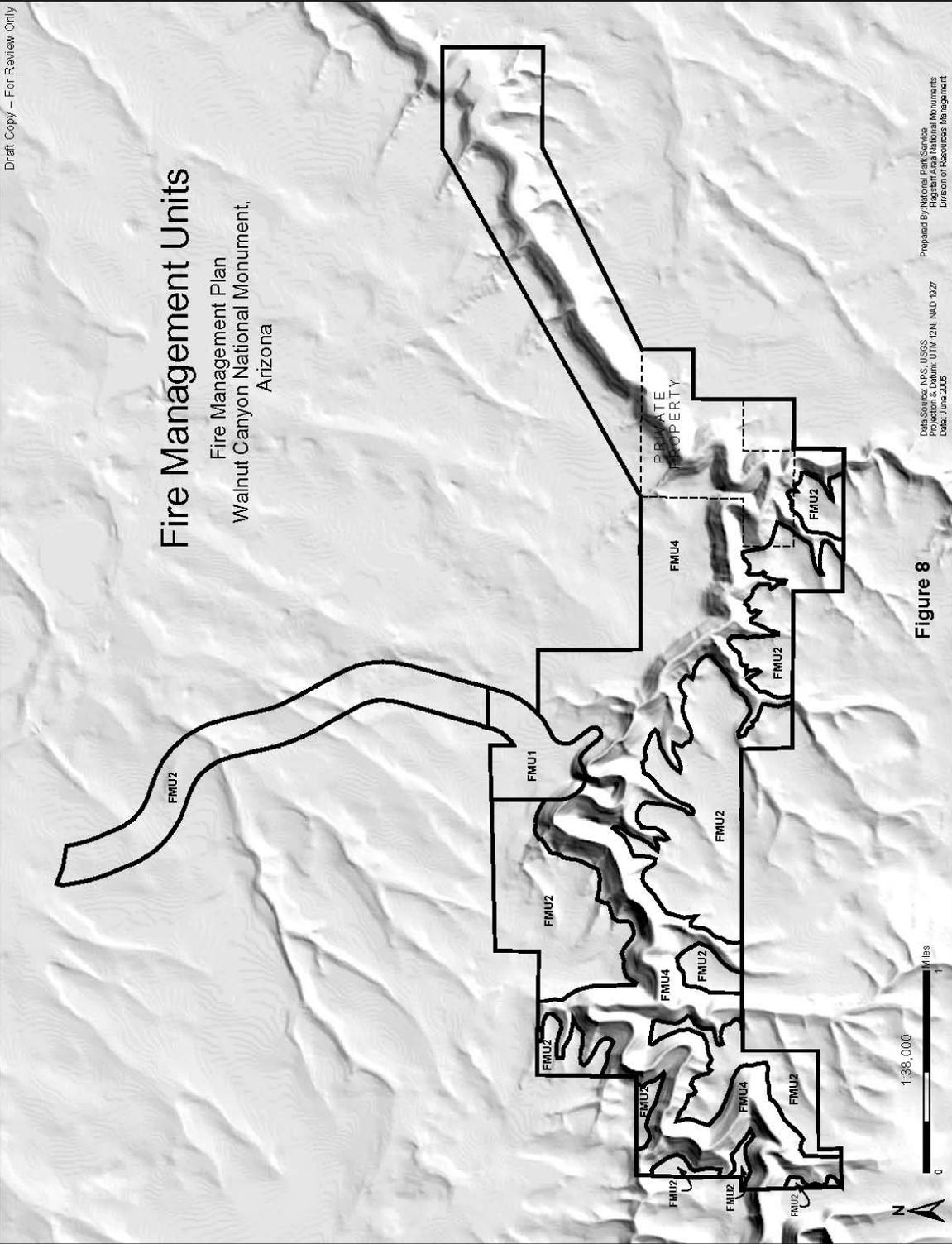
sites, large ponderosa pine trees, raptor nests, rare plant populations, etc.) and NPS facilities. If needed, vegetation would be manually thinned and wildland fuels would be removed or reduced across the remaining FMU 2 area to restore vegetation structure similar to reference period conditions. Prescribed fires would be used to simulate natural fire disturbance and the shape vegetation over time. Appropriate suppression response to unplanned fire would include all options from full suppression to conditional monitoring.

**FMU 3:** Areas of vegetation that, based upon the best available fire ecology and land-use history information, are maintained by a frequent fire regime. However, there are a number of scientific information needs and other considerations to be resolved prior to management decisions on the use of prescribed fire, including the following:

- Approximately 2,800 acres of grassland-juniper woodland at Wupatki National Monument, or 17% of the entire grassland-juniper woodland area, have burned in 4 natural/human-caused wildfires since 1995. If this trend continues, prescribed burning may not be needed to reintroduce fire disturbance into the system.
- Grassland, shrubland, and pinyon-juniper woodland vegetation composition and cover have changed significantly throughout the Colorado Plateau region and southwestern United States over the last one or two centuries, which is attributed to the introduction of European livestock, wildfire exclusion, and climate trends. As documented in scientific/technical literature, the grassland-woodland vegetation at Wupatki was extensively settled and utilized by the ancestral Hopi 900-700 years ago. Much of the vegetation change over the last nine centuries, and at least some of the vegetation change over the last century is attributable to recovery from prehistoric land use. Prior to considering a prescribed burning program within this FMU at Wupatki, the NPS desires a site-specific understanding of vegetation change over the last 150-900 years.
- Wupatki is a comparatively small conservation area, and fire management decisions should be made very judiciously to ensure that over time the burn pattern approximates natural historical fire disturbance. There is no site-specific information on the natural historical fire return interval, peak wildfire season, or natural range of burn areas for the grassland and juniper woodland vegetation at Wupatki National Monument or the surrounding area. This information is difficult to obtain for herbaceous-dominated communities using conventional scientific methods. All similar grassland-dominated areas within the region are actively grazed by livestock; consequently, there are no areas to provide surrogate reference conditions. Continued studies of lightning-ignited fires at Wupatki may be the best means of obtaining this information.
- As documented in similar grasslands within the Colorado Plateau Region, fire disturbance may promote rapid invasion by non-native cheatgrass. Cheatgrass is very difficult to control, and has been shown to seriously disrupt natural ecosystem function throughout the region.
- Sunset Crater Volcano erupted less than 1,000 years ago, and the surrounding volcanic terrain is still undergoing primary ecological succession. Even though the fire regime for ponderosa pine vegetation is well understood both locally and regionally from available literature, the stands around Sunset Crater are growing in a unique environment that has very discontinuous understory vegetation/fuels. Wildfires may occur either less frequently or over smaller areas (or both), but a site-specific study of fire-scarred trees and other research is needed to understand the natural historic fire regime.

# Fire Management Units

Fire Management Plan  
Walnut Canyon National Monument,  
Arizona



Data Source: NPS, USGS  
Projection & Datum: UTM 12N, NAD 1983  
Date: June 2005

Figure 8

Prepared by: National Park Service  
Flagstaff Area National Monuments  
Division of Resources Management



# Fire Management Units

Fire Management Plan  
Sunset Crater Volcano National Monument,  
Arizona

- Legend**
-  Benito Lava Flow
  -  Fire Management Unit (FMU) Boundaries
  -  Proposed Boundary Adjustment Area (Cocconino NF)

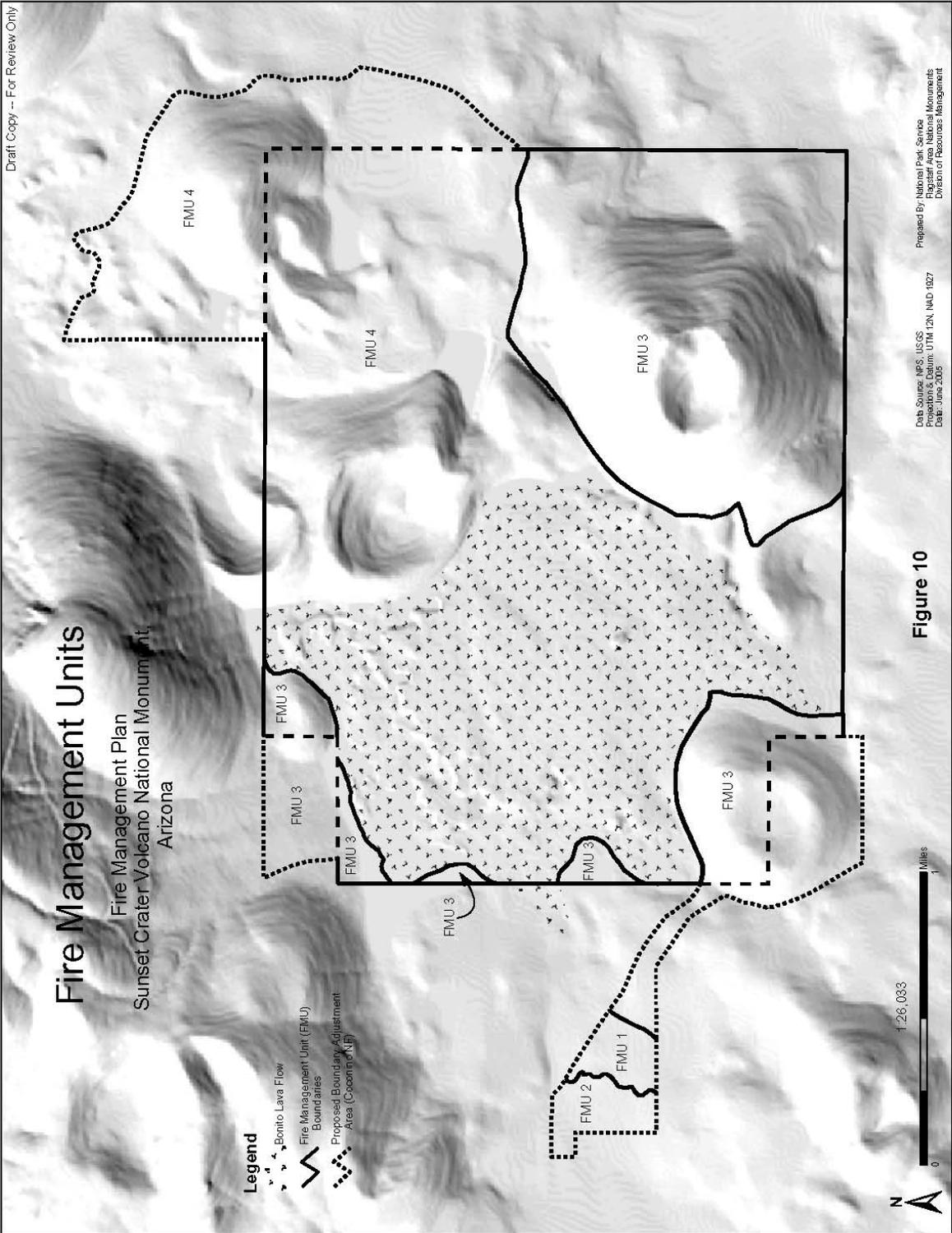


Figure 10

- The ongoing period of extended drought, increasing temperature regime, and longer growing seasons is resulting in widespread mortality of juniper, pinyon, and ponderosa pine surrounding Wupatki, Sunset Crater Volcano, and Walnut Canyon National Monuments. If the climate change trend continues, the range of natural conditions may no longer support vegetation communities that were formerly adapted to frequent, low-severity fire regimes.

During the life of the FMP, site-specific manual thinning treatments may be used to protect cultural and natural resources at risk (e.g., selected archaeological and historic sites, large ponderosa pine trees, raptor nests, rare plant populations, etc.), NPS facilities, and private property improvements adjacent to Wupatki National Monument. Appropriate suppression response to unplanned fire would include all options from full suppression to conditional monitoring. The NPS may change strategies to include prescribed burning as an adaptive management option, pending the accumulation of additional information on: vegetation change during the last 150-900 years; natural fire disturbance regimes; effects of recent wildfires on vegetation and wildlife; and the risk of invasion by non-native plants. Prior to any change in management direction, additional planning, public involvement, and NEPA compliance would be completed.

**FMU 4:** Areas of terrain and vegetation that, based upon the best available fire ecology and land-use history information, have one or more of the following attributes:

- Are extremely rugged terrain, and human safety could not be ensured during direct suppression or prescribed burning operations.
- Are vegetation types that are adapted to long-term, stand-replacing fire cycles (e.g., pinyon-juniper stand along northeast Walnut Canyon rim).
- Are resistant to fire (e.g., riparian areas).
- Are very sparsely vegetated and fire would not spread far (e.g., cinder barrens, sandstone/shale desert).
- Are on steep slopes or rocky bluffs where lightning strikes locally “torch out” a few trees to create snags and local stand-replacement patches (e.g., Bonito Flow, Walnut Canyon slopes).
- Have had very few or no lightning or human ignited fires over the last 140 or more years (most of the examples above), and when ignitions did occur, fires rarely exceeded 1/10 acre and would not be expected to exceed 5 acres.

Site-specific manual thinning treatments may be used to protect cultural and natural resources at risk (e.g., selected archeological and historic sites, large ponderosa pine trees, raptor nests, rare plant populations, etc.), NPS facilities, and private property improvements adjacent to the boundaries of the Flagstaff Area National Monuments. Appropriate suppression response to unplanned fire would include all options from full suppression to conditional monitoring.

**Zone of Cooperation:** Areas of shared values (public, private, cultural, and natural) inside or outside of NPS administered areas (e.g., Sunset Crater Volcano Administrative Site) where fire management objectives and tactics will be developed in cooperation with the Coconino National Forest, local government agencies, and private property owners.

<b>Table 3: Walnut Canyon Vegetation by Fire Management Unit</b>				
<b>veg_code</b>	<b>Vegetation</b>	<b>FMU 1 Acres</b>	<b>FMU 2 Acres</b>	<b>FMU 4 Acres</b>
1	Riparian Corridor	0.95	-	220.12
9	Pinyon-Juniper-Blue Grama Woodland	14.77	64.78	492.16
11	Pinyon-Juniper-Shrub-Succulent Woodland	39.97	209.45	748.95
12	Douglas-Fir Gambel Oak Woodland	0.21	20.22	359.63
13	Ponderosa-Pinyon-Juniper-Oak-Blue Grama Woodland	58.63	1051.23	280.25
19	Facilities	3.09	-	-
19	Utility Corridors	-	0.71	-
21	Transportation Routes	4.87	15.41	-
(Final Map) Totals:		122.49	1361.80	2101.11
(Draft Map) Totals:		122.49	1362.81	2096.25
Differences:		0	-1.01	4.86

<b>Table 4: Wupatki Vegetation By Fire Management Unit</b>			
<b>veg_code</b>	<b>Vegetation</b>	<b>FMU 3 Acres</b>	<b>FMU 4 Acres</b>
1	Cinder and Basalt Patchy, Mixed Herbaceous-Shrubland	201.43	5,082.40
11	Shale and Sandstone Sparse, Mixed Herbaceous-Shrubland	27.05	6,871.45
23	Grassland (with Juniper and Shrubland Patches)	11,761.92	140.01
36	Wash System Patchy, Mixed Herbaceous-Shrubland	57.31	1,414.56
40	Juniper Woodland	4,176.97	55.89
41	Mixed Grassland-Shrubland (with Juniper)	1,014.62	4,350.82
51	Invasive Riparian Shrubland	-	77.45
53	Native Riparian Tree and Shrubland	-	25.49
60	Roads	81.63	84.33
65	Developed Areas	0.11	14.80
Totals:		17321.04	18,117.20
<b>Total:</b>			<b>35438.24</b>

<b>Table 5. Sunset Crater Vegetation by Fire Management Unit</b>							
<b>veg_code</b>	<b>Vegetation</b>	<b>FMU 1 (Coco) Acres</b>	<b>FMU 2 (Coco) Acres</b>	<b>FMU 3 (Coco) Acres</b>	<b>FMU 3 (Park) Acres</b>	<b>FMU 4 (Coco) Acres</b>	<b>FMU 4 (Park) Acres</b>
1	Cinder Terrain	-	-	2.15	263.02	135.25	684.13
2	Basalt Terrain	-	-	0.26	6.74	-	538.91
5	Cinder/Basalt Sparse Herb Shrubland	-	-	0.23	50.84	41.71	255.54
8	Montane Grassland	-	42.51	-	-	-	-
17	Ponderosa Pine with Continuous Understory	28.22	-	208.27	341.42	48.54	99.51
18	Ponderosa Pine with Patchy Understory	-	0.16	4.00	350.68	170.72	422.70
22	Roads	0.70	-	1.33	7.53	-	8.61
23	Facilities	4.74	-	-	-	-	1.48
Totals:		33.66	42.67	216.24	1020.23	396.22	2010.88
<b>Total:</b>							<b>3719.9</b>

## **Strategies - Alternative B**

The fire management strategies that could be implemented under Alternative B include suppression, prescribed fire, and manual thinning. These strategies are described below.

**Suppression.** All wildland fire suppression activities would provide for firefighter and public safety as the highest consideration. Suppression activities would strive to minimize the potential damage to natural and cultural resources, and would take into consideration economic expenditures, firefighting resources, and other fire priorities (local, regional, and national preparedness).

The concept of Appropriate Management Response (AMR) is integral to fire management policy. Management responses are programmed to accept resource management needs and constraints, reflect a commitment to safety and cost effectiveness, and accomplish desired objectives while maintaining the versatility to varying fire intensities as conditions change. The AMR would be used to curtail the spread of fire and eliminate or reduce all fire threats to identified resources. Appropriate management response could range from aggressive suppression actions to “confine and contain” actions to conditional monitoring.

More aggressive suppression strategies could be used when critical resources are threatened. An example of an aggressive suppression strategy would be to attack along the fire’s edge with fire engines, hand lines, aerial resources, and in some cases dozers or heavy ground disturbing equipment used to create fire lines.

A confine/contain action could involve the use of a fuel break around a fire, allowing the fire to burn to the fuel break. The break could include natural barriers or could consist of manually and/or mechanically constructed lines. Active firefighting actions may not be implemented in areas where natural fuel breaks exist. Using natural fuel breaks could increase fire size, but could provide for firefighter safety and reduce disturbances on the land and sensitive resources from ground firefighting actions caused by fire line construction. This strategy could allow managers to focus firefighting activities on an area of the fire where life, property, and natural or cultural resources are threatened, while allowing other areas to burn out naturally.

Conditional monitoring means that the fire could be allowed to burn for a short period of time before it is fully suppressed. This option would be used only if conditions allow for safe and controlled burning conditions.

Aircraft resources could be used for all fire management activities, including reconnaissance, detection, ignition, personnel and logistical transportation, and fire control missions, such as retardant/bucket drops. The purpose of this action would be to transport personnel and equipment, as well as facilitate implementation of fire management operations. Use of aircraft would be managed to meet all safety, resource protection, wilderness, and soundscape objectives.

**Prescribed Fire.** An approved prescribed fire plan (also called a “burnplan”) must be written for each prescribed fire project. A burnplan (according to wildland fire policy, NPS RM-18) outlines the management objectives, prescription, resources to be used, contingencies, and mitigation required for the prescribed fire.

For all prescribed burns, motor vehicles would be restricted to existing public and administrative roads. Tools for prescribed fires and pile burns would be limited to hand-carried equipment such as chainsaws, handtools, backpacks, drip torches, portable pumps (for hose-lays from engines stationed along roads) and porta-tanks to supply water.

Monitoring of prescribed fires under Alternative B would involve the systematic collecting and recording of data on fuels, topography, weather, air quality, and fire behavior. The NPS Fire Monitoring Handbook outlines the standard monitoring protocols that would be used; NPS fire monitors are trained and certified in both basic fire behavior and prescribed fire monitoring techniques. Monitoring would be conducted by a NPS Fire Effects Monitoring/Fire Ecology Program crew on temporary assignment from another park. Monitoring results would determine whether actions had the desired effect, whether more information is needed, and whether modification would be needed to meet management goals and objectives.

**Manual Thinning.** Pre-burn thinning treatments would be completed to reduce the risk of crown fires. Thinning would reduce ladder fuels, post-settlement tree densities, and tree canopy closure and redistribute woody fuel accumulations from recent drought/insect killed trees. Over the next 10 years, the target average basal area for the ponderosa stands would be 55 to 65 square feet per acre, which is 1½ times greater than circa 1876 stands based upon stand reconstruction data, but still within the accepted range for reducing crown fire risk in this vegetation type on level terrain.

Measures would be implemented during manual thinning to protect pre-settlement trees (tree diameter 16 inches or greater at breast height) from fires. As described in Appendix B, thinning would mostly be restricted to ponderosa and juniper trees 9 inches in diameter or less, but individual trees in the 9- to 15-inch-diameter range may be cut to meet site-specific objectives for protecting archeological sites, raptor nests and roosts, other important wildlife habitat attributes (snags, gambel oak, pinyon pine), or larger diameter pre-settlement trees. A proportion of smaller-diameter trees would be left to ensure recruitment of larger trees as stands age. Stumps would be cut as close to (or flush with) the ground surface.

Disposing of thinned trees and slash presents the greatest management challenge. In descending order of preference, the NPS would: buck or chip slash (chipper would only be used along existing roads) and broadcast within openings between tree canopies to be consumed in subsequent burns; remove (hand-carry), pile, and burn off-site; or, pile and burn on-site at carefully selected sites. There may be opportunities to explore surplus “biomass” disposal options to generate electricity or heat homes, but these may be constrained or prohibited under federal regulations governing commercial use of natural resources within the national park system. The NPS may also need to utilize varying combinations of several of the above options, depending upon project location, to achieve objectives.

After preliminary stand structure and crown fire prevention objectives are achieved through thinning, prescribed fire would subsequently be used to maintain and shape stands. The stands would be burned every 4 to 14 years, based upon local fire scar records dating from 1566 through 1881. The timing and extent of fires would be based upon both local and regional fire scar records for the reference period.

## **10-Year Fuels Treatment Implementation Plan**

Appendix A outlines the proposed 10-year fuels treatment plan, including both prescribed burns and manual thinning treatments. At Walnut Canyon National Monument, the NPS would conduct manual pre-thinning of wildland fuels to protect sensitive resources and restore forest stand structure on about 1,350 acres of ponderosa pine vegetation at Walnut Canyon National Monument. Afterward, prescribed fires would be used to maintain most of this area. Up to 123 acres of ponderosa pine-dominated vegetation would be manually thinned around NPS facilities and visitor-use areas to create defensible areas in the event of a wildfire. In addition, up to 83 acres within a variety of fire-prone vegetation types would be manually treated within to protect archaeological sites from fire damage. At Sunset Crater Volcano National Monument, up to 34 acres of ponderosa pine-dominated vegetation would be manually thinned around NPS facilities and visitor-use areas to create defensible areas in the event of a wildfire. In addition, 50 acres of montane meadow vegetation would be maintained with prescribed fire. At Wupatki National Monument, up to 250 acres of juniper woodland would be potentially treated to manage vegetation/fuels build-up in proximity to archeological sites, and up to 30 acres in proximity to adjacent private structures. At Sunset Crater Volcano and Wupatki National Monuments, other fuels assessment and resource protection activities would be implemented on a more limited basis, while a program of vegetation change and fire ecology research is under development to guide fire restoration decisions. For other areas, the treatment schedule would be revised annually, building on completed projects, cyclic assessments of vegetation condition and fire risk, and scientific research.

The NPS would cooperate with the Coconino National Forest, local governments and fire response agencies, forest restoration scientists and partners, neighboring landowners, and other stakeholders to coordinate fire management activities on lands within and immediately surrounding the monuments; this strategy is directed by the National Fire Plan, and could simultaneously reduce wildfire threats to Flagstaff and surrounding communities, reduce fire threats to unique resources and rare species habitats, and restore forest health at the landscape or watershed scale.

## **Environmentally Preferred Alternative**

The environmentally preferred alternative is determined by applying the following criteria, which are suggested in NEPA, which is guided by the CEQ. The CEQ provides direction that “. . . the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA Section 101 . . .”

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations
2. Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences

4. Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice
5. Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Alternative A (No Action) would maintain the current fire management scenario at the Flagstaff Area National Monuments. Firefighters would be exposed to somewhat elevated safety risks and suppression costs would be higher, since this alternative does not allow for the use of confinement strategies in suppression operations. Alternative A would contribute to the continued build-up of fuels, the potential for larger, more severe wildfires, and the spread of non-native species, and there would be an increased risk of unwanted wildland fire escaping the Flagstaff Area National Monuments onto surrounding lands. This alternative would not provide the same level of protection of natural and cultural resources and humans over the long-term as would occur under the preferred alternative. Consequently, Alternative A does not satisfy provisions 2, 3, and 4 of NEPA Section 101.

Alternative B (NPS Preferred) provides the greatest flexibility in responding to wildland fires and provides more opportunities for the effective management of hazardous fuels. It offers the lowest risk to firefighters by using an AMR (i.e., the full range of suppression strategies) for wildland fires. Fuels can be effectively managed under Alternative B using prescribed fire and manual thinning. This fuel reduction program would ultimately promote visitor/employee safety and protect natural and cultural resources. Prescribed fire treatments would contribute to long-term stability and diversity in fire-dependent vegetation communities. Humans, cultural, and natural resources would receive more protection with minimum disturbance. Over time, the costs of fire suppression would be reduced as historic fuels build-up is managed to more natural levels. Fire could be more effectively managed before they reach the monument boundaries. This alternative would satisfy each of the provisions of NEPA Section 101.

Therefore, the environmentally preferred alternative is Alternative B, the NPS Preferred Alternative.

## **Alternatives Considered but Dismissed**

The following alternatives were considered, but dismissed from further analysis for the reason provided.

- **Wildland Fire Use** – A fire management program at Flagstaff Area National Monuments that includes wildland fire use for resource benefit as a management option was considered. However, the Flagstaff Area National Monuments are not large enough to manage for free-burning fires without substantial risk to cultural resources and/or park neighbors. Furthermore, only personnel with the specialized skills and training are qualified to manage such fires; such personnel are not readily available to the monuments as required by policy.

- **No Prescribed Fire** – One alternative considered would use only suppression and manual fuels management strategies to meet objectives. However, without the ability to use prescribed fire to mimic natural fire disturbance within the ecosystem, many fire management, resource protection, and vegetation restoration objectives would not be attainable.
- **No Manual Thinning** – Another alternative considered would use suppression and prescribed fire strategies only to meet objectives. However, under this alternative, manual fuels treatment methods would not be available to create defensible spaces around values at risk. This alternative would therefore not meet fire management and resource protection, and was dismissed from further analysis.
- **Mechanical Thinning Using Motor Vehicles Off Existing Roads** – This alternative would allow the use of motor vehicles off existing public and NPS administrative roads for thinning and slash removal operations. Vegetation and fire restoration work might have progressed more rapidly and cost-effectively; however, this alternative would not meet resource protection objectives given the density of archeological sites at Wupatki National Monument and Walnut Canyon National Monument, and the extremely fragile volcanic terrain at Sunset Crater Volcano National Monument. During scoping this was identified as Alternative C.
- **No Management** – This alternative would allow all wildland fires to burn unimpeded by any management action. This alternative was dismissed because it defies Federal fire management policy, is too risky, and would not meet resource protection objectives.

## Summary Tables

The following tables provide summary information for the two alternatives considered in the EA. Table 6 provides a summary of the strategies that would be used under each alternative, while Table 7 summarizes how each alternative meets the goals and objectives presented in Chapter 1. Table 8 is a summary of impacts, which are discussed in detail in Chapter 3.

<b>Table 6: Summary Comparison of Alternatives</b>		
<b>Fire Management Strategy</b>	<b>Alternative A: No Action</b>	<b>Alternative B: Preferred Alternative</b>
Suppression	Full and aggressive suppression throughout all three monuments	Suppression with Appropriate Management Response (AMR) in all four FMUs – would range from full suppression to “confine and contain” to conditional monitoring, based on location, resource considerations, weather conditions, and safety considerations
Prescribed Fire	Not included – only permitted with separate plan and NEPA compliance	Would be used in FMU 2 (and possibly FMU 3 depending on adaptive management decisions) for fuels treatment, generally following manual thinning pre-treatment
Manual Thinning	Not included – only permitted with separate plan and NEPA compliance	Would be used in all four FMUs for fuels treatment and to protect high priority cultural resources, visitor use and administrative areas, or other sensitive resources
Wildland Fire Use (for Resource Benefit)	Not permitted	Not permitted in any of the four FMUs

**Table 7: How Each Alternative Addresses Goals and Objectives**

GOAL AND OBJECTIVES	Alternative A (No Action)	Alternative B (NPS Preferred)
<b>GOAL 1: HUMAN LIFE AND HEALTH ARE PROTECTED.</b>	Objectives not fully met.	Objectives would be fully met.
<ul style="list-style-type: none"> <li>Human safety and health are the highest priorities for all fire management activities.</li> </ul>	<p>All standard fire protection safety measures would be followed during suppression actions. There would be no pro-active management of vegetation and fuels. Over time, the potential for more severe wildland fire would increase within certain areas of the monuments, along with increased risk to human health and safety.</p>	<p>Prescribed fire combined with manual thinning would reduce fuel loads, and the potential for high severity fire. Manual thinning would be used to maintain defensible space around structures and visitor use areas. In addition to use of standard fire safety measures, the risk to visitors, neighbors, facilities, and employees would be reduced by appropriate management response (AMR) strategies.</p>
<ul style="list-style-type: none"> <li>Fire management responsibilities and procedures for protecting human life are effective and clearly communicated.</li> </ul>	<p>All wildland fires would be aggressively suppressed to protect values at risk. All fire suppression operations would be managed through the Incident Command System.</p>	<p>Wildland fires would receive an AMR commensurate to protection of park values and suppression costs.</p>
<ul style="list-style-type: none"> <li>Vegetation/fuels are managed around NPS visitor use areas, administrative facilities, and adjacent private property to minimize the chance of a wildfire related accident, injury, illness, or death to visitors, NPS staff, and others.</li> </ul>	<p>There could be limited management of vegetation and fuels, with NEPA compliance on a project-level basis. In the event that wildfire threatens facilities or improved property, defensible would be established as an emergency measure, time permitting.</p>	<p>Under the proposed FMP treatment schedule, pro-active manual thinning projects would be used to maintain defensible space around structures and visitor use areas. Adverse effects of treatments on nearby sensitive resources and natural scenery would be minimized. Prescribed fires would further reduce potential for high-severity wildland fires in proximity to NPS facilities.</p>
<ul style="list-style-type: none"> <li>Fire management activities comply with applicable federal, state, and local regulations and air-quality standards.</li> </ul>	<p>Objective would be met; all wildland fire suppression operations would comply.</p>	<p>Objective would be met. Burn plans would be developed and implemented in accordance with applicable regulations and air quality standards.</p>
<b>GOAL 2: PRIVATE AND PUBLIC PROPERTY AND NPS FACILITIES ARE PROTECTED FROM WILDLAND FIRE.</b>	Objectives only partially met. Alternative A does not address this objective without a fire management plan.	Objectives would be fully met.
<ul style="list-style-type: none"> <li>Fire management responsibilities and procedures for protecting property and facilities are effective and clearly communicated.</li> </ul>	<p>Alternative A does not fully meet this objective. Mutual aid cooperation for wildland fire suppression would partially meet this objective.</p>	<p>This objective would be fully met. In addition to cooperative agreements for mutual aid and fire suppression, the FMP would more effectively communicate responsibilities and procedures for protecting property and facilities.</p>
<ul style="list-style-type: none"> <li>A safe area is created around NPS facilities and adjacent private property where fire personnel and equipment may be deployed to protect structures and utilities from wildfire.</li> </ul>	<p>No treatment schedule would be developed. Safe areas could be created using manual thinning and fuels removed, but only with additional NEPA compliance.</p>	<p>This objective would be fully met. Under a treatment schedule, manual thinning and fuels treatments would be implemented around NPS facilities and adjacent private property.</p>

**Table 7: How Each Alternative Addresses Goals and Objectives**

<b>GOAL AND OBJECTIVES</b>	<b>Alternative A (No Action)</b>	<b>Alternative B (NPS Preferred)</b>
<ul style="list-style-type: none"> <li>Wildland fire originating within the Flagstaff Area National Monuments does not threaten adjacent structures or property.</li> </ul>	<p>This objective would be met, but even with more aggressive suppression actions under alternative A, there would be increased potential for more severe wildfires and risk of fire escape from the monuments.</p>	<p>This objective would be met. Fires would be managed by appropriate management response (AMR) strategies. Prescribed fire combined with manual thinning would reduce fuel loads, and the potential for high severity fire. The risk of fire escaping the monuments would be reduced over time.</p>
<ul style="list-style-type: none"> <li>Cultural resource integrity, natural viewsheds, and the desired visitor experience are maintained around NPS facilities and visitor use areas.</li> </ul>	<p>This objective would not be met. Suppression actions would utilize MIST, but there would be increased potential for more severe wildfires and impacts to resources, natural scenery, and visitor experience.</p>	<p>This objective would be fully met. The FMP would articulate guidelines and operational procedures to lessen effects of fire management activities on resources, natural scenery, and visitor experience.</p>
<p><b>GOAL 3: NATURAL AND CULTURAL RESOURCES ARE PRESERVED AND PROTECTED.</b></p>	<p>Objectives would not be met, except for minimal actions to comply with the Endangered Species Act.</p>	<p>Objectives would be mostly met, except for additional restoration treatments would be needed on adjacent Coconino NF lands around MSO habitat.</p>
<ul style="list-style-type: none"> <li>Cultural resources are protected at the landscape level over the long term.</li> </ul>	<p>Fire management would be limited to wildfire suppression. There would be no long-term strategy to manage fire-prone vegetation and fuels. The potential for more severe fire would increase, with increased risk of damage to cultural resources.</p>	<p>This objective would be fully met. The FMP would articulate a long-term strategy for reducing fire intensity at the landscape level in fire-prone vegetation types. Project level treatments would ensure that vegetation around cultural resources blends with the surrounding landscape.</p>
<ul style="list-style-type: none"> <li>Wildfire suppression tactics minimize impacts upon cultural sites, protected/sensitive species, and protected/unique habitats.</li> </ul>	<p>This objective would be accomplished if wildfire suppression operations made effective use of resource advisors, but certain measures to lessen impacts to these resources would not be readily available unless they are articulated in a FMP.</p>	<p>This objective would be fully met. The FMP would provide more flexible suppression strategies and articulate additional tactics to lessen effects on sensitive/unique resources for immediate use during suppression operations.</p>
<ul style="list-style-type: none"> <li>Prescribed burning and manual vegetation/fuels management activities utilize methods, which do not impact cultural sites, protected/sensitive species, and protected/unique habitats.</li> </ul>	<p>This objective would be partially met. Prescribed fire would not be available as a management strategy and there would be no impacts to protected/sensitive/unique resources. Without a FMP, direction and funding would likely not be available for manual vegetation/fuels treatments, but some might occur on a very limited basis. Individual project plans would identify and articulate measures to negate or minimize impacts to protected/sensitive/unique resources.</p>	<p>This objective would be fully met. The FMP would provide a long-term vegetation restoration, wildland fuels reduction, and prescribed fire implementation plan. The FMP would articulate standard guidelines and operational procedures to lessen effects of these activities on protected/sensitive/unique resources.</p>

**Table 7: How Each Alternative Addresses Goals and Objectives**

GOAL AND OBJECTIVES	Alternative A (No Action)	Alternative B (NPS Preferred)
<ul style="list-style-type: none"> <li>Vegetation and fuels accumulation within and nearby archaeological sites at Walnut Canyon are locally treated to reduce wildland and prescribed fire intensity as needed. Examples of high risk sites include wooden historic structures, sites with flammable prehistoric materials (original wall plaster, wooden lintels and wall pegs and packrat middens), and sites with standing original architecture.</li> </ul>	<p>This objective would be partially met, as limited vegetation/fuels treatments might occur in proximity to some cultural resources as part of routine archaeological site stabilization work. Work would be accomplished using standards very similar to those in a FMP. However, hazardous fuels management funding would not be available to accomplish this objective for most archaeological sites.</p>	<p>This objective would be fully met. The FMP would include a comprehensive schedule for vegetation/fuels treatments in proximity to cultural resources. Work would be accomplished using standards to prevent impacts. Hazardous fuels management funding would be available to accomplish this objective for high priority archaeological sites.</p>
<ul style="list-style-type: none"> <li>Vegetation and fuels accumulation within and nearby archaeological sites with flammable prehistoric materials at Wupatki will be assessed and, if needed, locally treated to reduce wildland fire intensity.</li> </ul>	<p>See above.</p>	<p>See above.</p>
<ul style="list-style-type: none"> <li>Appropriate fire management strategies and implementation guidelines to protect the Mexican Spotted Owl population and to conserve designated Critical Habitat at Walnut Canyon are developed in consultation with the U.S. Fish &amp; Wildlife Service and in accordance with the Mexican Spotted Owl Recovery Plan.</li> </ul>	<p>This objective would be partially met. All NPS activities would comply with the Endangered Species Act and MSO Recovery Plan direction. Without a FMP, programmatic direction and funding would not be available for landscape level habitat protection with vegetation/fire restoration treatments adjacent to MSO nesting areas. Over time, the risk of severe, stand replacing fires in MSO habitat would increase. This objective might also be partially met if restoration work is completed on nearby Coconino NF lands.</p>	<p>This objective would be partially met. The FMP would provide programmatic level direction consistent with the MSO Recovery Plan. Additional conservation measures to protect the MSO and critical habitat from fire management activities would be developed in consultation with the U.S. Fish &amp; Wildlife Service and incorporated into the FMP. Funding would be available for landscape level habitat protection with vegetation/fire restoration treatments adjacent to MSO nesting areas. The risk of severe, stand-replacing fires near MSO nesting areas would be reduced, but additional restoration work would be needed on adjacent Coconino NF lands to fully meet this objective.</p>
<ul style="list-style-type: none"> <li>Vegetation and fuels around sensitive plant populations or wildlife habitats are cyclically assessed and, if needed, locally treated to reduce wildfire and prescribed fire intensity.</li> </ul>	<p>This objective would not be met. Funding would not be available for pro-active vegetation/fuels management treatments to accomplish this objective.</p>	<p>This objective would be fully met. The FMP would include a comprehensive schedule for vegetation/fuels treatments in proximity to sensitive natural resources. Work would be accomplished using standards to prevent impacts. Hazardous fuels management funding would be available to accomplish this objective during project implementation.</p>

**Table 7: How Each Alternative Addresses Goals and Objectives**

<b>GOAL AND OBJECTIVES</b>	<b>Alternative A (No Action)</b>	<b>Alternative B (NPS Preferred)</b>
<b>GOAL 4: THE ECOLOGICAL ROLE OF FIRE IS RESTORED WITHIN FIRE-DEPENDENT VEGETATION.</b>	Objectives would not be met	Objectives would be met over the long term.
<ul style="list-style-type: none"> <li>The biotic communities within the monuments function within their natural range of variability for vegetation structure and cover, species composition and diversity, fuel loads, fire disturbance, and watershed function.</li> </ul>	This objective would not be met because a long term approach to restoring fire as an ecological process would not be available without a FMP.	Through adaptive management principles, this objective would be met over the long term. Treatment schedules, project plans, and a science-based fire management plan would direct the management of fire into the future.
<ul style="list-style-type: none"> <li>Site-specific information on reference period conditions and natural historical fire regimes for each biotic community is used to guide the frequency, timing, severity, and extent of prescribed burning.</li> </ul>	Without a plan that provides a reference period and target condition framework, this objective would not be met.	A FMP would provide reference period and target conditions to guide restoration treatments. Funding and support would more likely be available to complete additional studies to fill in information gaps.
<ul style="list-style-type: none"> <li>Manual vegetation thinning and prescribed fires mimic the environmental effects of the natural historical fire regime.</li> </ul>	See above.	To the degree practicable, this objective would be met. The FMP (see above) would contain treatment schedules and plans that direct prescription development, timing and season of treatments, and other environmental conditions necessary to mimic the historical fire regime.
<b>GOAL 5: FIRE MANAGEMENT ACTIVITIES ARE FULLY INTEGRATED WITH NPS OPERATIONS AT THE MONUMENTS AND WITH OTHER NPS AREAS THAT PROVIDE OFF-SITE FIRE MANAGEMENT STAFFING EXPERTISE AND SUPPORT.</b>	Objectives would only be partially met.	Objectives would be met.
<ul style="list-style-type: none"> <li>Fire management activities mutually address other NPS operational objectives for safety, facility protection, resources management, and visitor-use at the monuments.</li> </ul>	Objectives would not be met without a fire management plan.	Objective would be met through internal management documents and their relationship to the FMP, fire staff participation on standing committees and the Management Team for the monuments.
<ul style="list-style-type: none"> <li>A team develops fire management projects with expertise in a variety of professional disciplines, and off-site subject matter expertise is sought as needed to augment existing staff capabilities.</li> </ul>	Projects would be developed on a limited basis, and the objective would only be partially met.	See above.

**Table 7: How Each Alternative Addresses Goals and Objectives**

<b>GOAL AND OBJECTIVES</b>	<b>Alternative A (No Action)</b>	<b>Alternative B (NPS Preferred)</b>
<ul style="list-style-type: none"> <li>Fire management projects are reviewed by the Flagstaff Area National Monuments Management Team to identify and resolve any safety, staffing, budgetary, operational, and logistical issues.</li> </ul>	See above.	See above.
<ul style="list-style-type: none"> <li>Other NPS areas provide support for fire management projects in a timely and effective manner.</li> </ul>	Without a fire management plan, little or no outside support would be available for projects.	Objective fully met under a FMP.
<ul style="list-style-type: none"> <li>Employees are knowledgeable about fire’s role in ecosystem management, and the scope and effect of fire management activities.</li> </ul>	This objective would partially be met through ongoing forest restoration activities on the surrounding Coconino National Forest.	Objective fully met under direction of a FMP.
<ul style="list-style-type: none"> <li>Visitors gain an understanding of fire management within the park, and an appreciation for the role of fire in the regional ecosystem.</li> </ul>	This objective would partially be met through the development of visitor education exhibits, etc., but the public would not be exposed to actual restoration results during their visit to the Flagstaff Area National Monuments.	A FMP would provide direction toward accomplishing this objective.
<p><b>GOAL 6: CITIZENS, ADJACENT LAND MANAGERS, NEIGHBORS, PARTNERS, AND OTHER STAKEHOLDERS ARE INFORMED AND INVOLVED IN FIRE PROGRAM DIRECTION WITHIN THE MONUMENTS.</b></p>	Objectives would only be partially met.	Objectives would be fully met.
<ul style="list-style-type: none"> <li>Fire management projects within the monuments are coordinated with and complement, to the greatest extent possible, similar activities on adjacent Coconino National Forest, Arizona Trust Lands, tribal, and private lands.</li> </ul>	This objective would be met.	A FMP would provide direction in fostering cooperative relationships with neighbors.
<ul style="list-style-type: none"> <li>Visitors are well informed about local fire danger ratings and measures to prevent unwanted fires.</li> </ul>	This objective would not be met.	This would be addressed in a FMP; objective would be met.
<ul style="list-style-type: none"> <li>The NPS cooperates with the Coconino National Forest and other stakeholders to restore and maintain fire-dependent vegetation, wildlife habitats, watershed function, cultural landscapes, and scenic viewsheds across management area boundaries.</li> </ul>	This objective would not be met.	A FMP would provide direction in working with cooperators across mutual boundaries; objective would be met over time.

<b>Table 7: How Each Alternative Addresses Goals and Objectives</b>		
<b>GOAL AND OBJECTIVES</b>	<b>Alternative A (No Action)</b>	<b>Alternative B (NPS Preferred)</b>
<b>GOAL 7: THE FIRE MANAGEMENT PROGRAM AT THE FLAGSTAFF AREA NATIONAL MONUMENTS IS INFORMED BY THE BEST AVAILABLE SCIENCE AND TECHNICAL INFORMATION.</b>	Objectives would only be partially met.	Objectives would be met.
<ul style="list-style-type: none"> <li>An active program of scientific study and resource conditions monitoring continues within the monuments to improve knowledge of the role that fire plays in local biotic communities and landscapes.</li> </ul>	Programs of study or monitoring would be minimally funded without a FMP.	A FMP would provide justification for study and monitoring funding, and would meet this objective.
<ul style="list-style-type: none"> <li>Natural and cultural resource conditions are cyclically monitored to ensure that fire management objectives are being met.</li> </ul>	See above.	See above.

<b>Table 8: Summary of Impacts of Alternatives</b>		
<b>Impact Topic</b>	<b>Alternative A (No Action) Continued current program of suppressing wildland fires.</b>	<b>Alternative B (Preferred) Implement a fire management program of appropriate management response to wildland fires, with prescribed fire and manual thinning for fuels management.</b>
<b>GEOLOGY AND SOILS</b>	Alternative A (No Action) would result in adverse, mostly localized, short- and long-term, minor to moderate, direct and indirect impacts to geology and soils within the three monuments. Cumulative impacts would be minor to moderate, short- and long-term, and adverse.	Under Alternative B (Preferred Alternative), adverse impacts of appropriate management response to wildland fire strategies would be negligible to minor, localized and short-term. As objectives are met and the potential for severe fire is reduced, impacts would be diminished to near negligible. Impacts of prescribed fire treatments on soil erosion potential, soil chemistry, and geological processes would be negligible. Scorch rings from any pile burns would likely have a localized, minor adverse effect. Manual thinning, with mitigation in place, would likely result in negligible impacts to soils. After fuels objectives are met under the proposed treatment schedule, localized, minor, indirect, and beneficial impacts to soils resources on those affected FMUs would be expected. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.

**Table 8: Summary of Impacts of Alternatives**

<b>Impact Topic</b>	<b>Alternative A (No Action) Continued current program of suppressing wildland fires.</b>	<b>Alternative B (Preferred) Implement a fire management program of appropriate management response to wildland fires, with prescribed fire and manual thinning for fuels management.</b>
<b>VEGETATION</b>	Alternative A (No Action) would result in minor to moderate, direct, localized adverse effects to vegetation depending on fire severity, and indirect minor adverse impacts due to loss of vegetation from suppression operations. Cumulative impacts would be long-term, adverse, and range from minor to moderate.	Alternative B (Preferred Alternative) would have negligible to minor adverse impacts on vegetation, with moderate beneficial impacts as fuels are restored to natural levels and a diversity of native vegetation is restored through prescribed fire treatments under a proposed schedule. Cumulative impacts would be short- and long-term, minor, and adverse.
<b>NON-NATIVE, INVASIVE PLANT SPECIES</b>	Under Alternative A (No Action), both high severity wildland fires and suppression activities would potentially prepare more areas for colonization by non-native, invasive species. Thus, the direct adverse effects would be localized, short-term to long-term, and minor to moderate. Indirect effects of suppression of wildland fires would be adverse, localized, short-term to long-term, and moderate. Cumulative impacts would be long-term, minor to moderate, and adverse.	Under Alternative B (Preferred Alternative), wildland fires, suppression activities, and fuel management actions that cause ground disturbance would potentially prepare more areas for colonization by non-native, invasive species. Thus, the direct adverse effects under Alternative B would be localized, short-term to long-term, and minor to moderate. Indirect effects of suppression of wildland fires under AMR would be adverse, localized, short-term to long-term, and minor. Indirect effects resulting from treatments may also result in a minor, localized, and long-term benefit as native species could more effectively compete with non-native species. Cumulative impacts would be long-term, minor to moderate, and adverse.
<b>WILDLIFE</b>	Alternative A (No Action) would result in negligible to moderate, adverse, localized, short- and long-term impacts to wildlife and wildlife habitat, with some long-term benefits to those species favoring more open woodland and grassland that would occur following fire events. Cumulative impacts would be short- to long-term, minor to moderate, and adverse.	Alternative B (Preferred Alternative) would result in beneficial, localized, long-term impacts of minor to moderate intensity on wildlife and habitat during the analysis period, as overall habitat condition is improved, with negligible to minor, short-term adverse effects on wildlife from planned fuel reduction treatments. Cumulative impacts would be short- and long-term, minor, and adverse.

**Table 8: Summary of Impacts of Alternatives**

<b>Impact Topic</b>	<b>Alternative A (No Action) Continued current program of suppressing wildland fires.</b>	<b>Alternative B (Preferred) Implement a fire management program of appropriate management response to wildland fires, with prescribed fire and manual thinning for fuels management.</b>
<b>SPECIAL STATUS SPECIES</b>	<p>The direct and indirect impacts of Alternative A (No Action) from wildland fire and/or suppression operations on as many as 11 of the 16 special status plant species across all FMUs would be negligible to adverse, minor, localized, and short-term to long-term. Five of the 16 species which occur fire-prone habitats could experience potential localized minor to moderate adverse impacts, short-term to long-term, with some potentially beneficial effects to species that thrive after fire.</p> <p>Impacts to special status wildlife species in all FMUs would be adverse and range from negligible to moderate intensity, of short- and long-term duration, and localized. Impacts would vary by the level of fire severity and degree of disturbance from suppression operations. Impacts to federally listed species include minor to potentially moderate short-term and localized adverse impacts to the Mexican spotted owl, and negligible to minor, short-term, localized adverse impacts to the bald eagle. Cumulative impacts related to all special status species would be minor to moderate and adverse, and limited to certain areas.</p>	<p>Under Alternative B (Preferred Alternative), impacts would be similar to Alternative A under expected wildland fire conditions for all special status species. For special status plants across all FMUs, direct impacts may be adverse and minor locally in the short-term; long-term impacts locally would range from negligible to beneficial, and vary from minor to moderate as objectives are met under a proposed treatment schedule. For special status animals and habitats, adverse impacts from Alternative B would be negligible to minor, direct and indirect, short-term and long-term, and localized. Impacts on the federally listed Mexican spotted owl would include negligible to minor adverse impacts, with beneficial, indirect, long-term, and moderate impacts on MSO habitat as the threat of severe wildfires is reduced along the Walnut Canyon rim terraces and upwind of the MSO PACs. Impacts to the bald eagle would be adverse, short-term, negligible to minor, and localized. Cumulative impacts related to all special status species would be minor to moderate and adverse, and limited to close proximity around NPS facilities and visitor use areas.</p>
<b>WATER RESOURCES, WETLANDS, AND RIPARIAN AREAS</b>	<p>Under Alternative A (No Action), the adverse impacts of wildland fire on water resources, wetlands, and riparian areas within the three monuments would be negligible. If large high severity fires would occur, particularly in watersheds in and above Walnut Canyon National Monument, adverse impacts under Alternative A would be minor, localized, and short-term. There would be negligible impact on springs, water resources, wetlands, and riparian areas at Wupatki National Monument, and no impacts to water resources, wetlands, or riparian areas at Sunset Crater Volcano National Monument. Cumulative impacts would be long- and short-term, minor to moderate, and adverse.</p>	<p>Under Alternative B (Preferred Alternative), impacts on water resources at the monuments, particularly Walnut Canyon National Monument, would range from negligible and adverse over the short-term to beneficial, moderate, and indirect over the long-term. Cumulative impacts would be short- and long-term, minor to moderate, and adverse, with much of the adverse impacts stemming from past dam development.</p>

**Table 8: Summary of Impacts of Alternatives**

<b>Impact Topic</b>	<b>Alternative A (No Action) Continued current program of suppressing wildland fires.</b>	<b>Alternative B (Preferred) Implement a fire management program of appropriate management response to wildland fires, with prescribed fire and manual thinning for fuels management.</b>
<b>AIR QUALITY</b>	Alternative A (No Action) would result in a short-term, direct and indirect, minor, adverse effect to air quality on a local scale and nearly negligible effects on a regional scale. Cumulative impacts would be short- and long-term, minor, and adverse.	Impacts of Alternative B (Preferred Alternative) would range from minor, short-term, direct, adverse, and localized to long-term, minor, and beneficial locally and regionally as fuel loadings are reduced. Cumulative impacts would be short- and long-term, minor, and adverse.
<b>CULTURAL RESOURCES</b>	Direct and indirect effects of Alternative A (No Action) on cultural resources (including archaeological, historic, and cultural landscapes) would be adverse or beneficial, localized, minor to potentially moderate, and short- to long-term. Many impacts described can be reduced in intensity or prevented with mitigation, including post-fire rehabilitation. Cumulative impacts on cultural resources would be long-term, minor to moderate, and adverse.	Under Alternative B (Preferred Alternative), there would be negligible to short-term, minor, direct adverse impacts from proposed fuel treatment projects. Long-term, beneficial, indirect, minor to moderate, localized impacts would be expected as fuels reduction and restoration objectives are accomplished under the plan. Cumulative impacts on cultural resources would be long-term, adverse, and minor.
<b>NATIVE AMERICAN TRADITIONAL VALUES</b>	Under Alternative A, impacts on Native American Traditional Values would range from negligible to minor, and be localized, short-term, and adverse. Cumulative impacts would be long-term, minor, and adverse.	Under Alternative B (Preferred Alternative), short-term adverse indirect impacts ranging from negligible to minor would occur because of increased NPS presence while managing wildland fire or conducting fuels management projects; however, mitigation would reduce adverse impact. Also long-term, minor to moderate indirect beneficial impacts to Native American Traditional Values would occur as the potential for high-intensity, damaging fires is reduced. Cumulative impacts would be long-term, negligible to minor, and adverse.
<b>HEALTH &amp; SAFETY</b>	Under Alternative A (No Action), the direct and indirect adverse impacts to employees, firefighters, and the public would be mostly localized, short-term to long-term, and minor, with application of appropriate safety mitigation measures. Cumulative impacts would be short- and long-term, localized, minor, and adverse.	Impacts of Alternative B (Preferred Alternative) on human health and safety would be short-term, minor, and adverse, with minor to moderate, beneficial, and long-term effects as fuels are reduced under the proposed treatment schedule. Cumulative impacts would be short- and long-term, localized, negligible, and adverse.
<b>PARK NEIGHBORS</b>	Alternative A (No Action) would result in indirect, adverse, localized, long-term impacts of minor to moderate intensity on park neighbors. Cumulative impacts would also be long-term, minor to moderate, and adverse.	Alternative B (Preferred Alternative) would result in indirect, minor to moderate, long-term, and localized beneficial impacts to relationships with adjacent landowners and neighbors. Cumulative impacts would be long-term, minor, and adverse.

**Table 8: Summary of Impacts of Alternatives**

<b>Impact Topic</b>	<b>Alternative A (No Action) Continued current program of suppressing wildland fires.</b>	<b>Alternative B (Preferred) Implement a fire management program of appropriate management response to wildland fires, with prescribed fire and manual thinning for fuels management.</b>
<b>VISITOR EXPERIENCE</b>	Alternative A (No Action) would result in an adverse, localized, short-term effects of minor to moderate intensity, and negligible to minor, long-term, adverse effects on the aesthetic and auditory qualities of the visitor experience. Cumulative impacts would be short- and long-term, localized, minor, and adverse.	Alternative B (Preferred Alternative) would have effects on visitor experience similar to Alternative A over the short-term with minor, localized adverse impacts, but would result in a minor to moderate, localized, indirect, beneficial impacts to visitor experience over the long-term as resource management objectives are met. Cumulative impacts would be short- and long-term, localized, minor, and adverse.
<b>PARK OPERATIONS</b>	Alternative A (No Action) would result in an adverse, short- and long-term, localized, direct, and minor impacts on park staff and operations during and after wildland fire incidents. Cumulative impacts would be long-term, minor, and adverse.	Alternative B (Preferred Alternative) could result in short-term, minor, adverse impacts to NPS staff, but would also provide indirect, long-term, minor, beneficial impacts on park operations as treatment objectives are accomplished under the preferred alternative. Cumulative impacts would be long-term, minor, and adverse.
<b>WILDERNESS CHARACTER</b>	The direct and indirect impacts of Alternative A (No Action) on the wilderness character of Wupatki National Monument would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.	Under Alternative B (Preferred Alternative), adverse impacts to the wilderness character of Wupatki National Monument would be negligible to minor, short-term and localized as fuels are actively managed. However, long-term beneficial effects would be indirect, localized, and minor as fire is restored and wilderness character is maintained. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.

## **AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES**

This section describes the affected environment and analyzes the probable environmental consequences (impacts) of implementing each of the alternatives. The topics addressed are those which were identified as areas of concern during project scoping (see Chapter 1).

### **Methodology for Assessing Impacts**

Available information on the natural systems and cultural resources of the Flagstaff Area National Monuments and the surrounding ecosystems were reviewed, including information on geology, soils, water resources, vegetation, and wildlife. A primary source of information were the General Management Plans (GMPs) recently completed for all three monuments. Visitor use and support facilities and the anticipated visitor uses and administrative activities within the various management units were also identified. The potential impacts of each alternative on those systems then were evaluated for the analysis period (10 years). Potential impacts to special status species and wetlands/riparian resources within the monuments are assessed in separate sections below. Predictions about short- and long-term impacts were based on past studies, including some studies within the monuments, of land use and visitor impacts to the regional ecosystem.

**Definitions.** For each impact topic evaluated below, the impacts are defined in terms of context, intensity, duration, and timing. Direct, indirect, and cumulative impacts are discussed for each impact topic. Definitions of impact intensity levels vary by impact topic (see the thresholds matrix under each impact topic), but the following definitions were applied for all impact topics.

*Beneficial:* A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

*Adverse:* A change that moves the resource away from a desired condition or detracts from its appearance or condition.

*Direct:* An effect that is caused by an action and occurs in the same time and place.

*Indirect:* An effect that is caused by an action but that is later in time or farther removed in distance, but it is still reasonably foreseeable.

*Context:* The geographic extent of the impact; for example, the impact may be localized to a relatively small area (e.g., site-specific) or regional in scope.

*Intensity:* Refers to the magnitude of the impact. The four impact thresholds are defined for each impact topic. Threshold values for these four intensity categories were developed based on National Park Service standards, similar approved Fire Management Plans or NEPA documents, and discussions with subject matter experts.

*Duration (short-term, long-term):* Refers to length of time that an impact would last; i.e. the length of time before the resource is returned to its pre-disturbance condition or appearance.

Impacts may range from a few hours or the duration of a project (short-term) up to 5 years or greater (long-term).

Throughout this section, where individual monuments are not specifically indicated (in bold), the impact analysis would apply to all three monuments.

## **Cumulative Effects Methodology**

From CEQ regulations (1508.7), a “cumulative effect” (also termed “cumulative impact”) is the effect on the environment that results from the incremental effect of the action(s) when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such action.

Cumulative impacts were determined by combining the impacts of the alternative with other past, present, and reasonably foreseeable future actions. Therefore, in addition to recognizing the past actions that have occurred in the area, such as grazing and fire suppression, it was necessary to identify and analyze other ongoing or reasonably foreseeable future projects on the Flagstaff Area National Monuments and, if applicable, the surrounding area.

## **Ongoing and Proposed Projects and Activities**

Impacts from human use contribute to the impacts of natural agents of deterioration with cultural sites and features, and they can substantially increase the rate of deterioration. Impacts associated with deliberate vandalism or artifact collection also may contribute to cumulative impacts of the proposed action.

Construction of a new maintenance facility and a curatorial facility in the administrative area may have long-term cumulative effects on visitor use and fire management.

Rural residential growth also would add cumulatively to resource and human safety-related impacts on neighboring Forest Service lands and thus to NPS lands as the proposed action is implemented.

Cumulative impacts could also be associated with neighboring agencies’ prescribed fire and fuels management program(s), especially with regard to smoke emissions.

## **Compliance with §106 of the National Historic Preservation Act (NHPA)**

In accordance with the Advisory Council on Historic Preservation’s regulations implementing Section 106 of the NHPA (36 CFR Part 800, *Protection of Historic Properties*), impacts to cultural resources and the cultural landscape were identified and evaluated by (1) determining the area of potential effects, (2) identifying cultural resources present in the area of potential effects that were either listed in or eligible to be listed in the National Register of Historic Places, (3) applying the criteria of adverse effect to affected cultural resources either listed in or eligible to be listed in the National Register, and (4) considering ways to avoid, minimize or mitigate adverse effects.

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

CEQ regulations and the NPS's Conservation Planning, Environmental Impact Analysis and Decision-making (Director's Order DO-12) also call for a discussion of the appropriateness of mitigation, as well as an analysis of how effective the mitigation would be in reducing the intensity of a potential impact, e.g. reducing the intensity of an impact from major to moderate or minor. However, any resultant reduction in intensity of impact as a result of mitigation is only an estimate of the effectiveness of mitigation under NEPA. It does not suggest that the level of effect as defined by Section 106 is similarly reduced. Although adverse impacts under Section 106 may be mitigated, the effect remains adverse.

A Section 106 summary is included in the impact analysis sections under the preferred alternative (B). The Section 106 summary is intended to meet the requirements of Section 106 and is an assessment of the effect of the undertaking (implementation of the alternative) on cultural resources based on the criterion of effect and the criteria of adverse effect found in the Advisory Council's regulations.

## **Impairment Methodology**

The fundamental purpose of the National Park System, which was established by the Organic Act and reaffirmed by the General Authorities Act, as amended, begins with a mandate to conserve park resources and values. NPS managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adverse impacts on park resources and values. However, the laws do give the NPS the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of a park, as long as the impact does not constitute impairment of the affected resources and values. Although Congress has given the NPS the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the NPS must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise. The prohibited impairment is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. An impact to any park resource or value may constitute impairment. An impact would be more likely to constitute impairment to the extent that it affects a resource or value whose conservation is

- necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the parks;

- key to the natural or cultural integrity of the park or to opportunities for enjoyment of the parks; or
- identified as a goal in the parks' General Management Plan or other relevant NPS planning documents.

Impairment may result from NPS activities in managing the park, visitor activities, or activities undertaken by concessionaires, contractors, and others operating in the park. A determination on impairment is made in the Environmental Consequences section for impact topics relating to natural or cultural resources and values.

## **GEOLOGY AND SOILS**

### ***Affected Environment***

Walnut Canyon National Monument is located along the southern margin of the Colorado Plateau. The geology of Walnut Canyon is not complex. The canyon is eroded into sedimentary rock layers of the Kaibab Limestone and Coconino Sandstone formations. The drainage of Walnut Creek became entrenched in the canyon as the formations were locally uplifted. More recent volcanic events within the San Francisco Volcanic Field have influenced the drainage pattern of Walnut Canyon and surrounding canyons (USDI 2001c).

Walnut Canyon's soils are limestone-based, ranging from very thin to several feet in depth with well-developed profiles; rock outcrops are common (USDI 1998). Slopes on the mesas above the Walnut Canyon drainage generally range from 0-15%, and soil movement is minimal.

Wupatki National Monument is located in the southern part of the Colorado Plateau. Wupatki is roughly divided in half by the Doney Monocline, with each half having distinct geology, elevation, and dominant vegetation. At lower elevations to the east of the monocline, the monument is dominated by sandstone and shale geologic formations, saline soils, and open desert scrub vegetation. At higher elevations to the west of the monocline, the monument is dominated by limestone and volcanic formations, fertile soils, and juniper savanna and grassland vegetation.

Wupatki has limestone, sandstone, shale, and areas of volcanic-based soils that range from gently sloping to steep and shallow to moderately deep. Unique areas of relatively young, deep cinders are located where soils are still forming and vegetation is colonizing. Areas of sandstone and shale are situated on extremely complex and variable slopes, are generally thin, and are influenced by cinder deposition. Moderate to poorly developed stream channels occur in the area (USDI 2002b).

Sunset Crater Volcano National Monument is located in the southern part of the Colorado Plateau. The monument is dominated by a volcanic landscape. The Sunset Crater cinder cone and the northern half of Lenox Crater cinder cone lie at the southeastern and southwestern corners of the monument, respectively. Most of the surface area north of the two cones is covered by either the Bonito Lava Flow or deep volcanic cinder deposits, including an area of tall cinder hills within the northeastern quarter of the monument. Sunset Crater is very young in geologic time and one of the few undisturbed cinder cone volcanoes within northern Arizona. The volcano offers unique insight into fresh lava and cinder weathering processes, soil formation, and pioneering vegetation establishment.

Sunset Crater Volcano is a classic example of a cinder cone volcano. During the eruption cycle, volcanic magma was ejected from a vent and thrown into the air while still in a hot, liquid state. The ejected magma cooled, crystallized, and fell as ash, cinder, and popcorn-sized particles (called “scoria”). Larger material (called “bombs”) as much as 3 feet in diameter was also ejected. Larger, heavier material accumulated around the vent to build a cone-shaped volcano with a crater depression centered over the vent. The cone is approximately 1,000 feet high and more than a mile wide at the base. The crater is about 400 feet deep and 2,250 feet from rim to rim. Gaseous fumaroles at the crest of the cinder cone left distinct white, yellow, and pink mineral deposits. A blanket of ash and cinders ejected during the eruption covered more than 800 square miles around the cinder cone.

While Sunset Crater Volcano was erupting, two basalt lava flows originated at the base of the cinder cone. The Kana-A Flow (outside the monument boundary on the Coconino National Forest), an a’ a type lava flow, extruded near the eastern base of Sunset Crater. The Kana-A flowed more than six miles to the northeast, filling a narrow valley. The Bonito Lava Flow, a composite pahoehoe and a’ a lava flow, extruded from the northwest base of Sunset Crater. The Bonito locally pooled over a 2-square-mile area between the west side of the cinder cone and five older volcanic domes and cones. The Bonito is believed to have accumulated, during at least three separate flows, to as much as 100 feet thick. While the Bonito lava was flowing away from the base of Sunset Crater, portions of the cinder cone were carried on top of the flow as far as a mile to the northwest. The cinder cone quickly rebuilt itself through continued eruption as the lava flowed, which is evidenced by the cinder blanket on top of both the Kana-A and Bonito flows. In all, an estimated billion tons of material were erupted from the cinder cone and extruded in the two lava flows(USDI 2002c).

The soils of Sunset Crater are minimal. Volcanic rock and cinders cover the majority of the monument, thus exhibiting unique weathering processes, pockets of soil formation, and establishment of pioneering vegetation.

**Methodology:** The following threshold and duration criteria are identified for geology and soils.

Topic	Negligible	Minor	Moderate	Major	Duration of Impact
<b>Geology and Soils</b>	Impacts would be below detectable levels and not measurable.	Changes to character of geologic features or soils would be detectable and localized. Any mitigation needed to offset adverse impacts would be simple and would be effective.	Changes to character of geology and soils would be readily apparent over a wide area. Mitigation measures to offset impacts would probably be necessary and likely successful.	Impacts to geology and soils characteristics would be severe or of exceptional benefit over a wide area. Mitigation to offset adverse impacts would be needed, and its success not assured.	Short-term refers to durations of less than 5 years. Long-term refers to durations in excess of 5 years.

**Regulations and Policies:** Current laws and policies require that the following condition be achieved in the park for geologic resources and soils.

Desired Condition	Source
Natural soil resources and geologic processes function in as natural condition as possible, except where special management considerations are allowable under agency policy.	Parks' enabling legislation; NPS Management Policies

**Impacts of Alternative A – No Action**

*Impact Analysis:* Under Alternative A, soils would be affected by the aggressive fire suppression activities that could occur to control wildfire, as well as by the fire itself. Because fuel treatments would not occur as part of a planned program under Alternative A, there would be a greater potential for high intensity wildfires in areas that have developed or would develop denser understories and/or litter (fuel loads) over time with continued suppression. These areas include the ponderosa- dominated woodlands of WACA-FMU-1 and WACA-FMU-2 (1,490 acres), the denser woodlands of WACA-FMU-4 (330 acres of burnable Douglas fir-Gambel oak; 1,270 acres of pinyon-juniper woodland; and 220 acres of riparian corridor), and possibly the ponderosa-pinyon-juniper woodland of SUCR-FMU-3 (1,240 acres of ponderosa-pinyon-juniper woodland with contiguous understory). Also, the Bonito park meadow (SUCR-FMU-2; 42 acres of montane meadow) would tend to fill in with woody species and could experience more severe fire. At Wupatki, the lack of fire in WUPA-FMU-3 (17,371 acres of grassland, juniper savanna, and juniper woodland) would also allow the invasion of juniper and other woody brush, and continued medium-scale wildfire events could be expected.

Therefore, if fire were to start in these areas, there could be direct impacts to soils including change in soil chemistry, consumption of organic matter, a reduction in soil nutrients, and loss of soil through vegetation removal and subsequent erosion. If fires are intense, they can create hydrophobic soils, which resist infiltration by rain and put the forest floor at risk of runoff and erosion (DeBano et al. 1998). When soils heat to extreme temperatures, soil structure and organic matter can be destroyed. While this can provide nutrient release for plants growing immediately after a fire, these conditions can affect resources, nutrient cycling, and ecosystem productivity. Arid soils of the southwest recover more slowly from these effects than soils in which organic matter is replaced more quickly, which can alter soil hydrology and promote erosion. These impacts are generally short-term and localized, but accelerated erosion may impact affected areas over the long-term, depending on soil type, slope, and fire severity.

At Walnut Canyon National Monument, the adverse impact of higher-intensity fire on erosion potential would be localized and minor on gentle slopes to moderate on steep slopes. Indirect impacts could include post-fire soil movement depending on severity and percent slope. Localized, adverse impacts of minor to moderate intensity, and short to long-term duration would be expected. The overall potential for rapid erosion and subsequent loss of deep soils on steep shaded slopes would remain under Alternative A; however, since wildland fires at Walnut Canyon tend to remain small, the probability of such impacts also remains relatively low.

The direct impacts of large, high-intensity fire on soil properties at Wupatki National Monument would include similar effects as described above, with higher impacts on steeper slopes. Most fires would be expected within Wupatki to occur within WUPA-FMU-2, and the medium-scale

surface fires that are likely to occur would not be expected to cause extreme adverse impacts to soils. Impacts to soils within WUPA-FMU-4 (18,126 acres of desert shrub) would likely be negligible under alternative A, since this area of patchy, sparse desert shrub on highly dissected sandstone and shale terrain or cinder barrens would not experience extreme fires.

At Sunset Crater Volcano National Monument, fires would not have a great effect on the larger geologic features or on cinder –based soils and lava flows, but cinders situated at their “angle of repose” would be subject to movement on Sunset Crater and Lenox Crater (SUCR-FMU-3), if vegetation in these ponderosa woodlands with relatively contiguous understory fuels is consumed by high-intensity crown fire. These effects would have long-term, localized, and minor to moderate adverse effects on soil genesis and ecological succession.

In addition to the effects of fire itself, there could also be impacts to soils from the more aggressive suppression activities that would be permitted under Alternative A. The use of heavy equipment and construction of firebreaks on level terrain during suppression would have short-term, minor to moderate localized adverse effects on soils. Heavy equipment can rut and compact soils, and firebreak construction results in the direct disturbance of soils in a limited area. The use of MIST (see Appendix B) would help to reduce these impacts, and some burned areas may be rehabilitated following high severity fires to reduce soil movement and restore disturbed areas.

*Cumulative Effects:* Cumulative impacts to soils would include locally increased impacts around developed areas, trails, and roads from NPS operations and visitor use. Effects would be more severe where soils may be exposed on slopes. Cumulative effects also include the minor to moderate adverse impacts of past grazing over much of the land, resulting in compaction and erosion, as well as localized chaining that was done to remove dense growth and promote regrowth of herbaceous plants. These effects, when added to the potential impacts of wildland fires and suppression that would occur under Alternative A, would result in minor to moderate, short- and long-term adverse effects on soil productivity and stability at the monuments.

*Conclusion:* Alternative A (No Action) would result in adverse, mostly localized, short- and long-term, minor to moderate, direct and indirect impacts to geology and soils within the three monuments. Cumulative impacts would be minor to moderate, short- and long-term, and adverse.

Alternative A would not produce any major adverse impacts or impairment of geology and soils resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Under Alternative B, the employment of manual thinning and prescribed burns, plus the use of an AMR to wildland fires, would result in an increase in burned acres and a reduction in adverse impacts from suppression actions compared with Alternative A. In addition, with the use of natural and human barriers as part of an AMR, there would be less fire line construction to bare mineral soil and less overall ground disturbance. Any additional impact would be a result of slightly extended firefighter presence on the fire. With the implementation of fuel reduction projects over time, there would be less chance of a high intensity fire in

susceptible areas in the monuments, which would reduce the intensity of impacts to soil chemistry, structure, and fertility that could occur as a result of fire. Overall, the impact of wildfire suppression activities to soils under Alternative B would be adverse, negligible to minor, short-term, and localized in all FMUs. After long-term fuels management objectives are met, the potential intensity and duration of adverse impacts would diminish.

Prescribed fire use would involve some minor impacts to soils in the treatment areas, including soil compaction, a localized increase in soil temperature and minor erosion after vegetation layers are removed in small areas, and minor direct disturbance due to pre-burn preparation and use of equipment to contain the burn. Direct and indirect impacts on soils would likely be adverse, localized, minor, and short-term. The impact on soils following fire would dissipate as ground cover returns (generally in 3-5 years). Long-term impacts would be beneficial, localized, and of minor to moderate intensity on soil resiliency and stability. Impacts on geological features from prescribed fire would be negligible, since prescribed fire burns would not be planned near any sensitive features and/or plans would provide appropriate mitigation.

Surface burns typical of prescribed burning would elevate ground temperatures (i.e., those layers below the litter layer) only a few degrees, with negligible adverse effect on soils. With reasonable care to minimize ground disturbance during these projects, the potential impact is expected to be negligible and short-term. In the long-term, as nitrogen and other necessary chemical components become available for new and diverse post-fire vegetative growth, the effect would be minor, beneficial, and localized.

Manual thinning with chainsaws and handtools would be used, where approved, to reduce tree densities around identified structures, sites, and facilities. These actions are planned for WACA-FMU-1 (123 acres), SUCR-FMU-1 (34 acres), WACA-FMU-4 (225 acres), and WUPA-FMU-3 (280 acres). The area within WACA-FMU-2 may also be manually thinned with chainsaws and handtools where needed to restore vegetation and wildland fuels to reference period conditions and reduce the intensity of prescribed fires. Woody material would be carried to a chipper where feasible, or piled to be burned (see below), or removed from the area. With implementation of mitigation to protect the ground surface and soils during manual thinning (see Appendix B), ground and soil disturbance would be negligible across proposed treatment sites.

If burn piles are used, increased heating of soil organics would occur directly below burned debris piles. Soil impacts from burning large piles would be adverse, minor, localized, and long-term, though mitigation would reduce both the intensity and duration of effects. No toxic materials would be introduced into the soils or watershed during the treatments. Potential petroleum spills would be avoided by refueling chainsaws on surfaces where fuels could be contained.

*Cumulative Effects:* Impacts to geology and soils from past land uses and construction, plus future construction, routine park maintenance, visitor-use, or other ground-disturbing actions would be similar to those described for Alternative A. Overall, adverse impacts to soils under Alternative B would likely be somewhat offset as more natural fire cycles are restored and fuel reduction actions reduce the potential for high severity wildland fire. Also, the contribution of fire management activities to adverse cumulative impacts would diminish as soil condition is improved over time. Impacts from Alternative B actions, combined with the effects of other

actions on soils and geology, would result in short- and long-term, negligible to minor, adverse cumulative effects.

*Conclusion:* Under Alternative B (Preferred Alternative), adverse impacts of appropriate management response to wildland fire strategies would be negligible to minor, localized and short-term. As objectives are met and the potential for severe fire is reduced, impacts would be diminished to near negligible. Impacts of prescribed fire treatments on soil erosion potential, soil chemistry, and geological processes would be negligible. Scorch rings from any pile burns would likely have a localized, minor adverse effect. Manual thinning, with mitigation in place, would likely result in negligible impacts to soils. After fuels objectives are met under the proposed treatment schedule, localized, minor, indirect, and beneficial impacts to soils resources on those affected FMUs would be expected. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.

Alternative B would not produce any major adverse impacts or impairment of geology and soils resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

## **VEGETATION**

### ***Affected Environment***

Walnut Canyon National Monument harbors a rich floral assemblage; over 400 plant taxa have been documented (USDI 2001). Figure 5 (located in Chapter 1) depicts the dominant vegetation classes in the monument. In the southwestern portion of the monument, forest vegetation is dominated by ponderosa pine (*Pinus ponderosa*) with various associated species, including Gambel oak (*Quercus gambelii*). Pinyon-juniper (*Pinus edulis-Juniperus* spp) communities dominate the northeastern portion and rim areas of the monument. Within the canyon, the mixture of vegetation communities is influenced by aspect. North and east-facing slopes tend to be characterized by mixed-conifer stands of ponderosa pine and Douglas fir (*Pseudotsuga menziesii*), with south-facing slopes characterized by a pinyon-juniper-shrub-succulent woodland. The floor at Walnut Canyon contains a narrow band of riparian vegetation containing such species as New Mexico locust (*Robinia neomexicana*), boxelder (*Acer negundo* ssp *californicum*), Arizona walnut (*Juglans major*), quaking aspen (*Populus tremuloides*), red osier dogwood (*Cornus stolonifera*), desert olive (*Forestiera pubescens*), and Arizona rose (*Rosa arizonica*) (see also Water Resources, Wetlands, and Riparian Areas).

Wupatki National Monument includes three floral units: cold desert shrub (Wupatki Basin), grassland-juniper savanna, and grassland (Antelope Prairie). Figure 6 (located in Chapter 1) depicts the dominant vegetation classes in the monument. In the western portion of the monument, vegetation is predominantly grassland with juniper and shrubland patches, with denser juniper woodland along the southern border. As described in the Fire History section in Chapter 1, juniper woodland has been expanding into grasslands during the last century. This encroachment by juniper has likely occurred as a result of the loss of fine fuels and reduced competition from grasses from intensive grazing, as well as fire suppression, which has allowed juniper seedlings to take hold. The eastern portion of the monument contains sparser mixed herbaceous shrubland on highly dissected shale and sandstone terrain, mixed grassland/shrubland (juniper), and a small amount of

riparian shrubland along the Little Colorado River. Much of the riparian area has been taken over by invasive species, tamarisk and camelthorn, although a small amount of native cottonwood-willow cover is present (see also Water Resources, Wetlands, and Riparian Areas).

Sunset Crater Volcano National Monument has many areas with little or no vegetation (cinder and basalt terrain). Figure 7 (located in Chapter 1) depicts the dominant vegetation classes in the monument. Most of the monument is dominated by ponderosa pine forest. Associated shrubs include cliffrose (*Purshia mexicana*) and apache plume (*Fallugia paradoxa*). Herbaceous plants include spleenwort (*Asplenium septentrionale*), sand bluestem (*Andropogon hallii*), sedge (*Carex occidentalis*), and buckwheat (*Erigonum spp*). The distribution of vegetation is patchy in many areas because of the deep cinders and lava flows. However, in some portions of the forest on the cinder cone slopes, lack of fire has resulted in the build-up of a more continuous understory of young trees and shrubs within ponderosa pine forest.

This plan addresses fire management direction for about 700 acres of Coconino National Forest lands that are proposed to be added to Sunset Crater through an administrative boundary adjustment. These include the northeast corner (mostly cinder terrain and very open, patchy ponderosa pine forest), and an extension on the western side that contains the developed administrative areas surrounded by ponderosa-dominated forest, and an area of open montane grassland within Bonito Park.

**Methodology:** The following threshold and duration criteria are identified for analysis of impacts on vegetation.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
<b>Vegetation</b>	Vegetation would not be affected or individual plants could be slightly affected; impacts limited to small area. Impact on exotics barely detectable or individual species could be affected.	Changes would be localized and measurable to one or more species, but would be of little consequence to the population. Mitigation of any adverse impacts would be effective. Mitigation to protect native species would be effective.	A large segment of one or more species populations would be affected over a relatively larger area. Mitigation could be extensive, but likely effective.	Considerable impacts on plant populations over large areas would occur. Mitigation to offset adverse impacts would be required and extensive, and success not assured. Impact would be severe or of exceptional benefit to native species. Extensive mitigation would be required to offset adverse impacts to native species, but success not assured.	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.

**Regulations and Policies:** Current laws and policies require that the following condition be achieved for vegetation.

Desired Condition	Source
Populations of native plant species function in as natural condition as possible except where special management considerations are warranted.	Parks' enabling legislation; NPS Management Policies
The Service will strive to restore extirpated native plant and animal species to parks when specific criteria are met.	Parks' enabling legislation; NPS Management Policies
Management of populations of exotic plant species, up to and including eradication, would be undertaken wherever such species threaten park resources and when control is prudent and feasible.	NPS Management Policies; Executive Order 13112, Invasive Species

**Impacts of Alternative A – No Action**

*Impact Analysis:* Under Alternative A, the NPS would not have a long-term strategy for pro-actively managing fuels build-up and restoring fire disturbance to fire-adapted vegetation, and there would be continued aggressive suppression of all wildland fires. Over time, wildland fires in certain vegetation types could become more severe, with greater impacts on native vegetation. Any fire management project, such as a vegetation thinning treatment around NPS facilities, would require separate planning, public involvement, and regulatory compliance processes.

The lack of a fuels management program and continued fire suppression would result in the continued increase in vegetation and fuels in the understory of ponderosa-dominated forests, as well as the continued increase of juniper into grasslands. This would contribute to the continuation of unhealthy forest conditions with unnatural fire regimes, an increased risk of more severe fire and/or crown fires, and associated resource degradation. The primary areas affected would include the ponderosa forests surrounding the developed areas within WACA-FMU-1 (123 acres) and SUCR-FMU-1 (34 acres), the ponderosa-dominated woodlands of WACA-FMU-2 (1,375 acres), and parts of WACA-FMU-4 (330 acres of burnable Douglas fir-Gambel oak on north and east-facing slopes, 220 acres of riparian corridor, and 1,270 acres of pinyon-juniper woodland along eastern canyon rims and slopes). Approximately 1,240 acres of SUCR-FMU-3 that contain mixed ponderosa pine-pinyon-juniper woodland with a contiguous understory could also be affected, but effects here are somewhat unpredictable based on recent fire history (few, if any, fires) and the absence of scientific information on reference period and natural historical fire regime.

The lack of fire due to suppression would also affect the Bonito Park area in SUCR-FMU-2 (42 acres). This open, high-montane meadow would eventually become subject to increasing densities of invading ponderosa pine and other woody species. If these woody fuel species were to build up over time, and a fire were to occur here, it would be more intense and more damaging than sporadic, surface fires, causing more damage to the soil and vegetation present.

Finally, suppression of fire in WUPA-FMU-3 (17,371 acres of grassland, juniper savanna, and juniper woodland) would result in continued growth of juniper and woody shrubs such as rabbitbrush and snakeweed in the grassland area. This increase in fuels could support some medium-scale wildfire events, with more intense fire than would occur with just grassland present.

Impacts to vegetation would be negligible within the remainder of the vegetation in SUCR-FMU-4 (2,407 acres of lava flow and cinder barren) and WUPA-FMU-4 (18,126 acres of sparse desert shrub on sandstone and shale bedrock), based on fire incident records dating to the 1960s and current conditions. These areas are not very susceptible to fire and would not be expected to experience an increase in fuel base over time.

The direct impacts of wildland fire to vegetation include combustion of surface biomass and some mortality to plants. Increased mortality of grasses, shrubs, and overstory trees may result in areas with fuel build-up, especially if the residence time of the flaming front and the fireline intensity increase. However, given the relatively low occurrence of wildland fire and small acreages burned, impacts would be localized, short-term, and minor under most circumstances. Minor to moderate impacts could occur under more extreme burning conditions. Over time, there would be a shift to early successional species and a change in the structure and function of the community. In the long-term, beneficial impacts to the overall vegetation community could result following wildfire, with the creation of a more diverse, open woodland and a return to a more appropriate fire regime for the type of vegetation present. For example, ponderosa pine is one of the predominant vegetation communities in the monuments, especially Walnut Canyon. Fire has historically played an important role in the ponderosa pine forest, maintaining open stand conditions by periodically thinning the understory and providing a mineral seedbed for pine seed germination. With suppression of fire over time, the build-up of understory fuels has created fuel ladders that can allow development of a more severe crown fire, decreasing the chance of mature tree survival. A stand-destroying wildland fire would result in an initial herb-shrub stage, and the area would undergo succession over time, with the type of successional species depending on site-specific conditions. If ponderosa pine return, a more even-aged stand would result (Bradley et al. 1992).

Actions to aggressively suppress wildland fires also have direct, but short-term adverse impacts on vegetation. Suppression activities that would include creation of fire lines and use of heavy equipment would result in the removal of vegetation and the other impacts to vegetation from trampling, destruction of root systems, and compaction or removal of soils. These short-term, minor to moderate adverse impacts would be mitigated by limiting fire line construction and conducting site rehabilitation, as described under MIST in Appendix B.

Overall, Alternative A would result in minor to moderate, direct, localized direct adverse effects to vegetation depending on fire severity, and indirect minor adverse impacts due to loss of vegetation from suppression operations during the analysis period.

*Cumulative Effects:* Cumulative impacts to vegetation would result from the fire management actions described under Alternative A, combined with other actions in and around the park that affect vegetation. These actions include the fire management activities occurring and planned by other agencies and outside landowners along the park's boundary. Previous and potential future fire suppression has created unwanted fuel build-up outside the park, which contributes to the potential for adverse impacts from wildland fire that could spread into the park. Continued planning for fuels management by all parties under the Community Wildfire Protection Plan for Flagstaff and Surrounding Communities in the Coconino and Kaibab National Forests (Greater Flagstaff Forests Partnership and Ponderosa Fire Advisory Council 2004) and collaborative efforts between the Coconino National Forest and the Greater Flagstaff Forest Partnership would

gradually reduce that risk over time and result in indirect beneficial impacts to vegetation communities in the area.

In addition to these actions, a sharp increase in bark beetle activity is underway in southwestern forests. The beetles primarily attack ponderosa pine and pinyon pine stands weakened by ongoing drought. The impacts are not yet well understood, but there would likely be an increase over time in available dead, woody fuels in these areas which would contribute to increased fire hazard. Other actions that have adversely affected vegetation in the area include past grazing, logging, and chaining.

Any planned facility construction, together with routine maintenance activities, would have long-term adverse impacts in the immediate construction area, but the area affected would be sufficiently small and localized that overall impacts to vegetation communities would be minor. The loss of vegetation from unwanted high-severity wildland fire, when considered cumulatively with fire damage on adjacent lands from past fires, would result in minor adverse cumulative impacts. Native seed sources from such damaging wildland fires would likely decline locally, as would overall habitat quality, particularly during drought conditions and insect infestations. Overall, cumulative impacts from actions under Alternative A, plus impacts of other actions, would be adverse, long-term, and range from minor to moderate intensity.

*Conclusion:* Alternative A (No Action) would result in minor to moderate, direct, localized adverse effects to vegetation depending on fire severity, and indirect minor adverse impacts due to loss of vegetation from suppression operations during the analysis period. Cumulative impacts would be long-term, adverse, and range from minor to moderate.

Alternative A would not produce any major adverse impacts or impairment to native vegetation resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Under an approved FMP, wildland fires managed under an AMR would likely be somewhat larger in area than those under Alternative A, where direct suppression actions are required. Long-term comparative benefits to vegetative communities from reduced suppression impacts are more likely, especially if there are consecutive years of adequate moisture following fire. Thus, long-term benefits would be negligible to minor, indirect, long-term, and localized to individual burn areas.

The impacts of proposed prescribed fire treatments under the preferred alternative on vegetation as related to fuels build-up and fire severity include the following:

- Risk of high severity wildland fire and threats to NPS facilities and visitor use areas would be much reduced from those of Alternative A through pro-active manual treatment in WACA-FMU-1 (123 acres of mixed ponderosa-pinyon-juniper woodland) and SUCR-FMU-1 (34 acres of ponderosa pine stands).
- Risk of high severity wildland fire and threats within WACA-FMU-2 (1,350 acres of ponderosa pine-dominated vegetation on level terrain) would be much reduced from

those of Alternative A through combined manual pre-treatments to protect sensitive resources, manual thinning to reduce crown fire risk, and prescribed burning program designed to mimic the natural historic fire regime.

- Risk of high severity wildland fire in close proximity to archeological sites within WACA-FMU-4 and WUPA-FMU-3 would be much reduced from those of Alternative A through pro-active assessment and manual treatment; this would impact vegetation in very localized areas around identified sites and would not exceed 125 acres of vegetation in Walnut Canyon or 280 acres in juniper woodland at Wupatki National Monument.
- Continued use of prescribed fire to maintain the 42 acre montane meadow in Bonito Park in SUCR-FMU-2, preferably in conjunction with USFS burning of the remaining area of the meadow on the same fire return interval, would decrease the potential for invasion by woody species, a beneficial impact.
- Fire risk and effects to vegetation would remain nearly the same as Alternative A within SUCR-FMU-3 (1,237 acres of ponderosa pine-dominated vegetation); WUPA-FMU-3 (1,286 acres of juniper woodland/grassland), SUCR-FMU-4 (2,407 acres of lava flow and cinder barrens); and WUPA-FMU-4 (18,126 acres of sparse desert shrub).

Direct and indirect impacts from the application of prescribed fire to FMUs described above would be beneficial, localized, and of moderate intensity as vegetative management objectives are met long-term.

The strategy of manual thinning using hand-carried mechanical equipment and handtools would have a moderate beneficial impact locally as overgrown areas are thinned and risk of crown fire is reduced. Some surface vegetation would be subject to localized trampling from crews working in the area, but impact would be negligible. There is also the remote possibility of some chainsaw fuel and oil spillage on herbaceous plants and forbs, but timely cleanup would mitigate any adverse impact to negligible.

If pile burning is used following manual thinning operations, the burning would likely kill the surface and ground vegetation and micro-flora immediately under the piles. The indirect effect would be to create more open stands in a relatively short period of time in the remote areas and along park boundaries that would then be less susceptible to intense wildland fires. Therefore, this strategy would result in localized, short-term, and minor adverse impacts over a small area. However, as these areas re-vegetate in 3-5 years, indirect impacts would be beneficial, and of minor to moderate intensity for native vegetation.

As restoration objectives are met with combinations of non-fire and prescribed-fire strategies, tree densities would begin to decline, spacing would be increased, and more openings with reduced competition would result. The patchy pattern resulting from a variety of fire size and intensity on the landscape over time may result in vegetation in differing stages of re-growth, with varying abundance of trees, shrubs, grasses and forbs. Plant species diversity would be expected to increase. Over a longer period, these indirect impacts would be minor to moderate and beneficial. Closely monitored prescribed burns should be considered as part of adaptive management before any larger scale prescribed fires are initiated to accomplish vegetation management objectives.

*Cumulative Effects:* Cumulative impacts would be similar to those described under Alternative A, but with added long-term beneficial effects from reduced fuels and the ability to use less intensive suppression techniques. Fuels management projects adjacent to NPS lands would have long-term minor to moderate beneficial impacts when considered cumulatively with proposed projects under Alternative B. The cumulative effect on vegetation from Alternative B, along with all other actions affecting vegetation, would be short- and long-term, adverse, and minor.

*Conclusion:* Overall, Alternative B (Preferred Alternative) would have negligible to minor adverse impacts on vegetation, with moderate beneficial impacts as fuels are restored to natural levels and a diversity of native vegetation is restored through prescribed fire treatments under a proposed schedule. Cumulative impacts would be short- and long-term, minor, and adverse.

Alternative B would not produce any major adverse impacts or impairment to native vegetation resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### **NON-NATIVE, INVASIVE PLANT SPECIES**

Fire is generally considered a contributor to the spread of exotic species across all FMUs (Abella and Covington 2004, Sieg et al. 2003, Floyd-Hanna et al. 1999, USDI 2001). Most exotic species identified are limited to specific locations; fire management actions in these areas can be tailored to reflect the specific characteristics of each species. Roads, trails, and disturbed areas function as corridors for invasive species to move into the monument. Given time, aggressive exotic plant populations can greatly expand, altering natural vegetation, displacing rarer native plants, eliminating native forage and cover for animals, and changing the original scenic character. Many of these species are adapted to rapidly expand into areas following ecological disturbance events, such as floods, grazing, mechanical equipment use, soil churning by burrowing animals, and fire.

Some qualitative and limited quantitative work is currently underway by the Natural Resource Program to document the distribution of certain species within the Flagstaff Area National Monuments, but results are not yet available for consideration in the fire management planning. At least 23 non-native plant species are known to occupy Walnut Canyon National Monument. These include mullein (*Verbascum thapsus*), cheatgrass (*Bromus tectorum*), filaree (*Erodium cicutarium*), horehound (*Marrubium vulgare*), and dalmation toadflax (*Linaria dalmatica*). These invasive species occupy mainly disturbed areas (USDI 2001). Non-native species known to occur within Wupatki National Monument include Russian thistle (*Salsola kali*), annual brome grasses (*Bromus spp.*), and camelthorn (*Alhagi maurorum*), with tamarisk (*Tamarix ramosissima*) along the Little Colorado River. Little information is available on the distribution or impacts of non-native, invasive plants within Wupatki or within Sunset Crater. Those infestations noted within Sunset Crater Volcano National Monument are generally confined to road corridors, developed areas, and areas of heavy visitation. Species noted in Sunset Crater include mullein, camelthorn, and diffuse knapweed.

Many invasive non-native species, such as cheatgrass, employ an ecological strategy of early season maturation and seed dissemination. For this type of species, summer burning may not

provide effective control, as their seeds would already be released and surface temperatures under fast moving summer fires may not be high enough to kill the seeds. Cheatgrass is a strong competitor in the post-fire environment, where it takes advantage of increased resource availability and produces an abundant seed crop (Billings 1994).

Information on the fire ecology and adaptations of diffuse knapweed to fire is sparse in the literature. Diffuse knapweed has a large, perennial taproot that may survive fire if the root crown is not killed. It also produces large quantities of seed that may survive fire. Dense infestations may change the fire regime by changing the fuel characteristics and reducing the fire return interval at a given site. Watson (1972) notes that seed collected from diffuse knapweed plants in an area burned by a mid-August wildland fire was not viable.

Russian thistle aids in spreading fire. It burns readily because the stems are spaced in an arrangement that allows for maximum air circulation. Also, dead plants contribute to fuel load by retaining their original shape for some time before decomposing (Evans et al. 1970). Russian thistle will also readily colonize a burn area.

Dalmation toadflax is likely to be top killed by fire; however its deep, extensive root system is likely to survive even severe fire and allow reestablishment of the population from vegetative buds on roots. Many root-sprouting plants, including toadflax, have high fire survival rates regardless of burn severity. This is because even the most severe fires typically damage roots only to 4 inches (10 cm) below the soil, and toadflax roots typically penetrate the soil to a depth of several feet.

**Methodology:** Impact thresholds on non-native, invasive species have been developed from the literature and the experiences of staff and outside experts.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
Non-native, invasive species	Impacts would barely detectable as to changes in number, distribution, and densities	Impacts would be sufficient to cause a noticeable but not substantial change in number, distribution, and densities of non-native, invasive species.	Impacts would be sufficient to cause a noticeable but not substantial change in number, distribution, and densities of non-native, invasive species.	Impacts would result in substantial and highly noticeable changes in number, distribution, and densities of non-native, invasive species.	Short-term refers to a period of less than 5 years. Long-term refers to a period longer than 5 years.

**Regulations and Policies:** Current laws and policies require that the following condition be achieved for non-native, invasive species.

Desired Condition	Source
NPS management policies describe program guidance for preventing accidental introductions, spread, and control of existing non-native, invasive species.	NPS Management Policies; Executive Order 13112, Invasive Species
Management of populations of non-native, invasive plant species, up to and including eradication, would be undertaken wherever such species threaten park resources and when control is prudent and feasible.	NPS Management Policies; Executive Order 13112, Invasive Species

### ***Impacts of Alternative A – No Action***

*Impact Analysis:* Under Alternative A, higher severity fires could result from the build-up of fuels over time and could create areas of bare ground that are susceptible to the spread of non-native species, resulting in localized, short-term or long-term, minor to moderate adverse impacts. Depending upon the timing of wildfires, high intensity fires may kill seeds of diffuse knapweed, or promote denser growth of native plants on a newly exposed seedbed, which can compete with exotics, resulting in negligible to even some minor benefits locally. Low-intensity fires that would be expected in certain areas such as WUPA-FMU 3 and 4 may favor either native or non-native, invasive species depending on time of year, and impacts would range between adverse and beneficial. Cheatgrass may be increased from either high or low-intensity fire, resulting in potentially moderate adverse effects. Generally, burning the shoots of sprouters stimulates growth (adverse effect), but high-intensity fires may kill seeds of non-native species (beneficial effect).

Indirect impacts of suppressing most wildland fires may range from expansion of non-native, invasive species in the burned area to suppressed vigor of non-native, invasive species. The response would be largely dependent on the time and intensity of burning as well as secondary factors such as competition with native species and moisture availability post-burn. Indirect effects also would include the creation of new habitat by suppression-activity disturbances, and the clearing of areas by fire. The greater reliance on suppression under Alternative A, without the monitoring and mitigation in the Preferred Alternative, would lead to moderate long-term adverse effects.

*Cumulative Effects:* Management and visitor activities contribute to cumulative impacts through the inadvertent spread of invasive species. Past and future suppression activities and/or land uses within or adjacent to the monuments may cause disturbances that encourage spread of non-native, invasive plants with minor, long-term adverse effects. Large, high severity fires in areas of Walnut Canyon National Monument and Wupatki National Monument may add moderate adverse effects by creating expanses of habitat in the region for invasive non-native, invasive plants into the foreseeable future. Overall, cumulative impacts related to invasive species from actions under Alternative A, combined with other actions, would be long-term, minor to moderate, and adverse.

*Conclusion:* Under Alternative A (No Action), both high severity wildland fires and suppression activities would potentially prepare more areas for colonization by non-native, invasive species. Thus, the direct adverse effects would be localized, short-term to long-term, and minor to moderate. Indirect effects of suppression of wildland fires would be adverse, localized, short-term to long-term, and moderate. Cumulative impacts would be long-term, minor to moderate, and adverse.

Alternative A would not produce any major adverse impacts or impairment to native vegetation resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Direct and indirect effects from potential suppression actions and high intensity wildland fires would be similar to Alternative A in the short-term. However, as treatment objectives are met over time, these impacts may be reduced or result in a minor beneficial effect by increasing native plant competition. Similar to Alternative A, those invasive species that are established may benefit from prescribed or wildland fire of any intensity.

Minor adverse effects may occur from any increased clearing by prescribed fire, which increases the opportunity for the spread of non-native plants. Except for certain invasive species which are already so established at the landscape level that control is beyond feasibility, the distribution of non-native species in the monuments is relatively highly localized; thus, mitigation would possibly prevent additional colonization and spread. For example, each prescribed fire plan that involves patches dominated by non-native species would consider the species present and design the burn to discourage these species and encourage native species where possible. The NPS has already implemented invasive species control projects along the roads and front country areas within all three monuments, and under an approved Fire Management Plan, additional fire management project funds would be requested to expand this work as part of a burned area rehabilitation program.

*Cumulative Effects:* Cumulative effects would be similar to those described for Alternative A, but with benefits related to the increased emphasis on control of non-native species within the region. Overall, cumulative impacts related to invasive species would be long-term, minor to moderate, and adverse.

*Conclusion:* Under Alternative B (Preferred Alternative), wildland fires, suppression activities, and fuel management actions that cause ground disturbance would potentially prepare more areas for colonization by non-native, invasive species. Attempts would be made to expand the amount of ongoing invasive plant control work using fire project funding, but this outcome is not guaranteed. Thus, the direct adverse effects under Alternative B would be localized, short-term to long-term, and minor to moderate. Indirect effects of suppression of wildland fires under AMR would be adverse, localized, short-term to long-term, and minor. Indirect effects resulting from treatments may also result in a minor, localized, and long-term benefit as native species could more effectively compete with non- native species. Cumulative impacts would be long-term, minor to moderate, and adverse.

Alternative B would not produce any major adverse impacts or impairment to native vegetation resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

## **WILDLIFE**

### ***Affected Environment***

Walnut Canyon National Monument supports a rich assemblage of wildlife and wildlife habitats. Existing documentation shows a partial species list for 53 mammals, 8 reptile species, and over 100 bird species (USDI 1996). Observational records reveal that the canyon faunal diversity

remains largely intact, and wildlife habitats and migration corridors have remained relatively undisturbed under historic regional management conditions (USDI 2001c). Seasonal migration corridors and habitat exist for elk, mule deer, and pronghorn. Mountain lion and black bear also frequent the area. Areas south of the canyon provides turkey habitat. Raptors that utilize the steep terrain and secluded side canyons include Cooper’s hawk, sharp-shinned hawk, red-tailed hawk, golden eagle, prairie falcon, flammulated owl, and great horned owl. Special status species are also residents, and are discussed under that issue topic below.

The fauna of Wupatki National Monument is poorly documented. An inventory of natural resources within Wupatki was completed during the late 1970s (Bateman 1980). This study remains the best available documentation of the monument's flora and fauna. The monument is important habitat for American pronghorn within the grassland and grassland-savannah vegetation types. It is believed that fire is an important element in maintaining grassland habitat for the pronghorn and a number of bird species of concern. Although not formally listed or considered a species of concern, pronghorn are the focus of considerable wildlife management effort because they are attractive large herbivores and an important game species. Many ecologists believe that cattle grazing in combination with range-fire suppression may favor unwanted juniper encroachment into grasslands. Sunset Crater Volcano National Monument’s wildlife population is documented in an inventory of flora and fauna in the late 1970s (Bateman 1980). The same vegetation cover across much of the monument provides relatively little forage and cover for wildlife and surface water sources are lacking. The Bonito Lava Flow, which covers more than 25% of the surface area of the monument, is extremely inhospitable to foot travel and probably does not provide habitat for larger animals. Habitat for larger animals, such as mule deer, is restricted to the western, southern, and northern margins of the monument. Mammals that are observed on the monument include coyote, pronghorn, cottontail, jackrabbit, bobcat, squirrel, raccoon, porcupine, and skunk. Over 100 species of avifauna have been observed in the monument.

There are no known or documented exotic animal species occurring in the Flagstaff Area National Monuments.

**Methodology:** The following threshold and duration criteria are identified for wildlife.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Wildlife</b>	Impacts would be barely detectable or individuals could be affected but not populations. Impacts would be limited to small areas, and not measurable.	Changes would be localized, and affect one or more species populations. Any adverse impacts could be effectively mitigated.	A large segment of one or more wildlife populations would be affected over a relatively large area. Mitigation to offset adverse impacts would be extensive, but likely successful.	Impacts would be severe or of exceptional benefit to wildlife populations. Extensive mitigation would be required to offset adverse impacts, and its success not assured.	Short-term refers to a period of less than 10 years. Long-term refers to a period longer than 10 years.

**Regulations and Policies:** Current laws and policies require that the following condition be achieved for wildlife species, including exotic animal species.

<b>Desired Condition</b>	<b>Source</b>
Populations of native animal species function in as natural condition as possible except where special management considerations are warranted.	Flagstaff Area National Monuments' enabling legislation; NPS Management Policies
The Service will strive to restore extirpated native animal species to parks when specific criteria are met.	Flagstaff Area National Monuments' enabling legislation; NPS Management Policies
Management of populations of exotic animal species, up to and including eradication, would be undertaken wherever such species threaten park resources or public health and when control is prudent and feasible.	NPS Management Policies; Executive Order 13112, Invasive Species

### ***Impacts of Alternative A – No Action***

*Impact Analysis:* Under Alternative A, the continued build-up of understory fuels in certain areas of the monuments could result in more intense burns and changes in vegetation, as described under Vegetation. These changes in habitat would affect species in different ways. Fire can create, destroy, or enhance wildlife habitat, causing change in subsequent abundance and occurrence of animal species on a burned area. The nature and extent of impacts to wildlife would depend on fire intensity, duration, frequency, location, extent, season, site, fuels, and soil present (Bradley et al. 1992).

Given the relatively low fire occurrence for the Flagstaff Area National Monuments, the direct and indirect impacts of fire and related suppression actions on wildlife and habitats would be variable in the short-term. Direct impacts would include localized loss of habitat for short periods following fire, particularly in drought years and where fuels accumulations could be excessive, such as in WACA-FMU-2 (1,350 acres of ponderosa-dominated forest), WACA-FMU-4 (330 acres of Douglas fir-Gambel oak; 220 acres of riparian corridor; and 1,270 acres of pinyon-juniper woodland), WUPA-FMU-3 (1,286 acres of juniper woodland/grassland), and SUCR-FMU-3 (1,240 acres of ponderosa-dominated woodland with a contiguous understory). Disruption of ground-nesting bird and mammal activity as a result of fireline construction and general firefighter presence would be adverse, direct, localized, short-term, and of minor intensity. Mitigation to minimize impacts to wildlife during wildfire suppression operations is described in Appendix B (MIST).

Long-term indirect impacts in high-severity burn areas that recover slowly would be adverse and minor to moderate in intensity, as habitats are less able to support wildlife populations and fuels accumulate. However, some of these species would eventually benefit from the results of fire due to the openings created and the new undergrowth of forbs and grasses that would regenerate on burned sites.

Some wildlife species prefer older age stands or late successional woodlands (e.g., porcupines, tree squirrels). In time, any woods that are not burned and continue to exist as forests would benefit these animals. Fire may adversely affect these species, causing them to move to other, more suitable habitats within the Flagstaff Area National Monuments, resulting in short-term, minor impacts only.

Any amphibians found within riparian areas would be generally unaffected by fire because of the wet nature of their habitat. Reptiles (lizard, snakes) may experience short-term, minor to moderate adverse impacts due to reduction in ground cover and food, with some direct mortality

possible for less mobile species. However, long-term, moderate benefits would result from creation of a more open canopy and the eventual regeneration of a forb/grass ground cover that provides food and cover for these species.

In SUCR-FMU-2 (42 acres of high montane meadow in Bonito Park), a more intense fire could cause more mortality and habitat disruption to meadow dwelling species, such as small mice, shrews, and ground-nesting birds. However, many of these species would eventually benefit from the new undergrowth that would regenerate on the burned site. Impacts to habitat and species from fires under Alternative A within WUPA-FMU-3 at Wupatki National Monument and much of Sunset Crater Volcano National Monument (SUCR-FMU-3 and SUCR-FMU-4) would be negligible, because of the relatively sparse and discontinuous fuels in most areas and the expected lack of fire.

*Cumulative Effects:* Cumulative impacts to wildlife have and continue to occur from illegal poaching, woodcutting, off-road-vehicle use, and high levels of visitor use in certain areas. The most prominent activity continuing to occur over the three monuments that would add cumulative impacts on species or habitats would be ongoing, large-scale forest restoration, fire risk reduction treatments, and suppression actions on adjacent lands west of Walnut Canyon National Monument. However, given the careful planning and current mitigation included in other agency restoration and risk reduction projects, impacts in the long-term would likely be minor, except in rare cases where multiple fires of extreme intensity occur in the same area.. Overall, the effects of Alternative A, when added to the effects of these other actions, would result in cumulative adverse, short-term to long-term, minor to moderate adverse impacts to wildlife.

*Conclusion:* Alternative A (No Action) would result in negligible to moderate, adverse, localized, short- and long-term impacts to wildlife and wildlife habitat, with some long-term benefits to those species favoring more open woodland and grassland that would occur following fire events. Cumulative impacts would be short- to long-term, minor to moderate, and adverse.

Alternative A would not produce any major adverse impacts or impairment of wildlife resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Restoring the historical fire regime through use of planned ignitions and non-fire treatment strategies would result in vegetation communities which generally favor wildlife and habitat diversity over the long-term. The less aggressive approach to suppression of wildland fires under AMR guidelines would minimize inadvertent damage that might result from aggressive suppression operations under Alternative A. This would result in a beneficial, localized, indirect, long-term effect of minor to moderate intensity for wildlife and wildlife habitats.

Under Alternative B, the threat of severe fire would be much reduced over Alternative A through proactive manual treatment in WACA-FMU-1 (123 acres), SUCR-FMU-1 (34 acres), and around sensitive sites in WUPA-FMU-3 and 4 and WACA-FMU-4. Areas specifically targeted for protection include archeological sites, sensitive vegetation (e.g., large trees, rare plants), raptor

breeding areas, and structures. The removal of vegetation in and around these specific treatment areas would have short-term, minor, and very limited adverse impacts to wildlife habitat, since the treatment areas are so scattered and relatively small.

In WACA-FMU-2 (1,350 acres), severe fire risk and associated wildlife habitat destruction would be much reduced from those of Alternative A through proactive manual pretreatment, plus use of prescribed burning. Initially, there would be short-term, minor adverse impacts from these activities, as described below; however, in the long-term, the emphasis on returning fire where appropriate based on natural vegetation will produce more natural ecological conditions, increase habitat diversity, and provide a protective buffer around other sensitive habitats, a moderate beneficial impact.

Prescribed fire and thinning operations initially would disturb small mammals in localized areas but would benefit predator species. Those species dependent on heavier overstory cover and large trees may experience localized, minor adverse impacts. Noise from chainsaw use and human presence also may disturb animals and birds temporarily. Mitigation (see Appendix B) would serve to minimize disturbance during breeding and nesting season and would ensure that prescribed fire allows for low intensity surface burns only. Within several post-treatment growing seasons, sprouting and re-growth of grasses, forbs, and shrub species would invigorate habitats. This would be especially true in SUCR-FMU-2 (42 acres in Bonito Park), where prescribed fires would maintain an open montane meadow environment with a more natural fire return interval.

Areas targeted for prescribed fire would be planned primarily during non-breeding seasons, and prescribed fires would be less intense and/or widespread than potential wildland fires. Short-term impacts to some wildlife species include negligible to minor disturbance from the presence of humans and equipment during prescribed fire. Small mammal cover would be exposed over localized areas, but would eventually regrow as lush cover, which can benefit predator species. Sprouting of canopy species and regrowth of grasses, forbs, and shrubs would generally occur within one to two growing seasons and would moderately enhance habitat conditions for many species of wildlife. Those species that are more dependent on denser, mature woodlands could be displaced from areas where a frequent fire regime is restored.

Broadcasting (scattering) and treating slash with prescribed fire is preferable to piling. Any debris piles not burned immediately may provide temporary increased cover for small mammals, but this would probably not provide for changes in population. Snags (standing dead trees) with evidence of wildlife use would be retained. Prescribed fires would also create snags for future wildlife use. As restoration objectives are met, long-term indirect impacts to habitat would be beneficial, localized, and of moderate intensity as species diversity and habitat condition continues to improve.

*Cumulative Effects:* Cumulative impacts to wildlife would be similar to those described for Alternative A, but with added long-term benefits of restoring natural ecological conditions in many areas of the monuments. As fuels management objectives both on and off NPS lands are met, foreseeable impacts would likely be beneficial and of minor to moderate intensity due to habitat improvement. Overall, the effects of Alternative B on wildlife, combined with the effects

of other actions, would result in short-term and long-term, minor, adverse cumulative impacts to wildlife.

*Conclusion:* Alternative B (Preferred Alternative) would result in beneficial, localized, long-term impacts of minor to moderate intensity on wildlife and habitat during the analysis period, as overall habitat condition is improved, with negligible to minor, short-term adverse effects on wildlife from planned fuel reduction treatments. Cumulative impacts would be short- and long-term, minor, and adverse.

Alternative B would not produce any major adverse impacts or impairment of wildlife resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### **SPECIAL STATUS SPECIES**

#### *Affected Environment*

Special status species include legally protected threatened and endangered species listed under the Endangered Species Act, plus species of concern that are recognized by the state and federal agencies. The U.S. Fish and Wildlife Service was contacted and the Arizona Heritage Data Management System (Arizona Game and Fish Department 2003) was consulted via the Internet to generate a list of threatened and endangered species, and “species of concern” for Coconino County, Arizona. This list was compared with species and habitat information maintained by NPS staff, including an inventory of natural resources for Sunset Crater and Wupatki (Bateman 1980) and a recent survey for special status plants at all three monuments (Huisinga 2000). A list of special status species that may occur or are likely to occur in the three monuments was developed for analysis in this EA. Table 9 contains this listing of special status species for the Flagstaff Area National Monuments, with notations on habitat preferences and occurrence or potential occurrence within FMUs.

**Table 9: Special Status Species**

Common Name	Scientific Name	Status	Location*	Habitat(s); Habitat Attributes	FMUs
<b>BIRDS:</b>					
Mexican spotted owl	<i>Strix occidentalis</i> ssp. <i>lucida</i>	ESA Threatened	WACA*	Nests within canyon and riparian corridor environments: Douglas fir-Gambel oak vegetation on steep slopes; pinyon-juniper-succulent-shrub on steep slopes; ponderosa pine on steep slopes; ponderosa pine-Gambel oak on level terrain.	WACA-FMU-2, WACA-FMU-4
Bald eagle	<i>Haliaeetus leucocephalus</i>	ESA Threatened	SUCR, WACA*	Winter residents and nesting at perennial lakes near Walnut Canyon; observed in-flight over Walnut Canyon and nearby Sunset Crater during winter months; not known to nests in either monument. Few observations in snags adjacent to roadways; may feed on carrion on roads; may perch or rarely roost in large ponderosa and Douglas fir snags in other locations.	WACA-FMU-2, WACA-FMU-4, SUCR-FMU-3, SUCR-FMU-4
Northern goshawk	<i>Accipiter gentilis</i>	USFWS SC	WACA*	Nests within ponderosa pine stands with larger diameter trees; may have mixed Gambel oak-pinyon-juniper midstory.	WACA-FMU-2, WACA-FMU-4
Burrowing owl	<i>Athene canicularia</i> ssp. <i>hypugaea</i>	USFWS SC	WUPA*	Gunnison's prairie dog towns in grasslands and mixed grass-shrublands; not confirmed in Wupatki.	WUPA-FMU-3
Ferruginous hawk	<i>Buteo regalis</i>	USFWS SC	WUPA	Observed in juniper savanna in close proximity to southern WUPA boundary.	WUPA-FMU-3
Peregrine falcon	<i>Falco peregrinus</i> ssp. <i>anatum</i>	USFWS Recovered	WACA*	Nest on cliffs and steep slopes in Walnut Canyon.	WACA-FMU-2, WACA-FMU-4
Golden eagle	<i>Aquila chrysaetos</i>	NPS SC	WUPA*, SUCR	Nests on bluffs and canyon walls; frequently observed in flight over grasslands, desert shrublands, juniper woodlands; riparian corridor.	WUPA-FMU-3, WUPA-FMU-4
<b>MAMMALS:</b>					
Wupatki pocket mouse	<i>Perognathus amplus</i> ssp. <i>cinerus</i>	USFWS SC	WUPA*	Desert shrub vegetation; Moenkopi Formation terrain within Little Colorado River Basin; rare occurrence records west of Doney Monocline	WUPA-FMU-4; rare in WUPA-FMU-3
American pronghorn	<i>Antilocapra americana</i>	NPS SC	WUPA*, SUCR*, WACA	All of WUPA; Bonito Park adjacent to SUCR; rare in open cinder terrain around SUCR boundary; Cosnino & Youngs Canyon Range Allotments adjacent to WACA.	WUPA-FMU-3, WUPA-FMU-4, SUCR-FMU-2

\* indicates that the species is known to occur in the monument; other species listed are not known to occur, but may occur in the monuments based on available habitat.

**Table 9: Special Status Species**

Common Name	Scientific Name	Status	Location*	Habitat(s); Habitat Attributes	FMUs
Spotted bat	<i>Euderma maculatum</i>	USFWS SC	WUPA*, SUCR, WACA*	Anabat detection records for WUPA and WACA; specific habitat attributes unknown. Potentially occurs at SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Greater Western mastiff bat	<i>Eumops perotis</i> ssp. <i>Californicus</i>	USFWS SC	WUPA, SUCR, WACA*	Anabat detection record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Allen's big eared bat	<i>Idionycteris phyllotus</i>	USFWS SC	WUPA, SUCR, WACA*	Anabat detection record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Western red bat	<i>Lasiurus blossevilli</i>	AZ WSC	WUPA, SUCR, WACA	Potentially occurs at any of the three monuments, but habitat use/habitat attributes unknown	Potentially all FMUs
Western small-footed myotis	<i>Myotis ciliolabrum</i>	USFWS SC	WUPA, SUCR, WACA	Potentially occurs at any of the three monuments, but habitat use/habitat attributes unknown	Potentially all FMUs
Long-eared myotis bat	<i>Myotis evotis</i>	USFWS SC	WUPA, SUCR, WACA*	Anabat detection record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Occult little brown bat	<i>Myotis lucifugus</i> ssp. <i>occultus</i>	USFWS SC	WUPA, SUCR, WACA*	Anabat detection record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Fringed myotis bat	<i>Myotis thysanodes</i>	USFWS SC	WUPA, SUCR, WACA*	Observation record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs
Cave myotis	<i>Myotis velifer</i>	USFWS SC	WUPA, SUCR, WACA	Potentially occurs at any of the three monuments, but habitat use/habitat attributes unknown.	Potentially all FMUs
Long-legged myotis	<i>Myotis volans</i>	USFWS SC	WUPA, SUCR, WACA*	Anabat detection record at WACA; specific habitat attributes unknown. Potentially occurs at WUPA and SUCR, but habitat use/habitat attributes unknown.	Potentially all FMUs

\* indicates that the species is known to occur in the monument; other species listed are not known to occur, but may occur in the monuments based on available habitat.

**Table 9: Special Status Species**

Common Name	Scientific Name	Status	Location*	Habitat(s); Habitat Attributes	FMUs
Big free-tailed bat	<i>Nyctinomops macrotis</i>	USFWS SC	WUPA, SUCR, WACA	Potentially occurs at any of the three monuments, but habitat use/habitat attributes unknown.	Potentially all FMUs
Townsend's big-eared bat	<i>Plecotus townsendii</i> spp. <i>pallescens</i>	USFWS SC	WUPA*, SUCR, WACA*	Winter and breeding use in limestone fracture system at WUPA; potentially occurs at SUCR, but habitat use/habitat attributes unknown; Anabat detection record at WACA but specific habitat attributes unknown.	Potentially all FMUs
<b>PLANTS:</b>					
Peeble's bluestar	<i>Amsonia peeblesii</i>	NPS SC	WUPA*	Shrubland and grassland habitats in a wide variety of substrates; threatened by overcollection. (X)	WUPA-FMU-3, WUPA-FMU-4
Beath milkvetch	<i>Astragalus beathii</i>	BLM Sensitive	WUPA	Potentially occurs at WUPA on seleniferous soils of Moenkopi Formation.	WUPA-FMU-4
Marble Canyon milkvetch	<i>Astagalus cremnophylax</i> var. <i>hevronii</i>	USFS Sensitive	WUPA	Potentially occurs at WUPA on Kaibab Limestone bedrock along Doney Monocline	WUPA-FMU-3, WUPA-FMU-4
Mogollon columbine	<i>Aquilegia desertorum</i>	AZ SR	WACA*	Limestone slopes, benches, outcrops throughout the monument (X)	WACA-FMU-1, WACA-FMU-2, WACA-FMU-4
Arizona bugbane	<i>Cimicifuga arizonica</i>	USFWS SC	WACA	Marginal potential to occur in seasonally moist, shaded, deep soil terraces along riparian corridor. Not found during several field surveys.	WACA-FMU-4
Cameron water parsley	<i>Cymopterus megacephalus</i>	USFWS SC	WUPA	Historic occurrence record at WUPA on seleniferous shale outcrops of Moenkopi Formation	WUPA-FMU-4
Dogbane	<i>Erigeron saxatilis</i>	USFS Sensitive	WACA*	Several population records on Coconino Sandstone slickrock in rock crevices and ledges along the canyon riparian corridor.	WACA-FMU-4
Roundleaf errazurizia	<i>Errazurizia rotundata</i>	BLM Sensitive	WUPA	Historic occurrence record along intermittent drainage system through Moenkopi Formation outcrops.	WUPA-FMU-4
Flagstaff pennyroyal	<i>Hedeoma diffusum</i>	USFS Sensitive	WACA	Shallow soil of exposed Kaibab Limestone pavement, cliffs, and outcrops in ponderosa pine-dominated vegetation; has been documented near monument boundary. (X)	WACA-FMU-1, WACA-FMU-2, WACA-FMU-4
Fickeisen plains cactus/ Fickeisen pincushion cactus	<i>Pediocactus peeblesianus</i> var. <i>fickeiseniae</i>	ESA Candidate	WUPA	No record at WUPA, but a considerable area of good habitat occurs - shallow limestone gravels over limestone bedrock.	WUPA-FMU-3, WUPA-FMU-4

\* indicates that the species is known to occur in the monument; other species listed are not known to occur, but may occur in the monuments based on available habitat.

Table 9: Special Status Species					
Common Name	Scientific Name	Status	Location*	Habitat(s); Habitat Attributes	FMUs
Simpson plains cactus	<i>Pediocactus simpsonii</i>	AZ SR	WUPA*	Historic occurrence records at WUPA in limestone ledge and grassland. (X)	WUPA-FMU-3
Sunset Crater penstemon	<i>Penstemon clutei</i>	USFWS SC	SUCR*	Sparsely vegetated and volcanic cinder terrain; thrives after wildfire and severe ground disturbance; numerous locations known. (X)	SUCR-FMU-1, SUCR-FMU-3, SUCR-FMU-4
Cinder phacelia	<i>Phacelia serrata</i>	USFWS SC	SUCR*, WUPA	Ephemeral annual on sparsely vegetated and volcanic cinder terrain; numerous locations known.	SUCR-FMU-1, SUCR-FMU-3, SUCR-FMU-4, WUPA-FMU-3, WUPA-FMU-4
Welsh's ladies tresses	<i>Phacelia welshii</i>	USFWS SC	WUPA	Ephemeral annual on sparsely vegetated Moenkopi Formation outcrops and volcanic cinder terrain.	WUPA-FMU-3, WUPA-FMU-4
Common reed	<i>Phragmites australis</i>	NPS SC	WUPA*	Growing in saturated soil near seeps; one location known; threatened by overcollection.	WUPA-FMU-4
Whiting's indigo bush	<i>Psoralea thompsoniae</i> var. <i>whitingii</i>	USFWS SC	WUPA	Sandy and gravelly slopes and intermittent drainages in the Wupatki Basin.	WUPA-FMU-3

\* indicates that the species is known to occur in the monument; other species listed are not known to occur, but may occur in the monuments based on available habitat.

(X) – For plants, indicates fire prone habitat.

ESA Threatened – federally listed as “Threatened” under the Endangered Species Act

ESA Candidate – candidate species for listing as “Threatened” under the Endangered Species Act

USFWS Recovered – recently moved from the Endangered Species List and currently in the post-delisting monitoring period

USFWS SC – identified by the U.S. Fish & wildlife Service as a “species of concern”

AZ WSC – “wildlife species of concern” identified by the Arizona Game & Fish Department

AZ SR – listed under the Arizona Native Plant Law as “Salvage restricted”

BLM Sensitive – identified in Bureau of Land Management planning documents as a “sensitive species”

USFS Sensitive – identified in USDA Forest Service planning documents as a “sensitive species”

NPS SC – identified in the recent GMPs for WUPA, SUCR, and WACA as a “species of special management concern”

### ***Affected Environment—Special Status Species:***

#### ***Federally Listed Species***

##### **Mexican Spotted Owl**

The Mexican spotted owl (MSO, *Strix occidentalis lucida*), a federally listed threatened species, (USDI USFWS 1993) nests and roosts within Walnut Canyon National Monument. MSOs require high canopy closure and at least some old growth stands. The primary threat leading to its listing as a threatened species is alteration of habitat. Catastrophic wildland fire is listed as a main cause of continued habitat loss. To reduce this risk, the MSO Recovery Plan (USDI USFWS 1995) calls for the use of fire to reduce fuels in areas adjoining nest and roost sites without jeopardizing the sites. Within Walnut Canyon National Monument, portions of 4 MSO Protected Activity Centers (PACs) have been established based on historic and recent owl locations, vegetation, and topography. Suitable MSO habitat occurs mostly within WACA-FMU-4, but some habitat also occurs within WACA-FMU-2 and WACA-FMU-1. In 2004, all of Walnut Canyon National Monument and the surrounding area within the Coconino National Forest was designated as MSO critical habitat.

## **Bald Eagle**

Bald eagles (*Haliaeetus leucocephalus*) are winter residents and breeding birds within the region surrounding Walnut Canyon and have been observed in flight over Sunset Crater during the winter months. There are at least nine winter roosting or “significant perching” areas located south of the monuments around Upper Lake Mary, Lower Lake Mary, Mormon Lake, and other smaller lakes on Anderson Mesa. A small number of breeding pairs may also nest around the larger of these lakes. The closest potentially suitable aquatic habitat is two miles south at Marshall Lake. There are no suitable aquatic feeding habitats or significant perch areas within the monuments, and bald eagles would not be expected to nest here. Bald eagles frequently fly over Walnut Canyon from October through April. Bald eagles may occasionally perch in the monument, may feed on carrion along the entrance road corridor, and have been observed at least once feeding on a game carcass left on adjacent lands. Critical Habitat has not been formally designated within or nearby the monument.

## ***Other Special Status Species- Animals***

### **Birds**

#### **Peregrine Falcon**

Peregrine falcons (*Falco peregrinus anatum*) were removed from protected status as threatened in 1999, and their status is currently being monitored in Arizona to ensure the population is stable or increasing (USFWS 1999). This large falcon is primarily a hunter of small- to medium-sized birds. The most important habitat characteristic of this species is the presence of tall cliffs. Peregrines nest in crevices, in small caves, or on ledges that are relatively inaccessible to mammalian predators and protected from extreme weather conditions. Peregrines previously have nested in two locations in Walnut Canyon National Monument. Peregrines may be exposed to heat and smoke from fires during the nesting season.

#### **Northern Goshawk**

The northern goshawk (*Accipiter gentilis atricapillus*) is known to nest at Walnut Canyon National Monument. It is the largest North American member of the genus *Accipiter*. Although federal listing of the goshawk was determined “not warranted” by the USFWS (1998), it remains a species of public concern. Suitable nest sites include “old growth” ponderosa pine forest characterized by large diameter trees and relatively closed canopy cover. Prescribed burning is listed as a management recommendation for protecting and maintaining desired conditions for goshawks and their prey (USDA 1992).

#### **Burrowing Owl**

One observation of a burrowing owl (*Athene canucucularia ssp. hypugaea*) was recently documented at Wupatki National Monument. The burrowing owl inhabits mammal burrows and is primarily associated with prairie dog towns. Although prairie dogs occur within Wupatki National Monument, the population is small and there are not extensive burrow complexes. Burrowing owls likely utilize surrounding lands and occasionally fly into the monument.

## **Ferruginous Hawk**

The ferruginous hawk (*Buteo regalis*) inhabits open grassland surrounding Wupatki National Monument, but has not been observed nesting within the monument.

## **Golden Eagle**

Golden eagles (*Aquila chrysaetos*) are considered an NPS species of special management concern in Wupatki National Monument based on public and agency scoping process. Golden eagles have historically nested within Wupatki, though no nesting pairs were discovered during recent surveys (Britten 1999; Drost 2000). The best nesting habitat, as evidenced by old nests, is in the Citadel Sink, Doney Mountain, and Doney Anticline areas. In the past, public visitation, especially to the Citadel Pueblo area, may have interfered with breeding eagles. They are known to be sensitive to human presence. If disturbed by noise or movements, adult birds may fail to use a nest site or temporarily abandon their eggs or chicks, which expose them to undue cold temperatures and/or predators. Some biologists recommend establishing a 1/4- to 2-mile-diameter buffer zone around nests. Accordingly, park managers recently decided to close the Citadel Pueblo to visitors during the breeding season.

## **Mammals**

### **Wupatki Pocket Mouse**

The Wupatki pocket mouse is primarily documented in desert shrub vegetation within Wupatki National Monument, mainly within the Moenkopi Formation terrain in the Little Colorado River basin. There are also a few records of Wupatki pocket mouse occurring in patches of shrubs in the grasslands and juniper woodlands in the western half of the monument. Very little is known about the distribution or status of the subspecies, which inhabits subsurface burrows.

### **American Pronghorn**

Although not formally listed as a species of concern, the pronghorn antelope (*Antilocapra americana*) herd within all three monuments was identified as an NPS management issue during the public and agency scoping process for the GMPs. The pronghorn population has declined in the region during the last few decades (Bright and Van Riper III 2000). The species is being affected by regional habitat fragmentation and loss, including loss of open grassland habitat as juniper and other woody vegetation invade open areas. Perennial water sources are scarce, and the animals must move back and forth to water on adjacent lands. Existing roads within the monuments are not fenced, and from time to time animals are killed by automobiles.

## **Bats**

As many as twelve species of bats are considered species of concern within Coconino County, Arizona. Eleven are USFWS species of concern; one (the Western red bat) is an Arizona wildlife species of concern. Table 9 lists all 12 species that could occur in any of the three monuments. During recent bat surveys using mist-nets and anabat detection equipment at the Walnut Canyon sewage lagoon (Drost in prep.), seven of the twelve bat species of concern were documented; two of these were also documented using similar techniques at Wupatki. Although the NPS now has better information on the presence/absence of bat species, information on the distribution, phenology, abundance, and habitat utilization is still lacking. However, the fractured and eroded

limestone and sandstone ledges and walls of Walnut Canyon, the fractures and lava tubes in Sunset Crater, tree cavities in ponderosa pine trees, and buildings and structures in all the monuments likely provide ample bat habitat. Regardless of whether any of the sensitive bat species are residents or only present seasonally, they likely occur within the monuments in low densities.

***Other Special Status Species- Plants***

There are no federally listed plant species found in any of the monuments. However, there are 16 species that are either USFWS species of concern, Arizona “salvage-restricted” species, or NPS species of special management concern. Table 9 provides known habitat and occurrence information for all 16 species. As noted in the table, most of these species are found in areas that are not particularly prone to fire: on limestone and sandstone bedrock, on limestone or shale outcrops, on gravel and sandy soils, on slickrock, in cinder terrain, or in wet soils near seeps and drainages. Two of the 16 (Peeble’s bluestar and Simpson plains cactus) have been documented in grasslands or shrubland habitats within Wupatki, and these areas could be subject to surface burns. One (Flagstaff pennyroyal) could occur in ponderosa-pine dominated vegetation in Walnut Canyon, but has not been found within the monument. The desert columbine occurs in several populations in fire-prone habitat in smaller tributary canyons in Walnut Canyon National Monument. Some populations of Sunset Crater penstemon also occur in ponderosa pine dominated vegetation within Sunset Crater Volcano National Monument.

*Methodology:* The following threshold and duration criteria are identified for special status species.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Special Status Species</b>	Listed species would not be affected or change would be so small as to not be of any measurable or perceptible consequence to the individual or its population.	There would be an effect on one or more individuals of a listed species or its habitat, but change would be small.	A noticeable, measurable effect to an individual or population of a listed species would occur.	Noticeable, measurable effect with severe consequences or exceptional benefit to the population or habitat of a listed species would occur. Special status species populations may have large changes with population numbers significantly increased or depressed. In extreme adverse cases, species may be at risk of being extirpated locally, key eco-system processes like nutrient cycling disrupted, or habitat for any species rendered nonfunctional.	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.

*Regulations and Policies:* Current laws and policies require that the following condition be achieved for special status species, in the Flagstaff Area National Monuments.

<b>Desired Condition</b>	<b>Source</b>
Federal- and state-listed threatened and endangered species and their habitats are sustained.	Endangered Species Act; NPS Management Policies
Populations of native plant and animal species function in as natural condition as possible except where special management considerations are warranted [areas with special management considerations will be determined through management zoning decisions in the GMP].	Monuments' enabling legislation; NPS Management Policies
The Service will strive to restore extirpated native plant and animal species to parks when specific criteria are met.	Monuments' enabling legislation; NPS Management Policies
Management of populations of exotic plant and animal species, up to and including eradication, will be undertaken wherever such species threaten park resources or public health and when control is prudent and feasible.	NPS Management Policies; Executive Order 13112, Invasive Species

### ***Impacts of Alternative A – No Action***

#### ***Impact Analysis:***

#### ***Federally Listed Species***

##### **Mexican Spotted Owl**

Under Alternative A, there is a greater potential for more extreme wildfires to affect MSO habitat, since fuels would continue to build up over time. At Walnut Canyon National Monument, there are as many as four MSO breeding territories. MSO “Protected Activity Centers” (PACs). The PACs encompass 1,520 acres, and there are 262 additional acres of viable MSO habitat outside of the PACs, consisting of riparian, Douglas fir-Gambel oak, and ponderosa pine-Gambel oak vegetation (USDI 1995). More intense crown fires in and adjacent to MSO habitat may reduce total canopy cover and consume large trees and snags that are important for nesting, roosting, or perching sites. In addition, MSO nestlings would be exposed to smoke until fires could be extinguished, which would cause respiratory system stress or possibly even damage under prolonged exposure to high levels or certain weather conditions. Adult MSO could flee in advance of a wildfire and return to the area later, but nesting activity could be impacted, especially since nesting season overlaps with the time of year when wildfires are more frequent and more intense.

Suppression activities could also affect MSO and their habitat. Presence of firefighters, line construction, base camp activities, and use of equipment could disturb owls and locally alter habitat conditions. Aircraft use during extended fire-fighting efforts on a large fire could disrupt nesting owls if flights are too close or cause excessive noise within breeding territories. Retardant drops on MSO habitat could injure or kill MSO, or damage nest sites or tree stands around nesting areas. Based upon past fire history and given that fires would be rapidly suppressed, direct, adverse impacts could range from minor to moderate, but would be relatively short-term and localized.

Indirect impacts from suppression could include introduction and spread of invasive plants, loss of soil and erosion on steep slopes, and sedimentation in riparian areas, which could alter prey habitat conditions and reduce prey species populations. Based upon past fire history and given that fires would be rapidly suppressed, impacts could range from localized, short-term to more widespread and more persistent minor adverse impacts.

Overall, adverse impacts to MSO under Alternative A would be expected to be short-term and minor to possibly moderate if larger wildland fires were to occur near owl territories. Mitigation measures to limit impacts during suppression and mitigation specifically directed at protection of the owl (see Appendix B) would be used and would help limit adverse effects to the species.

### **Bald Eagle**

This species does not nest in any of the monuments and only overwintering birds are occasionally seen in flight near Walnut Canyon and Sunset Crater. There are no regularly used perch sites, and only single birds are occasionally seen perching within Walnut Canyon National Monument. Wildfire rarely occurs between November and April. Also, bald eagles can readily vacate any area affected by wildland fire. Therefore, adverse impacts of Alternative A would be indirect, negligible to minor, short-term, and localized.

### ***Other Special Status Species – Animals***

#### **Birds**

#### **Peregrine Falcon/Northern Goshawk**

Both of these raptors occur and breed within Walnut Canyon (WACA-FMU-2 and WACA-FMU-4). Under Alternative A, the increased potential for severe or crown fire would continue, and any fire that would occur as fuels continue to build up could adversely affect these species. Fire could cause direct loss of nest trees for the goshawk; peregrine nesting habitats in cliffs would not be directly affected. Any falcons or goshawks nesting in or near areas subject to a typical, localized wildfire would vacate the affected area and return later. Nestlings would be exposed to smoke until fires could be extinguished, which would cause respiratory system stress or possibly even damage under prolonged exposure to high levels or certain weather conditions. A large wildfire could extensively alter goshawk habitat conditions, or could cause a single season nest failure if it occurred during breeding season. Any fires that would occur in nesting habitats would result in short-term minor or moderate impacts on individuals from smoke and disturbance, but these impacts would not cause widespread effects on the species. Indirect impacts would include short-term reductions in prey species in burned areas, as well as noise and ground/vegetation disturbance from fire-fighting activities; these impacts would be short-term, minor and localized. Fire could also result in some beneficial effects (creation of increased prey habitat) as herbaceous and/or shrub cover returns to burned areas over time. Based upon past fire history and given that fires would be rapidly suppressed, impacts to these two raptors under Alternative A would be adverse, short-term, minor, and localized.

#### **Ferruginous Hawk, Golden Eagle**

These two raptors are known to occur mainly near Wupatki National Monument and have been observed in flight over grasslands and desert shrubland vegetation. The golden eagle may also hunt or perch at Sunset Crater. No nesting occurs in any of the monuments. Smoke and aircraft use during fire events could adversely affect these birds indirectly, although most individuals would vacate the affected area and return later. If nests occur downwind during wildfires, nestlings would be exposed to smoke until fires could be extinguished, which would cause respiratory system stress or possibly even damage under prolonged exposure to high levels or certain weather conditions. Wildfires could improve habitat conditions for prey species in the long-term as

herbaceous cover returns following fires. Overall, impacts to both of these raptors under Alternative A would be adverse, short-term, negligible to minor, and localized.

### **Burrowing Owl**

Individuals of this species occur within and nearby Wupatki in WUPA-FMU-3. If burrowing owls are present, they could experience minor short-term adverse impacts from smoke exposure if medium-scale fires occur over the grasslands. Indirect impacts would include reduced prey abundance in burned areas, and perhaps increased exposure to predators. Adverse impacts to the burrowing owl under Alternative A would be negligible to minor. Over the long-term, burrowing owls would likely benefit after wildfires as grassland vegetation regenerates more vigorously and prey abundance increases.

### **Mammals**

#### **Wupatki Pocket Mouse**

Under Alternative A, the chance of severe fire occurring in WUPA-FMU-4, where most of the Wupatki pocket mice would be expected, is low, given the sparseness of vegetation and expected fire regime. However, burrowing animals such as the Wupatki pocket mouse would not likely be impacted if fires would occur, since they stay in their burrows during wildland fires. Although there is some potential for asphyxiation with a long duration fire, the probability of this occurring would be very low in shrubland or grassland dominated vegetation. Direct impacts may also include disturbance of burrows during fire suppression. Indirect effects include potential loss of plant forage and greater exposure to predators. As plant communities rebound from fire, a beneficial indirect effect may be increased amounts and diversity of available forage. Both direct and indirect impacts of wildland fire and fire suppression would be adverse, negligible, localized, short-term to long-term, with potentially long-term minor to moderate beneficial impacts.

#### **American Pronghorn**

Impacts to the American pronghorn would be minor and mostly indirect from any fires under Alternative A in any FMU. As ungulates are rarely killed in wildland fires, the pronghorn would likely escape any fire with relative ease. Most of the boundary fence around the western half of Wupatki National Monument (WUPA-FMU-3) has been modified to allow pronghorn to more easily cross, so animals would not likely be trapped by fencing. Habitat for the pronghorn would likely be moderately and adversely affected locally by high severity fire in the short-term from loss of forage and cover. However, as herbaceous recovery would occur with adequate precipitation over time, long-term impacts would likely be beneficial. Juniper mortality from wildfires would provide more open habitat conditions which would also be beneficial over the long-term.

#### **Bats (12 species)**

If wildland fires were to occur under Alternative A, bats could be directly and adversely impacted if young were present in the cavities, e.g., in WACA-FMU-4, SUCR-FMU-3, WACA-FMU-2. However, direct impacts on the bat species are very unlikely given their mobility. Indirect impacts may include modification of local hunting habitats and loss of trees or snags with roosting cavities, but their mobility would offset these effects on all but the largest of fires. Also, those indirect impacts would dissipate with regeneration of the vegetation communities. The direct and indirect

adverse impacts of fire and fire suppression on bats would be localized, negligible to minor, and short-term.

### ***Other Special Status Species – Plants***

Only 5 of the 16 special status plants are expected or known to occur within habitats that could be affected by fire; the remainder would be expected to incur negligible adverse effects from fire under Alternative A, based on the lack of fire/fuels in their preferred locations and the expected lack of fire. Of the 5 species that do occur in fire-prone habitats, two are known from grassland habitats within Wupatki (Simpson plains cactus and Peeble's bluestar). Fire in Wupatki under Alternative A would likely be continued medium-scale wildfire events (WUPA-FMU-3) or little fire at all (WUPA-FMU-4). Although some individual plants could be adversely affected by scorching or consumption of above-ground plant parts, it is unlikely that these fires, which would be immediately suppressed, would result in more than a short-term, minor, localized effect on these species. Although Simpson plains cactus is very difficult to survey for and distribution information is lacking, it may only occur in localized populations with small numbers of plants. It may be more vulnerable to wildfires, in which case Alternative A could result in long-term, moderate adverse impacts.

Of the 5 species that do occur in fire-prone habitats, one (desert columbine) is known to occur, and another (Flagstaff pennyroyal) potentially occurs, in ponderosa pine dominated vegetation within Walnut Canyon National Monument. Both of these species could be adversely affected by more severe wildland fire within ponderosa-dominated vegetation in WACA-FMU-1 or WACA-FMU 2. Direct impacts would include burning of aboveground and possibly subsurface plant parts, and would be dependent on the severity of the fire. Both species may be fire-adapted to some degree, but moderate adverse effects could occur from higher severity fires that could occur over the long-term under Alternative A. Suppression operations may also result in plant damage and mortality, although MIST (Appendix B) would be employed and special measures taken to limit impacts from ground disturbance to known populations.

The last species found in fire-prone habitat is the Sunset Crater penstemon, which occurs in ponderosa pine-dominated vegetation within Sunset Crater Volcano National Monument. This species could be adversely affected by more severe wildland fire within ponderosa-dominated vegetation in WACA-FMU-1 or WACA-FMU 2. Direct impacts would include burning of aboveground and possibly subsurface plant parts, and would be dependent on the severity of the fire. The species is likely adapted to moderately severe fire (Fulé et al. 2001), but moderate adverse effects could occur from higher severity fires that could occur over the long-term under Alternative A. Suppression operations may also result in plant damage and mortality, although MIST (Appendix B) would be employed and special measures taken to limit impacts from ground disturbance to known populations.

*Cumulative Impacts:* Cumulative impacts to listed species of special concern include the actions under Alternative A, plus disturbances from past fires in and outside the park. Suppression of fire in these areas over the years has led to conditions of high fuel build-up where state-listed or sensitive species could be affected, but the more proactive fuels reduction now occurring on public and neighboring lands are decreasing this potential adverse impact. Other impacts to species of special concern include hunting, park and regional development, and disturbance from monument visitors. Beneficial cumulative impacts have occurred from the protective measures

taken by the park and other surrounding land management agencies to identify and protect habitats. Overall, impacts of actions under Alternative A, combined with impacts of other actions that could affect these species, would result in minor to moderate, adverse, cumulative impacts limited to certain areas.

*Conclusion:* The direct and indirect impacts of Alternative A (No Action) from wildland fire and/or suppression operations on as many as 11 of the 16 special status plant species across all FMUs would be negligible to adverse, minor, localized, and short-term to long-term. Five of the 16 species which occur fire-prone habitats could experience potential localized minor to moderate adverse impacts, short-term to long-term, with some potentially beneficial effects to species that thrive after fire.

Impacts to special status wildlife species in all FMUs would be adverse and range from negligible to moderate intensity, of short- and long-term duration, and localized. Impacts would vary by the level of fire severity and degree of disturbance from suppression operations. Impacts to federally listed species include minor to potentially moderate short-term and localized adverse impacts to the Mexican spotted owl, and negligible to minor, short-term, localized adverse impacts to the bald eagle. Cumulative impacts related to all special status species would be minor to moderate and adverse, and limited to certain areas.

Alternative A would not produce any major adverse impacts or impairment to special status species whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

#### *Impact Analysis:*

#### ***Federally Listed Species***

##### **Mexican Spotted Owl**

Under Alternative B, the risk of severe fire in MSO habitat and PACs (1,782 acres, primarily within WACA-FMU-4 and partly within WACA-FMU-2) would be much reduced from that of Alternative A at the landscape level over the life of the FMP by restoring vegetation structure and reducing crown fire risk within ponderosa-dominated stands that surround key MSO habitat. This would be accomplished through proactive manual thinning to protect sensitive areas and to reduce crown fire risk, plus the follow-on prescribed burning program within WACA-FMU-2. This would indirectly reduce the risk of severe fire within the MSO core nesting and PAC areas, and additional viable MSO habitat outside the PACs (Douglas fir-Gambel oak vegetation on step slopes, riparian vegetation, and mixed ponderosa-Gambel oak vegetation) In addition, up to 423 acres of ponderosa pine and pinyon-juniper dominated vegetation on level terrain that occur within PACs would be manually treated to restore vegetation structure and fire disturbance along with the remainder of WACA-FMU-2.

Alternative B could result in some short-term, adverse impacts to breeding owls or adversely affect other critical attributes in viable MSO habitat if manual thinning or prescribed burns are implemented near owl nesting sites. However, specific mitigation measures would be in place

during any fuel treatments and during suppression under AMR (if needed). In addition, MSO nestlings would be exposed to smoke if prescribed fires were implemented during the breeding season, which could cause respiratory system stress or possibly even damage under prolonged exposure to high levels or certain weather conditions. Appendix B lists the specific mitigation measures to minimize impacts to MSO, including: leaving large diameter trees, snags, logs, and cavity-bearing trees in place; retaining adequate amounts of woody debris to leave habitat for small mammal species; using only manual thinning around certain sensitive areas; limiting use of fire aircraft near owl territories during the breeding season; and limiting use of certain equipment within MSO PACs and restricted habitat. There are also prohibitions on prescribed burning during breeding season until vegetation and fuel levels are sufficiently reduced to ensure smoke is primarily generated from burning understory herbaceous vegetation. Prescribed fires would be limited to a total of 1 to 3 days per year to minimize smoke exposure. In addition, the NPS would consult with the USFWS under Section 7 of the Endangered Species Act on the 10-year implementation plan (Appendix A) to evaluate potential effects and establish specific conservation measures to protect MSO. With the implementation of these measures, Alternative B would result in short-term, negligible to minor adverse impacts to MSO.

If these treatments are conducted in the general vicinity of foraging habitat, there could be minor adverse, short-term, indirect impacts, but the eventual increase in grasses and forbs that support the owl's prey base of mice, vole, and other small rodents would result in a beneficial effect. There would also be a moderate beneficial impact due to the reduction of wildland fire threat to improved habitat over time.

### **Bald Eagle**

Adverse impacts under Alternative B would be similar to those described for Alternative A (negligible to minor, adverse) since the bald eagle does not nest in the monuments and has only occasionally been observed using day perches during late Fall to early Spring months within Walnut Canyon National Monument. Prescribed fire, manual thinning, and suppression under AMR should not directly adversely impact the species, since it can easily vacate any affected areas and use nearby areas for feeding, perching, and nesting. Large snags would be retained during manual vegetation thinning and protected from fire to ensure ample perches remain available. Smoke may cause indirect negligible effects, and there would be less risk of widespread smoke from severe fire under Alternative B.

## *Other Special Status Species – Animals*

### *Birds*

#### **Peregrine Falcon/Northern Goshawk**

Under Alternative B, habitat for these two species within WACA-FMU-2 and WACA-FMU-4 could be subject to manual vegetation thinning/fuel reduction treatments and prescribed burning, along with AMR for wildfire suppression. Impacts from fire suppression would be similar to Alternative A, but over time there would be a reduced chance of extensive wildland fire that could significantly alter important habitat attributes and cause smoke and noise-related impacts. Given the fire history within the monument, wildfire suppression activities would likely have short-term minor adverse impacts in localized areas of habitat, and could adversely impact a few individuals of either of these two species. The proposed mitigation (Appendix B) would limit adverse impacts from suppression, manual thinning, and prescribed fires. Treatments would be scheduled to avoid work in proximity to northern goshawk and peregrine falcon nesting sites during their respective nesting seasons. Measures would also be taken to protect large diameter trees from wildfire and prescribed fire, and nest buffers would be observed. For the falcon, treatments would be restricted above cliffs occupied during the breeding and brood-rearing season. Long-term beneficial impacts would occur in localized treatment areas from the creation of more diverse prey habitat conditions within the wooded environment.

#### **Ferruginous Hawk, Golden Eagle**

Under Alternative B, a limited area of WUPA-FMU-3 (up to 280 acres) could undergo manual thinning if needed to protect archeological sites and adjacent private property improvements, but fire risk and vegetation conditions would remain similar to Alternative A in most of WUPA-FMU-3 and WUPA-FMU-4. The treatments would favor more open grassland habitat over heavy juniper cover in these areas, which would have long-term, negligible to minor beneficial impacts on habitat for these two species. The ability to use a wide variety of less intrusive suppression techniques under AMR would reduce suppression impacts to prey habitat and to individual birds. Smoke and suppression activities could still cause indirect, minor adverse impacts, but it is expected that birds would vacate affected areas and return later (neither nests in the monument). The surface burns that could occur on the grasslands of Wupatki would benefit both species as herbaceous cover (prey habitat) would return following fires. Overall, impacts to these two birds would be short-term, negligible to minor, adverse and localized, with minor long-term benefits from the increase in prey habitat.

#### **Burrowing Owl**

Impacts to burrowing owls under Alternative B would be similar to Alternative A, except AMR suppression of medium-scale wildfires expected in WACA-FMU-3 would have negligible to minor indirect adverse impacts from temporary loss of forage and exposure to predators. However, there would be a long-term benefit due to the maintenance or creation of habitat that supports its prey (insects). Proposed manual thinning of up to 280 acres of juniper cover to protect archeological sites and adjacent private property improvements would likely have negligible impacts to this species.

## Mammals

### **Wupatki Pocket Mouse**

Impacts to the mouse under Alternative B would be very similar to Alternative A, since the fire risk and the medium-scale fires expected to occur in Wupatki are the same, particularly in WUPA-FMU-4. More limited suppression under Alternative B would serve to limit direct adverse impacts of fire line construction on mouse habitat. Also, since burrowing mice tend to sleep during hot, dry periods when woodland fire usually occurs, the limited manual thinning planned for certain sensitive sites in WUPA-FMU-3 would have little direct adverse impact. Because the species may occur in very low densities in the fire-prone grasslands of WUPA-FMU-3, fire would have long-term negligible to minor beneficial impacts related to the increased amounts and diversity of forage, and populations of the mouse could increase when fire is followed by favorable precipitation the next growing season.

### **American Pronghorn**

Similar to Alternative A, pronghorn would avoid any direct adverse impacts from fires under Alternative B through direct escape. Habitat would be adversely affected in the short-term, but prescribed burns could have minor, short-term effects on grasslands and create more areas of open, herbaceous vegetation that could support more pronghorn. As herbaceous recovery occurs with adequate precipitation over time, minor to moderate benefits would occur.

### **Bats**

Impacts to the 15 species of bats that could occur within any of the three monuments would be similar to Alternative A, but with a reduced possibility of severe wildland fire and habitat destruction from fire and/or aggressive suppression. Bats would not experience direct adverse impacts from treatments planned under Alternative B, since efforts would be made to protect large trees, which are the most likely roosting sites. Bats are also very mobile and would be expected to flee as manual vegetation thinning work progressed. Fuel treatments would not be conducted in or immediately adjacent to known bat roosts or colonies. Indirect adverse impacts would include a temporary displacement from roosts and hunting habitats. Therefore, adverse impacts to bats would be short-term, negligible to minor, and localized.

### ***Other Special Status Species – Plants***

Five of the 16 plants listed in Table 9 could experience some impacts from wildland fires under Alternative B, similar to that expected for Alternative A. Prescribed fire treatments are not proposed within Wupatki, and any treatments within WACA-FMU-2 and SUCR-FMU-2 would be preceded by a survey for rare plants, including the Mogollon columbine, Flagstaff pennyroyal, and Sunset Crater penstemon. Mitigation at all times would include identifying and isolating groups of plants prior to prescribed fire or manual treatments, limiting adverse effects of Alternative B to negligible to minor, short-term, and localized. In addition, columbine, pennyroyal, and penstemon may all actually benefit from cool burns. Minor to moderate localized long-term benefits would be expected as fire severity potential is reduced throughout the monuments.

*Cumulative Effects:* Cumulative impacts to special status species would be similar to those described for Alternative A, but with beneficial effects relating to the return of natural structure and function in monument ecosystems. Overall, impacts of actions under Alternative B, combined with actions of others that could affect special status species, would result in minor to moderate, adverse cumulative impacts, limited to close proximity around NPS facilities and visitor use areas.

*Conclusion:* Under Alternative B (Preferred Alternative), impacts would be similar to Alternative A under expected wildland fire conditions for all special status species. For special status plants across all FMUs, direct impacts may be adverse and minor locally in the short-term; long-term impacts locally would range from negligible to beneficial, and vary from minor to moderate as objectives are met under a proposed treatment schedule. For special status animals and habitats, adverse impacts from Alternative B would be negligible to minor, direct and indirect, short-term and long-term, and localized. Impacts on the federally listed Mexican spotted owl would include negligible to minor adverse impacts, with beneficial, indirect, long-term, and moderate impacts on MSO habitat as the threat of severe wildfires is reduced along the Walnut Canyon rim terraces and upwind of the MSO PACs. Impacts to the bald eagle would be adverse, short-term, negligible to minor, and localized. Cumulative impacts related to all special status species would be minor to moderate and adverse, and limited to close proximity around NPS facilities and visitor use areas.

Alternative B would not produce any major adverse impacts or impairment of special status species whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

## **WATER RESOURCES, WETLANDS, AND RIPARIAN AREAS**

### ***Affected Environment***

Wetland, floodplain, and riparian resources within Walnut Canyon National Monument are restricted to the narrow canyon bottom and a number of perennial seeps found in the tributary canyons on the south side of the monument. The floor of Walnut Canyon within the monument harbors approximately 80 acres of well-developed riparian vegetation, which is locally dominated by stands of Arizona walnut and cottonwood trees. Box elder, New Mexico locust, Arizona wild rose, and red osier dogwood are also common. The riparian plant community is very rich in shrub, wildflower, vine, and a few obligate wetland species. In the narrow reaches of the drainage, water catchment basins are scoured into Coconino Sandstone bedrock. These are filled seasonally by local snowmelt and rainfall, and provide important water sources for wildlife. In addition, numerous localized seeps have been recorded in the fractures and bedding planes of the steep canyon walls. Prominent seeps are also found in the tributary canyons on the south side of the monument. Wetlands that meet U.S. Corps of Engineers jurisdictional criteria under Section 404 of the Clean Water Act are likely restricted to the narrow canyon drainage and perennial seeps.

The Walnut Canyon watershed drains an area of approximately 170 square miles. The headwaters of Walnut Creek are found in the Mormon Mountain-Mormon Lake area more than 20 miles south of the monument. Prior to 1900, the creek is believed to have intermittently

flowed through the bottom of Walnut Canyon on a biannual cycle. Reliable flows typically occurred early each year during the period of spring snowmelt, and less predictable flows likely occurred later each year during the summer and fall thunderstorm season. The natural hydrology within the Walnut Canyon drainage was severely altered when the town of Flagstaff began impounding Walnut Creek for use as its public water supply. Around 1900, the first dam was built upstream of the monument to create Upper Lake Mary. The dam significantly disrupted seasonal water flow through the canyon. A second dam was built in 1941 to create Lower Lake Mary, at which time Walnut Creek ceased flowing. Since 1941, the canyon has flooded only three times during extreme storm events that completely filled both lakes. Flows of lesser magnitude occur about once a decade from smaller tributary watersheds below the lakes.

The impoundment and diversion of Walnut Creek for the last 60 years has greatly impacted the wetland, floodplain, and riparian resources within the monument. The processes of stream channel scouring, sediment transport, terrace formation, and local spring and seep recharge have been altered, and riparian vegetation is also changing in the absence of seasonal flows. Historic photographs from the 1940s show a well-defined stream channel along the canyon bottom. Today, the channel is obscured by vegetation. True riparian species, including the Arizona walnut for which the canyon is named, are believed to be decreasing in number, and New Mexico locust now dominates the former open drainage channel. Local wildlife populations have probably already adapted to less reliable surface water. Aquatic invertebrates and amphibians were likely impacted the most. The NPS believes that the riparian system is still changing in response to dewatering of the drainage, and long-term trends have yet to be assessed.

Another relatively small impoundment exists near the downstream end of the canyon within the monument. The Santa Fe Dam was built around 1885 to supply water to the Santa Fe Railway, and has locally impacted riparian resources. The former reservoir area is now almost entirely filled with sediment, and most local storm flows pass through the dam's spillway. The Walnut Creek stream channel and sediment plain behind the dam are dominated by both native and non-native weedy annual species, such as Russian thistle, cheatgrass, horehound, sweet clover, and field bindweed. The canyon floor area around the reservoir is seasonally utilized by wildlife for both browse and water.

The occurrence of shallow groundwater is expressed only via the aforementioned seeps within sedimentary rock fractures and bedding planes. It is believed that the seeps are recharged via local fractures and limestone "karst" erosion features in the watershed. The only reliable groundwater beneath the monument is found at a depth greater than 1,500 feet within the regional Coconino Aquifer. The NPS maintains a well into the aquifer to supply operations at the monument, and the water table has remained relatively stable.

Wupatki National Monument is largely included within the upland watershed that drains the east and northeast San Francisco Mountain slopes, including the San Francisco Volcanic Field. Wetland, floodplain, and riparian resources at Wupatki are restricted to the Little Colorado River banks and three perennial springs (one of which is presently dry). Approximately 1½ to 2 miles of the Little Colorado River flow intermittently along the monument's eastern boundary. Wetlands that meet U.S. Corps of Engineers jurisdictional criteria under Section 404 of the Clean Water Act are likely found only on the scoured cobble and stone riverbed, which is almost devoid of vegetation and may be dry for months at a time during an average year. Peshlaki

Spring and Heiser Spring have no measurable surface flow, and surface water is typically available only if a shallow basin is dug and maintained. Above Peshlaki Spring, common reed (*Phragmites communis*) communities grow over approximately 750 square feet. This is the only obligate wetland plant species recorded within Wupatki. Although extremely limited in area, Peshlaki Spring may also meet jurisdictional wetland criteria.

The Little Colorado River floodplain is very distinct, and supports a narrow band of riparian vegetation. It was likely dominated by cottonwood-willow forest in the early 1900s. Now, the floodplain is mostly dominated by non-native tamarisk thickets, likely as a result of long-term grazing pressure and altered flood regimes from upstream impoundments and diversions. Local Navajo residents continue to graze livestock on both banks upstream and downstream from the monument. At a few areas where large tributary washes meet the Little Colorado River, such as Deadman Wash, a high water table supports tamarisk thickets.

Currently the only human development within the floodplain at Wupatki is the Black Falls Crossing. Local Navajo residents cross the river at this location year-round, except during high water. Continual use and maintenance has caused ruts, erosion, and gradual widening of the crossing, which locally influences hydrology and sediment movement. This riverbed crossing and past construction of the Black Hills Dam 1/8 mile upstream have locally altered this reach of the Little Colorado River floodplain.

There are three natural springs within Wupatki National Monument: Peshlaki, Heiser, and Wupatki. All of them derive their water from a local, perched aquifer within interbedded sandstone and shale in the Moenkopi Formation. Spring flows are highly variable, increasing during winter and spring, and declining through the summer and fall. All three springs were modified historically by Navajo occupants, ranchers, and/or the NPS. Peshlaki Spring was heavily relied upon by local Navajo shepherders, and still has an installed water containment and animal trough system. Heiser Spring was first modified by the Heiser family ranching operation, and was later distributed to NPS residences for drinking water. Installed "spring-boxes" divert springwater through piping to a local Navajo property inholder, leaving no surface water at the spring site. Wupatki Spring was also developed by the NPS as the original water supply for the visitor center, this spring ceased flowing during the 1950s.

Five major intermittent drainage systems traverse the eastern half of the monument-Citadel Wash, Antelope Wash, Doney Mountain Wash, Deadman Wash, and Kana-a Wash. Each drains a sizeable area, and all are subject to infrequent, but intense flash flooding. The wash beds are characteristic braided sand sands and gravels. Thicker desert scrub vegetation lines the drainages, and none of the washes possesses hydrologic, soil, or vegetation characteristics indicative of jurisdictional wetlands. Except for their respective confluences with the Little Colorado River, none would be considered riparian habitat.

Sunset Crater Volcano National Monument supports no known perennial surface water features, wetlands, or riparian resources.

**Methodology:** The following threshold and duration criteria are identified for water resources.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Water Resources</b>	Effects to water quality, hydrology, wetlands, or riparian areas would be barely perceptible or below detection levels.	Effects to water quality, hydrology, wetlands, or riparian areas would be detectable but relatively small. No mitigation would be necessary.	Effects to water quality, hydrology, wetlands, or riparian areas would be readily apparent but localized and affect the function and value of wetlands. Mitigation to offset adverse impacts could be necessary, and would likely be successful.	Effects to water quality, hydrology, wetlands, or riparian areas would be severe or of exceptional benefit over a wide area and change the function and value of wetland areas substantially. Mitigation to offset adverse impacts would be necessary, but success is not assured.	Short-term would refer to a period of 1-3 years. Long-term would refer to a period longer than 5 years.

**Regulations and Policies:** Current laws and policies require that the following desired conditions be achieved in the monument for water resources, wetlands, and riparian areas.

<b>Desired Condition</b>	<b>Source</b>
The Service will perpetuate surface and groundwater resources as integral components of park aquatic and terrestrial ecosystems.	Clean Water Act; Executive order 11514; NPS Management Policies
The Service will determine the quality of park surface and groundwater resources and avoid, whenever possible, the pollution of park waters by human activities occurring within and outside of parks.	Clean Water Act; Executive Order 12088; NPS Management Policies; Arizona Administrative Code, Title 18, Chapter 11. Department of Environmental Quality Water Quality Standards. Article 1 – Water Quality Standards for Surface Waters.
Natural floodplain values are preserved or restored.	Executive Order 11988; Rivers and Harbors Act; Clean Water Act; NPS Management Policies
The natural and beneficial value of wetlands are preserved and enhanced.	Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS Management Policies

**Impacts of Alternative A – No Action**

**Impact Analysis:** Under Alternative A (No Action), there would be few, if any, direct impacts to water resources, wetlands, or riparian areas from fire itself, especially at Wupatki National Monument and Sunset Crater Volcano National Monument, where these resources are lacking. There would be the continued risk of severe fire in ponderosa-dominated woodlands and a risk of fire in heavy juniper woodland in such areas as WACA-FMU 1, 2, and 4, SUCR-FMU 2 and 3, and WUPA-FMU 3. However, most of these areas are not in proximity to any water feature or wetland/riparian area, except for portions of WACA-FMU-4 along Walnut Canyon. Therefore, direct moderate adverse impacts to canyon riparian areas could result if fire occurred within the riparian corridor itself during dry conditions, or along adjacent steep slopes. However, with rehabilitation of burned areas, impacts would be reduced to minor levels.

Under Alternative A, erosion of topsoil along the steeper canyon slopes could occur if severe fires were to reach these areas. Sediments could be deposited on stream terraces along the stream at the bottom of Walnut Canyon. The associated disturbance and removal of soils and litter would leave patches of watershed areas in a less than satisfactory condition until a grass/forb and litter layer could be re-established within 3-5 years (USDI 2002). Once the litter

layer and ground cover is re-established, the areas should return to a satisfactory condition, with negligible impacts on water resources or downslope riparian areas. Actions taken to minimize impacts to soils during suppression (see MIST, Appendix B) should keep sedimentation due to direct soil disturbance within acceptable limits by minimizing soil disturbance and increased runoff. These indirect impacts would be adverse, short-term, localized, and of negligible to minor impact on surface water quality.

Direct impact to wetlands could occur if fire suppression actions occurred within the wetlands; this potential impact would be obviated by avoidance. Indirect impacts to wetlands from suppression actions and effects of the fire would include potential decline of groundwater recharge, reduced flows from seeps, and potential loss of wetland vegetation around seeps in Walnut Canyon National Monument. A high-severity wildland fire incident would likely reduce potential habitat for wetland species and increase water temperatures resulting from reductions in shading. Although these indirect effects are unlikely, they would result in adverse, localized, negligible to minor, and short-term impacts if they were to occur. However, if low intensity wildland fires would occur in the immediate location of wetlands, long-term, indirect, and minor beneficial impacts would result from nutrients contained in ash being made available for wetland vegetation.

Due to sparse fuels, a lowered risk of severe fire, flat topography, and a lack of water resources, impacts to springs, and other very limited surface waters at Wupatki National Monument from wildland fire would be negligible. There would be no impacts to water resources, wetlands, or riparian areas at Sunset Crater Volcano National Monument, since these resources are not present at the monument.

*Cumulative Effects:* Cumulative impacts to water resources, wetlands, and riparian areas have occurred from past park development, dam construction (see Affected Environment discussion), development of the surrounding watersheds, past grazing, and drought. There are no substantial sources of industrial pollution in or near park waters, and none is anticipated. However, the City of Flagstaff has annexed all lands adjacent to the north and west boundaries of Walnut Canyon National Monument, including a relatively large area contiguous with the canyon rim and tributary canyons west of the monument. Development of these lands within the relatively pristine canyon watershed could increase non-point source pollution from streets and residences. Reasonably foreseeable future cumulative impacts under this alternative are anticipated to be negligible to minor. Current large-scale forest restoration and fire risk reduction projects on the Coconino National Forest in the Flagstaff WUI encompass most of the Walnut Canyon watershed. Long-term cumulative effects on watershed function and downstream riparian resources from these actions are presumed to be beneficial, based upon available literature, but site-specific technical and monitoring information is insufficient to reliably predict effects. Overall, impacts of actions described under Alternative A, added to other actions affecting water resources, wetlands, and floodplains, would result in cumulative long- and short-term, minor to moderate adverse impacts to these resources in the monuments and downstream waters.

*Conclusion:* Under Alternative A (No Action), the adverse impacts of wildland fire on water resources, wetlands, and riparian areas within the three monuments would be negligible. If large high severity fires were to occur, particularly in watersheds in and above Walnut Canyon National Monument, adverse impacts under Alternative A would be minor, localized, and short-term. There would be negligible impact on springs, water resources, wetlands, and riparian areas

at Wupatki National Monument, and no impacts to water resources, wetlands, or riparian areas at Sunset Crater Volcano National Monument. Cumulative impacts would be long- and short-term, minor to moderate, and adverse.

Alternative A would not produce any major adverse impacts or impairment of water resources, wetlands, or riparian areas whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Under Alternative B, the risk of severe fire, erosion on steep slopes, and impacts to the riparian corridor would be similar to Alternative A for Walnut Canyon National Monument (WACA-FMU-4), but the risk of a crown fire burning into the canyon would be moderately reduced by proposed manual treatments and prescribed burning on ponderosa-dominated vegetation on terraces above the canyon rim. Long-term indirect effects related to the reduced fire risk would be beneficial, localized, and minor to moderate. Effects from suppression would also be reduced with the use of AMR instead of extensive fireline construction, resulting in reduced direct soil disturbance and potential erosion into the canyon. The presence of firefighters would have a minor adverse and localized direct effect if they inadvertently trampled wetland areas. Otherwise, impacts would be negligible. Motorized vehicle traffic would be limited to existing roads, and would have no effect on wetlands. With timely application of mitigation, impacts would be negligible with no net loss of wetlands. Over the long-term, it is expected that beneficial effects would occur to wetland areas as fire is restored and minerals and nutrients are released, but these would be minor, indirect, and localized. Fuels reduction treatments at both Walnut Canyon and Wupatki National Monuments would likely have some initial short-term effect on overall watershed condition, such as small amounts of ash runoff post-fire, but by implementing mitigation measures, those impacts would be negligible.

*Cumulative Effects:* Cumulative impacts under Alternative B would be similar to those described for Alternative A, but reduced in intensity and duration since fuel reduction actions and the use of controlled, lower intensity burns at Walnut Canyon Nation Monument would help limit extensive burns that could create more severe erosion and sedimentation. Also, impacts from suppression activities would be less severe. Overall, impacts of actions described under Alternative B, added to other actions affecting these resources, would result in minor to moderate cumulative adverse impacts to water resources, wetlands, and riparian areas, with most of the adverse cumulative impacts stemming from past dam development. Cumulative effects would be similar to Alternative A, except that as restoration strategies are applied and widespread wildland fire risk reduced long-term, beneficial effects would likely occur.

*Conclusion:* Under Alternative B (Preferred Alternative), impacts on water resources at the monuments, particularly Walnut Canyon National Monument, would range from negligible and adverse over the short-term to beneficial, moderate, and indirect over the long-term. Cumulative impacts would be short- and long-term, minor to moderate, and adverse, with much of the adverse impacts stemming from past dam development.

Alternative B would not produce any major adverse impacts or impairment of water resources, wetlands, or riparian areas whose conservation is necessary to the establishment or purpose of

the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

**AIR QUALITY**

***Affected Environment***

The Flagstaff Area National Monuments are located within a Class II air-quality area of the Little Colorado airshed. Overall, the regional air quality is good. Air generally flows southwest to northeast, down and away from the adjacent San Francisco Peaks, and visible pollutants generally do not accumulate within the three monuments. The NPS has very little direct control over air quality within the airshed encompassing the monuments. At times, regional haze generated from coal-fired power generating stations affects Flagstaff and surrounding areas, which is in the same airshed as Grand Canyon National Park.

Prescribed fire activity is subject to the regulations of the Arizona Department of Environmental Quality. Burning approval, through a permit system from the Arizona Department of Environmental Quality (ADEQ), is required prior to ignition. The NPS also cooperates with ADEQ and the Environmental Protection Agency to monitor ozone concentrations in the Flagstaff Area National Monuments between April and October every year. Current results show some elevation of ozone levels (about 60 parts per billion [ppb]) during the summer months prior to the onset of the monsoon season in July (USDI 2001). In addition, the NPS remains concerned that seasonal temperature inversions during the winter may trap wood-burning smoke.

***Methodology:*** The following threshold and duration criteria are identified for air quality.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Air Quality</b>	Impact on air quality barely detectable and not measurable; if detected, would have slight effects.	Impact on air quality measurable and localized. No mitigation measures would be necessary.	Changes in air quality would be measurable and would have consequences, but impacts would be relatively local. Mitigation measures would be necessary and would likely be effective.	Changes in air quality would be measurable, would have substantial consequences, and would be noticed regionally. Mitigation measures would be necessary and success of measures not assured.	Short-term would refer to hours or days; i.e., the duration of the fire management incident. Long-term would refer to that substantially beyond the duration of the incident or action.

***Regulations and Policies:*** Current laws and policies require that the following desired conditions be achieved in the monument for air quality.

<b>Desired Condition</b>	<b>Source</b>
Air quality in the monuments meets national ambient air-quality standards (NAAQS) for specified pollutants.	Clean Air Act; NPS Management Policies
Park activities do not contribute to deterioration in air quality.	Clean Air Act; NPS Management Policies

### ***Impacts of Alternative A – No Action***

*Impact Analysis:* Direct impacts to air quality from wildland fires that could occur under Alternative A would include release of particulates and smoke into the airshed and the potential for a slight increase in fugitive dust from suppression activities. However, with the relatively low fire occurrence, and the aggressive suppression that would occur under Alternative A, under normal fire season conditions the impacts would likely be minor. As with all alternatives analyzed, any smoke from wildland fires would be carried away from population concentrations such as Flagstaff, based on the prevailing southwest to northeast wind direction. For the Walnut Canyon National Monument area, Interstate 40 could be temporarily impacted depending on location and size of the fire. The potential exists for reductions in recreation values resulting from visibility limitations, smoke, and odors (see Visitor Experience section). Possible health effects on sensitive residents locally and visitors would also be likely (see Health and Safety section).

The direct and indirect impacts of the no action alternative would be short-term and minor on a local scale and nearly negligible on a regional scale, except in the most extreme cases.

*Cumulative Effects:* Air quality in the park would continue to be impacted from daily vehicle emissions and management activities as well as other fire activity in the region. Good to poor air quality occurs on a seasonal basis from permitted wildland fires, prescribed fires, and debris burning on neighboring agency lands in the area. Regional air quality may be further degraded periodically by smog from the Phoenix area. The cumulative effects of these actions along with the actions under Alternative A (absent a major increase in non-fire related pollutants or very large wildland fires in the region) would be short- and long-term, minor, and adverse.

*Conclusion:* Alternative A (No Action) would result in a short-term, direct and indirect, minor, adverse effect to air quality on a local scale and nearly negligible effects on a regional scale. Cumulative impacts would be short- and long-term, minor, and adverse.

Alternative A would not produce any major adverse impacts or impairment of air quality resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Direct impacts to air quality from wildland fires under Alternative B would include small increases in the release of particulates and smoke into the airshed and the potential for a slight increase in fugitive dust from suppression activities, since wildland fires may be slightly larger when managed under an AMR. Smoke from wildland fires would be carried away from population concentrations such as Flagstaff, but for Walnut Canyon National Monument, Interstate 40 could be temporarily impacted, depending on location and size of the fire. Indirect impacts include the potential for reductions in recreation values resulting from visibility limitations, smoke and odors (see Visitor Experience section). The possibility of health effects to sensitive residents and visitors from smoke also exists (see Health and Safety section). These adverse impacts would be localized, short-term, localized and negligible to minor. Regionally, smoke emissions would have negligible impacts, and there would be a reduced need for more widespread, intense wildfire that would contribute more to regional air quality degradation.

Activities resulting from implementing the FMP and proposed prescribed fires in WACA-FMU-2 (Walnut Canyon National Monument) under a proposed treatment schedule would involve vegetation removal, debris or pile burning, and broadcast prescribed fire. The NPS will conform to the Arizona State Implementation Plan and would comply with all federal, state, and local air-quality laws and regulations, specifically the U.S. Clean Air Act and the Arizona Administrative Code (R18-2-602). The Flagstaff Area National Monuments would notify local agencies (Flagstaff Fire Department, etc.), offices, and individuals before commencing prescribed burning under an approved prescribed fire burn plan. Mitigation actions are listed in Appendix B and include burning at higher fuel moistures, avoiding adverse wind conditions, avoiding burning during strong inversions, and reducing particulate emissions by reducing time of smoldering phase.

Direct impacts of prescription burns include release of particulates and fugitive dust. Indirect impacts would be similar to those of wildland fire. However, the limited scale of treatments, adherence to approved burn plan provisions, and use of mitigation listed in Appendix B (MIRxT) would result in minor, direct, and short-term, adverse impacts to air quality. However, once fuel loads have been reduced to more natural ranges of variability, negligible to beneficial minor indirect effects on local air quality over the long-term would result as smoke emissions from potential future wildland fires are reduced.

Manual thinning could also involve use of burn piles in certain areas. This would produce high levels of emissions for very short periods, and mitigation measures would be followed for smoke management, resulting in short-term minor, localized adverse impacts.

*Cumulative Effects:* Cumulative impacts would be similar to those described for Alternative A. Because of the short duration of proposed fuel treatment projects, limited use of motorized equipment where possible, and limited pile burning, cumulative impacts related to fuel treatments to local and regional air quality are anticipated to be negligible. Overall, the cumulative effects of other actions, along with the actions under Alternative B (absent a major increase in non-fire related pollutants or very large wildland fires in the region), would be long- and short-term, minor, and adverse.

*Conclusion:* Impacts of Alternative B (Preferred Alternative) would range from minor, short-term, direct, adverse, and localized to long-term, minor, and beneficial locally and regionally as fuel loadings are reduced. Cumulative impacts would be short- and long-term, minor, and adverse.

Alternative B would not produce any major adverse impacts or impairment of air-quality resources or values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments, that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

## **CULTURAL RESOURCES**

The undertakings described in this EA/AEF are subject to Section 106 of the National Historic Preservation Act, under the terms of the 1995 Service-wide Programmatic Agreement among the NPS, the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers. This document will be submitted to the Arizona State Historic Preservation Officer (SHPO) for review and comment. The NEPA process and documentation

may be used to comply with section 106 in lieu of the procedures set forth in Sections. 800.3 through 800.6 if the agency official has notified in advance the SHPO and the Council that it intends to do so and specific standards are met (Section 800.8 (c)).

### ***Affected Environment (Archeological Resources)***

Walnut Canyon National Monument and the area immediately surrounding the monument contain hundreds of archeological sites dating mostly to the 11<sup>th</sup>, 12<sup>th</sup>, and early 13<sup>th</sup> centuries AD. These sites and associated artifacts are the tangible remains of a prehistoric culture that flourished in Central and Northern Arizona from about AD 700 to 1400. Archeologists call this culture “Sinagua,” in reference to the early Spanish name for this highland region, “Sierra Sinagua” (Mountain Range without Water). Scattered Northern Sinagua families farmed the upland areas around Walnut Canyon for centuries, growing small gardens of corn, squash, and beans. Beginning in the late 1000s, the population grew significantly. By the mid-1100s, many people had moved into limestone alcoves below the canyon rim, where they constructed substantial dwellings with locally available stone and clay. The Walnut Canyon Northern Sinagua community thrived for about 150 years; growing crops in the surrounding grasslands and woodlands; raising children; making stone tools, ceramic vessels, rich textiles and other artifacts; and following the ancient ceremonial cycles passed down for generations. Today, Walnut Canyon preserves a portion of the once extensive Northern Sinagua cultural landscape. Multi-room residential sites (both cliff dwellings and open-air pueblos), isolated field structures, “forts,” quarries, agricultural fields, shrines, rock art, and other features are now protected within the monument. There are a total of 452 sites including new lands.

Approximately 40 archeological sites in Walnut Canyon National Monument have been stabilized to some degree, but many retain substantial amounts of original masonry architecture and a more or less complete assemblage of artifacts. However, these sites are continually deteriorating due primarily to the impacts of weather and gravity. Left alone, sites will inevitably degrade over time.

Wupatki National Monument was established to protect the ancient dwellings of puebloan peoples. The monument contains 2,688 recorded archeological sites, including Paleoindian lithic sites, pit house villages, unit pueblos, field houses, lithic and ceramic scatters, rock art, dams, reservoirs, field alignments, hogans and historic trash dumps. The prehistoric sites date from 9500 BC to AD 1250 and contain material culture and architecture that reflects the growth, development and departure of at least three groups of prehistoric peoples.

A recent study at Wupatki National Monument (Maloney and Zimpel 1998a), where hazardous fuels were assessed on sites, concluded there exists several relationships between wildland fire and archeological remains. The study noted that wildland fires are generally fast-moving in light fuels and cooler than fires burning in heavier fuels. If fires occur often, fuels in most areas generally would not build to potentially damaging levels. An exception may be in those areas where grazing has been terminated and fuels are beginning to accumulate, such as in some areas of WUPA-FMU-3 where juniper has begun to fill in formerly open grasslands. Wildland fire normally plays an important role in maintaining grassland ecosystems, and can be used as a tool without damage to archeological remains, given appropriate and timely mitigation.

A formal archeological survey has never been completed for Sunset Crater Volcano National Monument. The status and number of sites has not been determined. However, archeological sites are known to exist in the vicinity. In 1995, the Anthropology Laboratories at Northern Arizona University (NAU) conducted archeological investigations at the Sunset Crater Volcano administrative site.

### ***Affected Environment (Historical Resources)***

The Flagstaff Area National Monuments had a total of 202 structures entered on the List of Classified Structures. By the end of FY2002, 65 of those structures were deemed to be in good condition, i.e. requiring only routine and cyclic maintenance (USDI 2003).

The Walnut Canyon National Monument Historic District has historic significance at the national level. It is an excellent example of projects completed as part of the early conservation efforts and administrative development of Walnut Canyon. It also includes components of two major nationwide infrastructure development thrusts in the National Park Service, the “New Deal” of the 1930s-1940s and “Mission 66” of the 1950s-1960s. Most of the contributing properties are in excellent condition and retain a high level of historic integrity, reflecting the original New Deal and Mission 66 era location, design, setting, materials, workmanship, feeling, and association.

The Headquarters Area Historic District of Walnut Canyon National Monument (the monument’s visitor center, public comfort station, maintenance shop and associated yard, employee residences, and water tower), has historic significance at the national level. Constructed by the Civilian Conservation Corps (CCC), the New Deal era properties are finely executed examples of projects completed as part of the federal relief programs of the 1930s, as well as examples of early infrastructure development during the formative years of the NPS.

The Cliffs Ranger Station/Ranger Cabin is a four-room, single story, long, narrow log cabin originally constructed by the Forest Service in 1904. The original structure was a one-room, relatively square log cabin. A kitchen and porch were added sometime before 1906, and by 1921, a bedroom and living room unit had been added. The cabin is intact but in poor condition and has been vacant since 1969. A historic fire lookout tree is also associated with the original cabin. Ranger Cabin was nominated to the National Register of Historic Places in 1975.

The road system for the Headquarters Area retains a high degree of its historic integrity and visual character. Informal, unpaved spur roads were added to the administrative road system, and many have been subsequently closed. However, additions and alterations have been minor and ephemeral. The road system still maintains the basic footprint of the original design. The Worm Rail boundary fence, the Island Trail, and Rim Picnic Area are also included in 1938-1942 historic period resources.

The major public and service facilities in use today at Walnut Canyon have changed little since the Mission 66 era. Visitors to Walnut Canyon today arrive at the monument from the same road as visitors in 1957. The Walnut Canyon Visitor Center still remains the heart of visitor activities. The CCC and Mission 66-era residences are still in use as residences or employee office space [text taken from draft “*Consensus Determination of Eligibility for Walnut Canyon National Monument Headquarters Area Historic District*”; National Park Service, Flagstaff Area National Monuments, Coconino County, Arizona].

The Wupatki National Monument Visitor Center Complex Historic District (Wupatki complex) is an amalgam of NPS Rustic style architecture constructed by the CCC and NPS Modern style architecture constructed as part of the Mission 66 program. These buildings form an administrative center, visitor contact area, maintenance area, and park housing for the monument. The Wupatki complex is comprised of ten buildings and structures that contribute to its historic significance and three non-contributing properties. Most of the contributing properties are in excellent condition and retain a high level of historic integrity, reflecting original CCC and Mission 66 era location, design, setting, materials, workmanship, feeling, and association [text taken from “*Consensus Determination of Eligibility for Wupatki National Monument Visitor Center Complex Historic District*”; National Park Service, Flagstaff Area National Monuments, Coconino County, Arizona; 2004]. Thus, The Wupatki complex has historic significance at the national level as an excellent example of a CCC and Mission 66 development, and Park Service Modern architecture in Arizona.

The Sunset Crater Volcano National Monument visitor center complex (Sunset complex), which was historically known as the “Headquarters Area for Sunset Crater Volcano National Monument”, is comprised of Mission 66 era properties that form an administrative center, visitor contact area, maintenance area, and park housing for the monument. Located on U.S. Forest Service land approximately ½ mile west of the monument boundary (and proposed for incorporation into the monument through boundary adjustments with Coconino National Forest), the Sunset complex is set in a ponderosa forest and cinder dune landscape. Designed in 1965 and constructed between 1966 and 1967, the visitor center complex at Sunset Crater Volcano National Monument has historic significance at the national level as an excellent representation of NPS Mission 66 planning and design. The Sunset Complex is comprised of six properties that contribute to the historic significance of the Mission 66 complex and thirteen non-contributing properties [text taken from “*Consensus Determination of Eligibility for Sunset Crater Volcano National Monument Visitor Center Complex Historic District*”; National Park Service, Flagstaff Area National Monuments, Coconino County Arizona].

*Methodology:* The following threshold and duration criteria are identified for cultural resources, including archeology and historic structures.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Cultural Resources</b>	Impacts would be at the lowest levels of detection – barely perceptible and not measurable on archaeological sites or features, historic structures, or cultural landscapes.	The impact would affect archaeological site or historic structure or cultural landscapes, with little data potential, but the impact would not affect the character defining features of a listed site or landscape, or site or landscape eligible for listing on the National	The impact would affect an archaeological site or historic structure or cultural landscapes with modest data potential. For a National Register eligible structure or building, the adverse impact would change the character defining feature(s) of the structure but would not diminish the integrity of the resource and	The impact would affect an archaeological or historic site with high data potential. For a National Register eligible or listed structure or building, the impact would change the character defining feature(s) of the structure or building, diminishing the integrity to the extent that it is no longer eligible for listing on the National Register. Section 106 determination similar to “moderate intensity”. An action that would	Short-term refers to a transitory effect, one that largely disappears over a period of days or months. The duration of long-term effects is essentially permanent.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
		Register of Historic Places. For Section 106, the determination of effect would be no adverse effect.	jeopardize its National Register eligibility. For Section 106, the determination of effect would be adverse effect, or a no adverse effect in the case of a beneficial impact.	cause a noticeable to severe change or exceptional benefit to a cultural resource. The change is measurable and has a substantial and possible permanent effect even with mitigation applied.	

*Regulations and Policies:* Current laws and policies require the consideration of impacts on cultural resources listed in or eligible for listing in the National Register of Historic Places. The undertakings described in this document are subject to compliance with Section 106 of the National Historic Preservation Act, under the terms of the 1995 Service-wide Programmatic Agreement among the National Park Service, the Advisory Council on Historic Preservation and the National Conference of State Historic Preservation Officers.

Current laws and policies require the consideration of impacts on archeological resources.

Desired Condition	Source
Archeological sites are identified and inventoried, and their significance is determined and documented.	The National Historic Preservation Act, as amended in 1992 (16 USC 470 <i>et seq.</i> ); the National Environmental Policy Act; and Director's Order 28, Cultural Resources Management Guidelines (1997), Management Policies (2001) and Director's Order 12, Conservation Planning, Environmental Impact Analysis and Decision Making (2001)
Archeological sites are protected in an undisturbed condition unless it is determined through formal processes that disturbance or natural deterioration is unavoidable.	
In those cases where disturbance or deterioration is unavoidable, the site is professionally documented and salvaged.	

Current laws and policies require the consideration of impacts on historic structures and buildings listed in or eligible to be listed in the National Register of Historic Places.

Desired Condition	Source
Historic properties are inventoried and their significance and integrity are evaluated under National Register criteria; all remains will be inventoried and protected.	The National Historic Preservation Act, as amended in 1992 (16 USC 470 <i>et seq.</i> ); the National Environmental Policy Act of 1969 (42 USC 4321 <i>et seq.</i> ); and the National Park Service's Director's Order #28, <i>Cultural Resource Management Guideline</i> (1997), <i>Management Policies</i> , 2001 (2000), and Director's Order #12, <i>Conservation Planning, Environmental Impact Analysis, and Decision Making</i> (2001)
The qualities that contribute to the eligibility for listing or listing of historic properties on the NRHP are protected in accordance with the Secretary of the Interior's Standards (unless it is determined through a formal process that disturbance or natural deterioration is unavoidable).	

### ***Impacts of Alternative A – No Action***

*Impact Analysis (archeological resources):* Under Alternative A, there would be continued full suppression of all wildland fires, with consequent increases in fuel loading over time without a fire management plan. Effects of Alternative A on archeological resources would depend on several factors: fuel loading, soil texture and moisture, type (e.g., head fire v. backing fire), rates of fire spread, and residence time (Ryan 2002). Fire effects, accordingly, may vary from negligible to moderate and adverse to beneficial.

Severe fires – those that burn in heavy fuel loads and exhibit long residence time and a substantial downward heat pulse – may damage buried organic and inorganic materials. In heavy continuous fuels, temperatures at the soil surface may be sufficient to damage stone or ceramic resources by scorching, fracturing, charring, and spalling. Organic matter may be distilled or destroyed at temperatures of 200-300° Centigrade (°C). Temperatures of 500-600°C will begin to affect stone materials. Temperatures diminish rapidly with soil depth; when surface temperatures are 500° C, the temperatures at a depth of 5 cm would be only about 200°C. With light to moderate severity fires, residence time is usually short and the downward heat pulse is low. Ryan (2002) notes that soil heating is commonly shallow even when surface fires are intense.

Heat from typical surface fires in brush, ponderosa pine, and mixed conifer communities would be insufficient to damage artifacts and other archeological materials in subsurface settings even if they are buried only a few centimeters below the ground surface. The direct adverse impacts of surface fires on archeological resources would therefore generally be negligible. Fire may also expose archeological resources as vegetation is removed. This may allow the discovery, more accurate mapping, and/or more complete assessment of archeological resources. This indirect effect would be short-term to long-term, minor, and beneficial.

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

Direct effects of heat impingement from unwanted wildland fires may produce varying degrees of adverse effects, depending on factors such as amount and type of available fuels, duration of heating, and type of cultural materials being affected. Protection of structures containing wood from high intensity fire is difficult; other combustibles such as packrat middens, beams, corncobs and other associated materials are similarly at risk. Alcove sites at Walnut Canyon National Monument may be relatively protected from fire because they are often surrounded by bare rock with little or no fuels. However, organic materials within this type of site can be ignited by firebrands or by intense heat from nearby fire. Rock art sites and panels may be subject to exfoliation from high intensity fires.

Long-term risk to sites from fires in heavy fuels and dense thickets (primarily at Walnut Canyon National Monument [FMU 2; part of FMU 4] and to a lesser extent Wupatki National Monument [FMU 3]) would increase potential for direct and indirect, moderate, adverse impacts during and following high-severity fires, with damage or displacement of materials in or around archaeological sites. Measures such as rehabilitation may help mitigate severe adverse impacts. Fire line construction without on-site direction from a cultural resource specialist has the potential to displace artifacts and damage subsurface cultural deposits. Minor indirect adverse effects could also occur from collection and other disturbance such as vehicle use and presence of fire personnel assigned to incidents. These potential impacts would also be mitigated, however, with the presence of cultural resource specialists and adherence to mitigation measures for cultural resource protection (see Appendix B).

Continuation of the current program under Alternative A would result in localized, minor to potentially moderate, short and long-term, direct and indirect, adverse and beneficial impacts to archaeological resources.

*Impact Analysis (historical resources):* Historic resources contain partially preserved wood structures such as the Ranger Cabin at Walnut Canyon National Monument, the CCC and Mission 66 developments at Wupatki and Walnut Canyon National Monuments and the Mission 66 development at Sunset Crater Volcano National Monument, and wood components of the administrative center, visitor contact area, maintenance area and park housing at Wupatki National Monument. Under Alternative A, there would be incremental increases in fuels in and around sites and features. Without a plan for fuels reduction long-term, effects could be potentially adverse and moderate on historic resources at the monuments. The direct adverse impact of wildland fire on historic structures could be destruction or damage to the structures if fire contacts the structures directly. However, with many historic structures, discontinuous fuels diminish the possibility of this impact. Also, for those sites that would be vulnerable to impacts from wildland fire, such as wooden historic structures, a wide range of options are available to eliminate or mitigate potential impacts. These include black-lining around structures or features near wildland fires, treatment with fire retardant foam prior to or concurrent with fires, wrapping with heat reflective materials, and establishing sprinkler systems on and around structures concurrent with wildland fire suppression activities. Other standard cultural resource mitigation measures are listed in Appendix B. In all cases, protection of structures and features will be more important than minimizing acres burned. The direct adverse impact of fire suppression on historic structures would therefore be limited to the potential to damage such structures by contact with fire fighting equipment, and indirect adverse impacts would include the possibility of smoke damage. The direct and indirect adverse effects of fire and fire suppression on historic structures under Alternative A would be localized and would range from negligible to minor with application of appropriate mitigation.

*Cumulative Impacts:* Increased visitor use, added or planned recreational facilities, and other improvements have had varying degrees of impact on cultural resources in and around the Flagstaff Area National Monuments. Cultural resources also continue to be subject to natural processes of weathering and decay, and with this effect the rarity and importance of these non-renewable resources will increase. When considered cumulatively with past, present, and reasonably foreseeable future wildland fires and operations, Alternative A would result in minor to moderate long-term cumulative adverse impacts to cultural resources.

*Conclusion:* Direct and indirect effects of Alternative A (No Action) on cultural resources (including archeological and historic) would be adverse or beneficial, localized, minor to potentially moderate, and short- to long-term. Many impacts described can be reduced in intensity or prevented with mitigation, including post-fire rehabilitation. Cumulative impacts on cultural resources would be long-term, minor to moderate, and adverse.

Alternative A would not produce any major adverse impacts or impairment of cultural resources and values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis (archeological resources):* Under Alternative B the risk of more intense fires in susceptible areas would decrease, as fuel reduction projects are implemented over time. Many of the proposed projects target sensitive area resources, and would result in removal of hazard fuels from around known archeological sites. Also, with AMR options available for management of wildland fires, natural and man-made barriers would be used in lieu of constructed fireline. A reduction in the adverse impacts mentioned above would therefore be expected as a result of potentially less line construction and soil disturbance and a reduced fire risk around archeological sites.

With manual thinning and prescribed fire use directed by a treatment schedule primarily in FMU-2 and FMU-3 (see Appendix A), impacts to archeological sites would be negligible with mitigation applied during planning and implementation of projects. All proposed prescribed fire units would be surveyed prior to site preparation activities such as constructing control line, falling hazard trees, installing water handling equipment, and identifying routes for vehicles to avoid cultural features. Vehicle and other equipment access would be from existing roads. A cultural resource advisor would be assigned to the project when necessary. If, during scheduled project planning and preparation activities, previously unknown archeological resources are discovered, resources would be identified and documented and on-site mitigation developed in consultation with cultural resource specialists (see Appendix B). If human remains were uncovered as a result of project implementation, all work in the area would cease until requirements of the Native American Graves Protection and Repatriation Act (NAGPRA) are met. Affected tribes would also be consulted during early planning.

The direct impact of hazard fuel reduction operations, as with prescribed fire, would be minor exposure of archeological materials resulting from ground disturbance from hand tools. Indirect impacts may include erosion, vandalism, or theft resulting from exposure, but these would likely be negligible. With avoidance of known cultural resources and other mitigation, the direct and indirect adverse impacts of manual hazard fuels removal would be negligible to minor, localized, and short-term. Removal and disposal activities such as piling, scattering, rolling, and dragging vegetation, could result in isolated short-term, negligible to minor, localized, direct adverse impacts from displacement of surface and sub-surface artifacts. However, as protection treatment objectives are met and fuels are restored to natural levels, long-term effects would be beneficial, localized, and range from minor to moderate as high severity fire potential is reduced.

*Impact Analysis (historic resources):* Under Alternative B, impacts from wildland fires similar to those described in Alternative A could occur for historic resources at the monuments. However, under a treatment schedule designed to reduce fuels near high-risk resources, the risk of high intensity fires and fires near structures would be reduced. Long-term effects would range from negligible to adverse, beneficial, localized, and minor. As with archeological resources, strict and detailed mitigation designed to minimize impacts from manual fuels reduction and prescribed fire would be included in the fire management plan and project plans.

*Cumulative Effects:* Under Alternative B, there would be an overall increase in protection for prehistoric, CCC, and Mission 66 structures including those eligible to be listed in the National Register of Historic Places (see above). As cultural resources in the region continue to be incrementally impacted by human activities, along with those natural processes of weathering

and decay, the rarity and importance of these non-renewable resources will increase. However, when activities under the preferred alternative are considered with reasonably foreseeable future wildland fire operations, adverse cumulative impacts would be long-term and minor, since long-term beneficial impacts expected with the decreasing risk of high-severity wildland fires in all FMUs.

*Conclusion:* Under Alternative B (Preferred Alternative), there would be negligible to short-term, minor, direct adverse impacts from proposed fuel treatment projects. Long-term, beneficial, indirect, minor to moderate, localized impacts would be expected as fuels reduction and restoration objectives are accomplished under the plan. Cumulative impacts on cultural resources would be long-term, adverse, and minor.

Alternative B would not produce any major adverse impacts or impairment of cultural resources and values whose conservation is necessary to the establishment or purpose of the Flagstaff Area National Monuments that are key to the natural or cultural integrity of the monuments, or that are identified as a management goal of the monuments.

*Section 106 Summary.* The adaptive management approach commits the NPS to continued consultation with interested tribes, stakeholders, and the AZSHPO. Pursuant to 36CFR800.5 (revised in January 2001, these regulations implement the National Historic Preservation Act and address the criteria of effect and adverse effect), the NPS concludes that implementation of projects and mitigation measures in the FMP for Flagstaff Area National Monuments would have *no adverse effects* to archeological and historic resources eligible for or listed on the National Register of Historic Places.

## **NATIVE AMERICAN TRADITIONAL VALUES (including Ethnographic Resources)**

### ***Affected Environment***

With respect to traditional values of Native Americans, the Flagstaff Area National Monuments are an integral part of a larger traditional landscape. Many of the geographic features and natural and cultural resources identified by the tribes as culturally significant within the three monuments are historically or ceremonially interconnected with other landscape elements, geographic features, and archeological sites throughout the tribes' entire customary land bases. In addition to the Hopi and Navajo Tribes, who currently occupy the tribal lands adjacent to or near the monuments, several other tribes retain customary associations with many of the same resources and places throughout the region.

Ethnographic resources included in this analysis are defined by the National Park Service as any "site, structure, object, landscape, or natural resource feature assigned traditional legendary, religious, subsistence, or other significance in the cultural system of a group traditionally associated with it" (USDI 1997).

Walnut Canyon National Monument is part of a region bordered by extensive high-altitude National Forest lands lying southwest of the Hopi and Navajo Indian Reservations. The Navajo Reservation forms the largest block of Indian tribal lands in the United States, with more than 25,000 square miles of territory. These contemporary reservations are only a small portion of the lands occupied aboriginally and historically by the tribes, to which tribes retain deeply rooted

traditional associations. The Flagstaff Area National Monuments are an integral part of this larger traditional landscape.

The Navajo Nation identified fourteen culturally significant plants in Walnut Canyon National Monument, in addition to white clay, a culturally significant mineral. The Hopi Tribe and Pueblo of Zuni identified ethnographic resources in Walnut Canyon, including pre-Columbian architectural remains and petroglyphs, as part of their traditional histories and contemporary cultural identities (USDI 2000). Tribal members utilizing traditional areas and activities also experience occasional contacts with visitors during traditional uses of the monument.

Wupatki National Monument neighbors' access, emergency response, economic contribution of the park to local economies, access to culturally sensitive areas by traditional users, traditional land uses external to park boundaries, and possible conflicts between the proposed action and local, state, or Indian tribal land use plans, policies, or controls have been described in the Final Environmental Impact Statement (USDI 2002b). Many Navajo tribal members pass regularly through the monument and depend on monument resources to serve a variety of needs, including routine maintenance of much of their main travel route. Numerous plant species, and culturally significant natural resources such as springs, the blowholes, and certain geographic features such as hills, the Little Colorado River, river crossings, trails, and various ceremonial locales have been identified. The identification of plants and other natural resources and geographic features as having particular cultural significance points to the fact that ethnographic resources include resources that have been distinguished as natural and cultural. The Hopi Tribe and Pueblo of Zuni identified ethnographic resources in Wupatki National Monument, including pre-Columbian architectural remains and petroglyphs, as part of their traditional histories and contemporary cultural identities (USDI 2000). Tribal members utilizing traditional areas and activities also experience occasional contacts with visitors during traditional uses of the monument.

Sunset Crater Volcano National Monument is considered a traditional cultural property because of oral traditions of area tribes relating events that took place there in the mythical past. The Navajo Nation identifies the Sunset Crater landscape as part of a regional ceremonial landscape, and considers cinder cones throughout the general region to have particular cultural significance. The Yavapai-Apache and White Mountain Apache also maintain ties to Sunset Crater and its associated volcanic features. Hopi oral traditions include stories about the eruption of Sunset Crater. The Hopi believe that their ancestors' spirits, the Kachinas, travel from the San Francisco Peaks to Hopi and back each year via Sunset Crater and Bonito Park. Some deities are believed to reside in the immediate area.

The Pueblo of Zuni also considers the area encompassed by Sunset Crater Volcano National Monument as part of a much larger, interconnected sacred landscape. The Pueblo of Zuni also shares concerns about the places identified by the Hopi Tribe as culturally significant. In addition, the Pueblo of Zuni specifically identified the sensitivity of a particular stand of aspen trees within the boundaries of Sunset Crater, as well as any springs that might occur there.

**Methodology:** The following threshold and duration criteria are identified for Native American Traditional Values, including ethnographic resources.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
<b>Native American Traditional Values</b>	No perceptible or measurable change to sites, structures, objects, or natural resource features assigned traditional legendary, ethnographic, religious, subsistence, or other significance in the cultural system of a group traditionally associated with them would occur.	A change to traditional or ethnographic values or significance in the cultural system of a tribe associated with them would occur; if the change is measurable, it would be small and localized.	Measurable change to a traditional or ethnographic value or significance in the cultural system of a tribe associated with it (them) would occur; mitigation to offset adverse impacts would be simple and generally effective.	A substantial adverse or beneficial change in a traditional or ethnographic value or significance in the associated cultural system would occur; mitigation to offset adverse impacts required, but success not assured.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.

**Regulations and Policies:** Certain contemporary American Indian and other communities are permitted by law, regulation, or policy to pursue customary religious, subsistence, and other cultural uses of park resources with which they are traditionally associated. The NPS plans and executes programs in ways that safeguard cultural and natural resources and ethnographic values, while reflecting informed concern for the contemporary peoples and cultures traditionally associated with these resources.

Desired Condition	Source
Ethnographic information is collected through collaborative research that recognizes the sensitive nature of such information.	NPS Cultural Resource Management Guideline (DO-28)
All agencies shall accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners, and avoid adversely affecting the physical integrity of these sacred sites.	Executive Order 13007 on American Indian Sacred Sites
Other federal agencies, state and local governments, potentially affected Native American and other communities, interest groups, State Historic Preservation Officer, and the Advisory Council on Historic Preservation will be given opportunities to become informed about and comment on anticipated NPS actions at the earliest practicable time.	National Historic Preservation Act; Programmatic Memorandum of Agreement among the NPS, Advisory Council on Historic Preservation, and the National Council of State Historic Preservation Officers (1995); Executive Order 11593; American Indian Religious Freedom Act, Native American Graves Protection and Repatriation Act, Executive Order 13007 on American Indian Sacred Sites; Presidential Memorandum of April 29, 1994, on Government-to-Government Relations with Tribal Governments; NPS Management Policies.
All agencies shall consult with tribal governments prior to taking actions that affect federally recognized tribal governments. These consultations are to be open and candid so that all interested parties may evaluate for themselves the potential impact of relevant proposals. Parks will regularly consult with traditionally associated native Americans regarding planning, management, and operational decisions that affect subsistence activities, sacred materials or places, or other ethnographic resources with which they are historically associated.	American Indian Religious Freedom Act; Presidential Memorandum of April 29, 1994, on Government-to-Government Relations with Tribal Governments; NPS Management Policies.

### **Impacts of Alternative A – No Action**

**Impact Analysis:** Under Alternative A, the continued build-up of fuels in some areas could threaten some resources that are considered ethnographic resources. For example, some native

plant species and petroglyphs could be directly affected if severe wildfire were to occur, particularly in Walnut Canyon. Suppression operations, considered as emergency incidents, could curtail travel and temporarily limit access to certain traditional sites. These direct and indirect adverse impacts on traditional use areas of the Flagstaff Area National Monuments and those individuals involved in activities would be localized, short-term, and negligible to minor. Ongoing tribal consultations between NPS and affected tribes would provide for measures identified in advance that are designed to minimize such impacts to general locations and provide the most effective basis for development of protection protocols for tribal traditional uses and values. As necessary, consultations would occur during and following incidents.

*Cumulative Effects:* Growth and development of the city of Flagstaff and the outlying communities would result in increased visitor and commuter traffic on roads and trails, and would have a minor, long-term, localized, adverse effect on ethnographic use of the monuments, present or foreseeable future fire traffic. However, the city of Flagstaff, U.S. Forest Service, State of Arizona and Coconino County are currently initiating planning efforts that should facilitate protection of lands adjoining the park, thus mitigating cumulative traffic increases that would potentially affect traditional use access to the Flagstaff Area National Monuments. Overall, these effects, plus the effects of actions under Alternative A, would result in cumulative long-term, minor adverse impacts to Native American traditional values.

*Conclusion:* Under Alternative A, impacts on Native American Traditional Values would range from negligible to minor, and be localized, short-term, and adverse. Cumulative impacts would be long-term, minor, and adverse.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Suppression activities under Alternative B would present similar impacts as under Alternative A, except human presence to and on incidents managed under AMR may be slightly increased. Patrols, monitoring, and less aggressive suppression actions to protect resources are the primary activities affecting traditional uses and routine traffic flow. The timely mitigation would be consultation with affected Tribes utilizing traditional sites and/or traveling through the incident area. Impacts would likely be negligible, minor, short-term, localized, and adverse on Native American activities. Mitigation would tend to lessen temporary impacts, particularly if tribal officials are regularly consulted.

Mechanical and hand fuels reduction in all FMUs and prescribed fire unit preparation in FMU-2 under a treatment schedule would also involve off-road foot travel to and from project areas to achieve program objectives. Adverse impacts would be negligible, as consultation with tribes would be completed. During planning, NPS employees would consult with tribes, officials of state and county governments, and private citizens groups and individuals to identify response measures that are appropriate to a given fire situation. Decision-tree and prescribed-fire prescriptions will reflect this need to closely manage fires under these situations. As a matter of routine, the appropriate tribal officials of the Navajo, Hopi, Apache, Zuni Tribes, Pai, and Southern Paiutes would be contacted by the compliance coordinator well in advance of planned fire management project work if known or suspected traditional use areas are included in the planning area. As long-term objectives are achieved and activities are reduced to a more maintenance-oriented intensity, traffic and personnel presence would diminish proportionally and impacts on Native American traditional uses, materials, and activities would diminish

because of the reduced wildland fire hazard. Thus the indirect impacts of the preferred alternative would be beneficial, localized, long-term, and minor to moderate.

*Cumulative Impacts:* Cumulative impacts would be similar to those described for Alternative A, but would include long-term beneficial effects from the reduced wildland fire hazard. Overall, cumulative impacts to Native American Traditional Values under Alternative B would be negligible to minor, long-term, and adverse.

*Conclusion:* Under Alternative B (Preferred Alternative), short-term adverse indirect impacts ranging from negligible to minor would occur because of increased NPS presence while managing wildland fire or conducting fuels management projects; however, mitigation would reduce adverse impact. Also long-term, minor to moderate indirect beneficial impacts to Native American Traditional Values would occur as the potential for high-intensity, damaging fires is reduced. Cumulative impacts would be long-term, negligible to minor, and adverse.

## **HEALTH AND SAFETY**

### ***Affected Environment***

Wildland fires have the potential to impact the health and safety of firefighters, monument employees, and the public. Within the monuments, most public use focuses on visitor centers, trails, picnic areas, and roadway pavement. Visitor use is highest during the summer months. About half of total annual visitation occurs June through August. Opportunities for visitors and neighbors to escape a large, fast-moving fire may be limited by the terrain and the monument road system. Health risk to the local residents outside the monuments consists primarily of smoke-related health effects.

The highest risk potential lies along the entrance road, trails, and the visitor center/housing areas at Walnut Canyon National Monument, with additional potential at the Sunset Crater Volcano National Monument Visitor Center area. Employee residential areas are also somewhat at risk, particularly where untreated fuels interface with wildlands. Employees and visitors are at risk when uncontrolled wildland fire threatens the monument, and firefighters face direct risks. Fire danger is usually most severe in the late spring and early summer, before the summer monsoon season.

Employees are responsible for directing visitors appropriately when wildland fire threats become severe. Emergency response plans and compendiums currently exist to provide for evacuation procedures, notifications, and restrictions.

**Methodology:** The following threshold and duration criteria are identified for park health and safety.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Health and Safety</b>	A change in level of risk to public and firefighter safety would occur, but the change would be so small that it would not be of any measurable or perceptible effect.	A change in risk level would occur, but the change would be small and localized effect. Mitigation would be a standard procedure and highly effective in minimizing risk.	Measurable change to levels of risk would occur; however, mitigation to offset adverse effects would generally be moderate complexity and effective.	A severe change or exceptional benefit to public and firefighter safety related values would occur. The change would have a substantial effect, and mitigation to offset adverse impacts is not assured.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.

**Regulations and Policies:** Current laws and policies require the consideration of impacts on health and safety.

<b>Desired Condition</b>	<b>Source</b>
Visitor and employee safety and health are protected.	NPS Management Policies, National Environmental Policy Act

**Impacts of Alternative A – No Action**

The direct adverse effect of Alternative A would be exposure of potentially more fire management personnel to the hazards typically associated with intense fires and wildland fire suppression: burns, cuts, and abrasions from equipment, falls, smoke inhalation, and other injuries. Indirect adverse effects include long-term effects of smoke inhalation. Direct and indirect adverse effects to firefighters would be mitigated by application of the Ten Standard Firefighting Orders, LCES, and other risk mitigation actions such as safety briefings (see safety measures listed in Appendix B (proper application of these measures, impacts would be minor.

The increased chance of wildland fire escapes along public roadways would create an element of risk to surrounding residents, park visitors, and firefighters. There would also be continued inability to provide immediate contact regarding wildland fire activity when visitors enter the monuments without staffed entrance stations, and there would still be no fire management funded staff present to provide orientation at any of the developed sites. Protection of visitors from any short-term, rapidly spreading fires may or may not be as achievable without preventive fuels management interventions to reduce risk. Temporary traffic restrictions on the Sunset Crater Volcano National Monument – Wupatki National Monument Loop Road as well as the Walnut Canyon National Monument entrance road would be a consideration to reduce exposure to park visitors and neighbors from high intensity wildland fires. Impacts would be potentially adverse, short-term, direct, localized, and of minor to moderate intensity on public safety, and would be partially mitigated by implementing existing emergency response plans.

Another important indirect health impact is the potential for impacts of smoke on visitors, employees, and sensitive residents. As fuel loads continue to increase, the potential risk to the health of people located downward or near fire would increase, resulting in indirect, minor to moderate adverse impacts, depending on sensitivity to smoke.

*Cumulative Effects:* Potential increases in visitation on summer weekends and holidays would pose the greatest threats should a wildland fire occur on any of the monument lands. Firefighters, visitors, and park neighbors are exposed regularly to hazards associated with vehicle use and other work activities. Alternative A would contribute increased duration of exposure to hazards associated with fire and suppression activities on and adjacent to NPS lands. The cumulative effects of Alternative A on wildland firefighters, employees, and public health and safety, along with effects of other hazards to health and safety, would be short- and long-term, localized, minor, and adverse.

*Conclusion:* Under Alternative A (No Action), the direct and indirect adverse impacts to employees, firefighters, and the public would be mostly localized, short-term to long-term, and minor, with application of appropriate safety mitigation measures. Cumulative impacts would be short- and long-term, localized, minor, and adverse.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Under Alternative B, there would be a reduction in the potential for high intensity wildland fires as fuels reduction treatments are applied around values at risk. Prescribed fire, thinning, and removal operations under a proposed treatment schedule in WACA-FMU-2 could result in reduced safety threats to visitors, staff, and adjacent residents. Defensible space would be established and maintained around high priority developments to assist firefighters in protecting values at risk. Unauthorized human presence in or around project areas would be regulated, and fuel treatment projects would be planned for low season to minimize exposure to humans in and adjacent to NPS lands.

As long-term protection and resource objectives are accomplished, the impact of the proposed alternative would range from minor adverse to minor to moderate beneficial, and localized as the potential for high intensity, rapidly spreading wildland fires is reduced.

*Cumulative Effects:* Cumulative effects would be similar to those described for Alternative A, but with increased long-term beneficial impacts related to completion of fuel treatment projects, including prescribed burns conducted under controlled conditions. Firefighters, visitors and park neighbors would be exposed regularly to hazards associated from vehicle use and other work activities on and near parklands. When considered with reasonably foreseeable impacts of the fire proposed fire management program, cumulative effects on public health and safety would be short- and long-term, localized, negligible, and adverse.

*Conclusion:* Impacts of Alternative B (Preferred Alternative) on human health and safety would be short-term, minor, and adverse, with minor to moderate, beneficial, and long-term effects as fuels are reduced under the proposed treatment schedule. Cumulative impacts would be short- and long-term, localized, negligible, and adverse.

## **PARK NEIGHBORS**

### ***Affected Environment***

Figure 1 (located in Chapter 1) shows the location of the monuments in relation to their neighboring landowners. As can be seen, much of the land surrounding the monuments consists

of portions of Coconino National Forest. The specific neighboring land uses for each monument are described below.

Walnut Canyon National Monument is surrounded by Coconino National Forest land except for a portion of the east boundary, where a portion of private land extends northeast out of the monument boundary. Arizona State land is adjacent to the west boundary. At the east boundary is a 293-acre private in-holding (included in the monument's legislative boundary additions of 1938 and 1996). This in-holding would be included for protection under NPS emergency planning.

Wupatki National Monument is bordered on the south by the Coconino National Forest, Arizona State Lands, and private lands. A portion of the east boundary is bordered by the Little Colorado River, with Navajo Tribal Lands on the east side of the river. One small parcel of Bureau of Reclamation land in the Black Falls area also borders the monument. Bureau of Land Management and CO Bar Ranch own land along the remaining eastern boundary. The north boundary of the monument is bordered by the CO Bar and Arizona State lands. The west boundary is bordered by CO Bar, Arizona State lands, and commercial private lands at Antelope Hills (Sinagua Trading Post).

Sunset Crater Volcano National Monument is surrounded by Coconino National Forest lands. Immediately to the east, the Forest Service administers the Cinder Hills Off-Road Vehicle use area. There are operating pumice and cinder mines adjacent to the west and northwest of the monument. Lands that are planned for incorporation into the monument as part of boundary adjustments with Coconino National Forest are included in the fire management plan. These additional lands surround the northeast and southwest corners of the monument and include the NPS operations area, employee housing, maintenance shops and utilities, and Bonito Park. The Bonito Campground, operated by the Coconino National Forest through a concession contractor, is located near the NPS operations area.

The Fire Management Program for Flagstaff Area National Monuments reflects and complements fire management programs of the adjacent Coconino National Forest and Arizona State Land Department. The Coconino National Forest implements an appropriate management response program. Prescribed fire is used extensively throughout the forest as part of ecosystem management and hazard fuels reduction. The Coconino National Forest, is active partner in all fire management activities. The Arizona State Land Department operates under a Memorandum of Understanding with the Forest Service and uses similar fire management practices on State and private lands under its jurisdiction.

The Flagstaff Area National Monuments would maintain a Partnership Cooperative Agreement with the Coconino National Forest and Arizona State Land Department for fire management activities. Additionally, an annual operating agreement would be maintained between agencies under the Joint Powers Agreement of 1995.

Members of nearby tribes are occasionally employed by the NPS locally as temporary, permanent, or emergency firefighter hires. However, under current conditions very few people are hired as a result of the limited funding for work in fire management that is other than suppression of wildland fires. Also, there is continuing need for tribal members to gain access to sensitive areas; fire operations would have little or no impact on these activities.

Impacts to parks neighbors include potential health and safety risks from fires or fuel treatments (e.g., smoke). There are addressed under Public Health and Safety, above.

**Methodology:** The following threshold and duration criteria are identified for relationships with park neighbors.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
<b>Park Neighbors</b>	An action could cause an effect in park neighbor(s)' activities, but the change would be so small that it would not be of any measurable or perceptible effect.	A change in park neighbor(s)' activities would occur, but the change would be small, and, if measurable, it would be a localized effect. Mitigation would not be necessary.	Some changes in park neighbor(s)' activities would occur. The change would be measurable and would have a sufficient impact on the neighbor in time or funds lost. Mitigation to offset adverse impacts would be necessary and effective.	A severe change or exceptional benefit to the activities of park neighbor(s) would occur. The change would be measurable in time or funds and would have substantial effect on neighbor relations. Mitigation to offset adverse impacts would be needed with success not assured.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.

**Regulations and Policies:** Current laws and policies require the consideration of impacts on park neighbors.

Desired Condition	Source
Public participation in planning and decision-making will ensure that the Park Service fully understands and considers the public's interests in the parks, which are part of their national heritage, cultural traditions, and community surroundings. The Service will actively seek out and consult with existing and potential visitors, neighbors, and people with traditional cultural ties to park lands, scientists and scholars, concessionaires, cooperating associations, gateway communities, other partners, and government agencies. The Service will work cooperatively with others to improve the condition of parks; to enhance public service; and to integrate parks into sustainable ecological, cultural, and socioeconomic systems.	NPS Management Policies
In the spirit of partnership, the Service will also seek opportunities for cooperative management agreements with state or local agencies that will allow for more effective and efficient management of the parks, as authorized by §802 of the National Parks Omnibus Management Act of 1998.	NPS Management Policies

**Impacts of Alternative A – No Action**

**Impact Analysis:** Suppression of wildland fires would continue under Alternative A, and the consequences over the long-term would be an increase in fuels and the potential for higher intensity wildland fires. However, with the relatively low fire occurrence in the monuments, and the current condition classes of the vegetation, the probability of such fires crossing boundaries and threatening adjacent private land ownerships and other agency lands would be relatively low except for periods of extreme fire danger. Related to this would be the sporadic but negligible effect on tribal member employment as wildland firefighters.

The lack of fuel management strategies under Alternative A would also continue to constrain any opportunities for accomplishing mutual fuels management objectives with the adjacent Coconino National Forest. Maintaining open and timely communications with area residents, agencies, and tribes is an important mitigating factor in Flagstaff Area National Monuments' fire management planning and operations. Newsletters, press releases, and interpretive messages all

contribute to keeping neighbors informed and involved, and help to keep impacts to park neighbors to a minimum. However, without an updated FMP that has AMR and fuel thinning options, indirect impacts on adjacent owners would potentially be adverse, localized, of minor to moderate intensity, and of long-term duration.

*Cumulative Effects:* A private in-holding exists in Walnut Canyon National Monument, a tract of 290.84 acres. With improved access and available water planned for this tract, it will have development potential as residential and/or commercial property. Although much of the tract is steep canyon slope or canyon bottom, the rims of the canyon offer acceptable building sites. If in the reasonably foreseeable future this development is realized, there would be adverse impacts of minor to moderate intensity on park neighbors resulting from the elevated human-caused wildland fire risk under Alternative A. The same basic effect would hold true for Coconino National Forest lands surrounding Sunset Crater Volcano National Monument as recreation visits increase over time. A neighboring landowner is proposing to donate lands to Wupatki National Monument, which would increase joint fire management opportunities with the Forest Service. However, this would not contribute substantially to cumulative beneficial impacts. Overall, cumulative impacts to park neighbors would be long-term, minor to moderate, and adverse.

*Conclusion:* Alternative A (No Action) would result in indirect, adverse, localized, long-term impacts of minor to moderate intensity on park neighbors. Cumulative impacts would also be long-term, minor to moderate, and adverse.

#### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Under Alternative B, many of the wildland fire risks to park neighbors could be mitigated along high-priority boundaries of the Flagstaff Area National Monuments by cooperative management of fuels and wildland fires under the multi-year treatment schedule. This lessening of risks to neighbors would result in indirect, long-term, localized, and minor to moderate beneficial impacts to the monuments and adjacent landowners. NPS employment of tribal firefighters may increase somewhat, but the extent would depend on such factors as projects approval and funding.

*Cumulative Effects:* Cumulative adverse effects on park neighbors would be similar to Alternative A, but with substantial benefits related to implementation of the new FMP. Alternative B would result in negligible to minor beneficial cumulative impacts with respect to accomplishment of mutual objectives under a proposed FMP. The same would hold true for Coconino National Forest lands surrounding Sunset Crater Volcano National Monument and Wupatki National Monument. Overall, cumulative impacts to park neighbors would be long-term, minor, and adverse.

*Conclusion:* Alternative B (Preferred Alternative) would result in indirect, minor to moderate, long-term, and localized beneficial impacts to relationships with adjacent landowners and neighbors. Cumulative impacts would be long-term, minor, and adverse.

## **VISITOR EXPERIENCE**

### ***Affected Environment***

The scenic qualities of Walnut Canyon National Monument cannot be divorced from other values. Nevertheless, the stunning views provided by the canyon continue to have importance to visitors and local residents. For as long as Euro-American settlers have lived in the Flagstaff area, Walnut Canyon has been a scenic and recreational attraction for local residents and out-of-town visitors alike (USDI 2001). This attraction continues to the present day, enhancing the visitor experience.

Visitors travel to Walnut Canyon National Monument via a 3-mile paved road from Interstate 40, just east of Flagstaff. The access road ends at a parking lot next to the visitor center. Visitor orientation and resource education are provided at the visitor center and the self-guided Island Trail and Rim Trail. The 9/10 mile Island Trail descends 185 feet into the canyon and is the best way to experience the cliff dwellings. The fairly level 7/10 mile Rim Trail passes pit-house and surface pueblo sites, and provides a scenic view of the canyon. Various interpretive programs are offered as NPS staffing permits, including guided small group tours to the Ranger Cabin and the Ranger Ledge cliff dwellings immediately west of the visitor center area. General public access is restricted to established trails, roadways, and developed facilities. The remainder of the monument has long been closed to unguided entry to protect archeological features.

Walnut Canyon National Monument is open to the public during the day and closed at night. Between 1992 and 2002, annual public use ranged as low as 102,839 visitors and as high as 157,987 visitors. Monthly visitation typically remains below 5,000 during December, January, and February, when daytime temperatures remain very cold and ice typically accumulates. Monthly visitation typically exceeds 10,000 from March through October, and typically exceeds 15,000 from May through August. Peak visitation occurs in June and July.

Visitor use at Wupatki National Monument is focused at the Visitor Center, four of the park's primary archeological sites (Wupatki, Wukoki, Citadel, and Lomaki Pueblos), and the picnic/view point located at Doney Mountain on Forest Service land. Thousands of archeological sites are protected within the monument, and the four major pueblos (listed above) have been developed for self-guided interpretation and "hardened" for visitation. The Crack-in-the-Rock area and other backcountry sites are visited via ranger-led programs. The rest of the park is closed to visitation. For many visitors, Wupatki is largely a drive-through experience.

Between 1992 and 2002, annual public visitation ranged from 217,466 to 267,090. Visitation is very low during the winter months. Peak visitation and associated traffic occur primarily during June, July, and August, typically at or about 30,000 visitors each month (NPS 2005).

At Sunset Crater Volcano National Monument, most NPS visitor-support facilities, including the Visitor Center, employee housing, maintenance shops, and utilities, are located ½ mile west of the monument boundary on 16 acres of the Coconino National Forest. The Bonito Campground, operated for the Coconino National Forest by a concession contractor, is located near the NPS operations area. Visitor-use is concentrated at: (1) the Visitor Center and the Bonito Campground area outside the monument; (2) the Lenox Crater and Lava Flow Trails around the southern margin of the Bonito flow and the western flank of Sunset Crater; and, (3) the Cinder

Hills Overlook at the northeastern base of the Sunset Crater. The ¾ mile Lava Flow Trail is located 2 miles east of the Visitor Center along the Scenic Loop Road, and is the best way to experience the unique volcanic features of the monument. Another ¼ mile trail ascends Lenox Crater. The Cinder Hills Overlook, a short spur-road near the east boundary, provides a scenic view of Sunset fissure eruptive features on the Coconino National Forest. In accordance with the NPS mission and policies, Sunset Crater Volcano National Monument is managed to protect unique geologic features for future generations, and to provide for their public enjoyment. Geologic features in proximity to visitor-use areas include lava flow surfaces, spatter cones, steep cinder slopes, and the ice cave.

The monument is open to the public during the day and closed at night. Between 1993 and 2002, annual public visitation ranged as low as 150,664 visitors and as high as 522,963 visitors. Visitation is very low during the months of December, January, and February, when daytime temperatures remain very cold and ice typically accumulates. Visitors travel to the monument from U.S. Highway 89 (US-89) via the paved Wupatki-Sunset Crater Volcano Scenic Loop Road. Local traffic on the Scenic Loop to surrounding Coconino National Forest Land, Navajo Indian Reservation, and privately-owned lands has steadily increased since the road was built. The road is used mostly during the day by visitors to the two national monuments and the Coconino National Forest, and commuters from neighboring private lands. Peak visitation and associated traffic occur primarily during daytime during the growing season.

Since 1998, general public access has been restricted to established trails, roadways, and developed areas to protect the unique geologic features. Backcountry use is limited primarily to NPS resource protection patrols, natural and cultural resource inventory and monitoring, fire management, and academic research. Access may also be permitted for other special uses, such as educational activities. There is occasional unauthorized off-road vehicle use on Sunset Crater, and unauthorized hiking north of the Bonito Lava flow and in the cinder hills at the northeast corner of the monument.

**Methodology:** The following threshold and duration criteria are identified for visitor experience.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Visitor Experience</b>	A change to a visitor aesthetic or recreational experience would occur, but the change would be so small that it would not be of any measurable or perceptible effect.	A change to a visitor aesthetic or recreational experience would occur, but the change would be small, and, if measurable, would be a small and localized effect.	Measurable change to a visitor aesthetic or recreational experience may occur; mitigation to offset adverse impacts would be simple and generally effective.	A severe change or exceptional benefit to visitor aesthetic or recreational values would occur. The change would have a substantial effect, and mitigation to offset adverse impacts would not be assured.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.

**Regulations and Policies:** Current laws and policies require that the following conditions be achieved in the parks regarding visitor experience.

Desired Condition	Source
Visitors understand and appreciate park values and resources and have the information necessary to adapt to park environments; visitors have opportunities to enjoy the parks in ways that leave park resources unimpaired for future generations.	NPS Organic Act; monuments' enabling legislation; NPS Management Policies

**Impacts of Alternative A – No Action**

*Impact Analysis:* Under Alternative A, wildland fires could occur, especially in areas where fuels would continue to build up over time. Aggressive suppression of wildland fires would continue. Depending on the location of a wildland fire, visitor uses may be temporarily disrupted, but the disruption would probably not extend beyond a few days due to the rapid suppression response. Temporary closures to restrict visitor access would ensure visitor safety. Indirect adverse effects, which would include the presence of smoke and burned areas within views, could result in initial “negative” responses for visitors and area residents as a result of alteration of scenes, visual, and auditory qualities resulting from suppression operations. These would include blackened or defoliated trees and shrubs, ash fields, stumpholes, and possibly the general sense of destruction to the average visitor. Vehicle tracks, unnatural coloration from retardants, and handline may also be visible prior to completion of burned area rehabilitation efforts. Both during and following incidents, levels of noise (auditory impacts) would likely produce negative responses of varying degrees. Most burned areas would “green up” during the same season or, at the latest, the next spring, and some burned areas may be rehabilitated, depending on the extent of impacts and the location with respect to visitor exposure. The direct and indirect adverse impacts of Alternative A on visitor experiences would be localized, minor, and short-term (for suppression activities) to negligible to minor, adverse and long-term (for visual effects following a fire).

*Cumulative Effects:* Cumulative effects that may impact the visitor’s aesthetic and auditory experience would include adjacent National Forest recreation site background noise, road access restrictions resulting from regional fire hazard or wildland fire incidents, increased visitation, and noise and visual effects from widening of US 89 north from Flagstaff to the Sunset Crater Volcano National Monument and Wupatki National Monument entrances. Cumulative effects of these actions, along with the effects related to Alternative A, would be short- and long-term, localized, minor, and adverse.

*Conclusion:* Alternative A (No Action) would result in an adverse, localized, short-term effects of minor to moderate intensity, and negligible to minor, long-term, adverse effects on the aesthetic and auditory qualities of the visitor experience. Cumulative impacts would be short- and long-term, localized, minor, and adverse.

**Impacts of Alternative B – NPS-preferred**

*Impact Analysis:* With the preferred alternative, there would be less aggressive suppression and the associated disturbance of these activities, but there would be a minor increase in smoke production and temporarily blackened acres from (a) potential small increases in burned acreage by wildland fires managed under an appropriate management response and (b) prescribed burns.

Smoke production would be of very limited duration in these fuels – usually a few hours at most in grass and shrub communities and a few days in forested communities. Blackened areas usually green up within weeks to months (and no later than the following spring).

Direct adverse impacts may include temporary displacement of some visitor activities during prescribed burn operations, but that effect should be limited to a few hours each year. Other direct adverse impacts of increased burning on visitor experiences would include smoke in scenic views, temporary restrictions in access to some areas, and the presence of blackened areas within natural vistas. The potential direct adverse impact to visitor experiences would be localized, short-term, and negligible to minor. The low frequency and small size of these fires would further reduce the potential adverse impacts.

The indirect effect of the preferred alternative would be the presence of blackened areas in near to mid-range views for the remainder of the growing season. Some visitors might find this displeasing. Others may not be adversely affected by burned areas, and the presence of fire, smoke, and blackened areas would present an opportunity for interpretation of natural values and processes that may provide a minor, long-term, beneficial impact. The indirect effects of this portion of the preferred alternative would be localized, short-term, minor, and adverse or beneficial.

To mitigate any potential short-term impacts to visitor and public enjoyment, project plans would contain actions designed to minimize visual impacts along entrance roads, vistas, trails, and transition areas between developed and undeveloped areas. Appropriate screening, feathering of vegetation manually, and burn prescriptions that protect visual values through low-intensity surface fires are mitigating actions that would be considered. Informational and interpretive messages to inform visitors and public about the role of fire and its importance in maintaining sustainable ecosystems would also be used.

Mechanical removal of hazardous fuels would be conducted (a) during periods of low visitation or (b) in areas of restricted public access and managed to create little visual impact or change in scenic vistas. Visitor access to the monuments would not be curtailed; consequently there would be no direct adverse impacts to visitors. Indirect adverse effects would include the sound of chainsaws for very short periods of time and a somewhat changed scene as fuels near the Visitor Centers and other facilities as fuels are reduced. Therefore, the adverse direct impacts of the manual thinning on visitor experiences would be short-term, localized, and minor.

Fewer restrictions on visitor access to natural scenery and visual values would occur because of reduced high-severity wildland fire potential over the long-term as fuels management objectives were met. With the return of planned prescribed fire under the proposed action, visitors would experience a more naturally functioning ecosystem and thus visual quality. Therefore, as fuels reduction and restoration objectives are met under a treatment schedule, the direct adverse impacts of the preferred alternative would be localized, short-term, and minor. The indirect impacts would be short-term to long-term, localized, negligible to minor, and adverse to beneficial. A key mitigation factor is a continuing program of visitor education on the beneficial aesthetic impacts of fire on the landscape.

*Cumulative Effects:* Cumulative impacts to visitor experience would be similar to those described for Alternative A, with added long-term benefits of the reduced potential for higher intensity fires.

Overall, the impacts of Alternative B, added to other actions affecting visitor experience, would result in short- and long-term, localized, minor, and adverse cumulative impacts.

*Conclusion:* Alternative B (Preferred Alternative) would have effects on visitor experience similar to Alternative A over the short-term with minor, localized adverse impacts, but would result in a minor to moderate, localized, indirect, beneficial impacts to visitor experience over the long-term as resource management objectives are met. Cumulative impacts would be short- and long-term, localized, minor, and adverse.

## **PARK OPERATIONS**

### ***Affected Environment***

The staff of the Flagstaff Area National Monuments is relatively small, and fire management currently is largely a collateral duty. Without an approved FMP, there would not be sufficient funds for dedicated fire management personnel. As a result, wildland fire incidents and related operations require that existing staff be called from regular duties to provide needed emergency services such as traffic control, fire suppression, logistics support, etc. Most wildland fire incidents occurring in the monuments are small in size and not extremely complex. However, when larger incidents do occur, impacts to the staff are high for much of the incident duration and often “backfill” (i.e., replacement) positions are not available to fill in for regular staff.

*Methodology:* The following threshold and durations criteria are identified for park operations.

<b>Impact Topic</b>	<b>Negligible</b>	<b>Minor</b>	<b>Moderate</b>	<b>Major</b>	<b>Duration of Impact</b>
<b>Park Operations</b>	Park operations would not be affected or the effect would be at or below the lower levels of detection, and would not have an appreciable effect on park operations.	The effect would be detectable, but would be of a magnitude that would not have an appreciable adverse or beneficial effect on park operations. Mitigation to offset adverse impacts would be relatively simple and successful	The effect would be readily apparent and would result in a substantial adverse or beneficial change in operations in a manner noticeable to staff and the public. Mitigation would probably be necessary to offset adverse impacts and would likely be successful.	The effect would be readily apparent and would result in a substantial adverse or beneficial change in park operations in a manner noticeable to staff, the public and be markedly different from existing operations. Mitigation to offset adverse impacts would be needed, would likely be expensive, and success could not be guaranteed.	Short-term would refer to the duration of a fire management incident. Long-term refers to duration extending beyond the specific incident.

*Regulations and Policies:* Current laws and policies require that the following conditions be achieved in the parks regarding park operations.

<b>Desired Condition</b>	<b>Source</b>
Park operations continue as uninterrupted as possible by emergency fire management operations.	DO-18 and RM-18, Wildland Fire Management policies, National Park Service.

### ***Impacts of Alternative A – No Action***

*Impact Analysis:* Under Alternative A, the monuments would continue to aggressively suppress all wildfires, and no program of fuels management would be initiated. Short-term, direct, adverse impacts of minor intensity would occur in form of unscheduled demands on routine internal operations and personnel initially assigned to incidents. As incidents grow in size and complexity, normally an incident management team would assume management for the Superintendent under an Agency Administrator's Delegation of Authority. Impacts to operations would be negligible for some staff personnel, but additional staff demands during post-fire management would result in adverse, localized, direct, and minor impacts over the long-term as the incident transitions back to the Flagstaff Area National Monument administration. Mitigation for unwanted wildland fire impacts on park operations, because of the emergency nature of the incident, would be identified as the situation warrants. This would include making available temporary “backfill” positions to assist with park operations.

*Cumulative Effects:* Other demands on park operations staff, along with increased visitation and other agency suppression actions that occur during the summer fire season, would result in cumulative impacts on NPS operations. Even with the mitigating effects of added seasonal staff and available suppression resources, the impacts related to fire program, plus additional impacts of other actions, would result in long-term, minor adverse cumulative impacts on park operations.

*Conclusion:* Alternative A (No Action) would result in an adverse, short- and long-term, localized, direct, and minor impacts on park staff and operations during and after wildland fire incidents. Cumulative impacts would be long-term, minor, and adverse.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Alternative B would include a multi-year treatment schedule that would result in increased demand on park staff. However, Alternative B and the proposed FMP would provide justification for funding in areas of planning and project implementation. Normally funding would provide resources necessary so as to minimally impact normal operations. Possible temporary disruptions in routine operations would result from operations involving prescribed fires and wildland fires managed under AMR, resulting in short-term, minor adverse impacts. However, beneficial, indirect, localized, and minor impacts would be experienced in NPS staff operations as the potential for large emergency management incidents diminishes.

Mitigation measures would be designed primarily to minimize disruptions to the Flagstaff Area National Monuments’ visitor services, residents, businesses, and internal management programs from prescribed fire and non-fire treatments. Short-term inconveniences in operations from temporary road access restrictions and slow traffic would be mitigated largely with planning, timely notifications, and adequate “backfill” personnel availability. Adequate long-term funding levels would also help reduce undesirable effects on park operations.

Vehicle access in support of project work using existing roads would result in negligible adverse impacts. With added, dedicated fire staff, impacts on park operations would likely be beneficial, indirect, and minor over the long-term.

*Cumulative Effects:* Cumulative impacts would be similar to Alternative A. The impacts to park operations from Alternative B, when considered with other park management actions, would result in long-term, minor adverse cumulative to park operations.

*Conclusion:* Alternative B (Preferred Alternative) could result in short-term, minor, adverse impacts to NPS staff, but would also provide indirect, long-term, minor, beneficial impacts on park operations as treatment objectives are accomplished under the preferred alternative. Cumulative impacts would be long-term, minor, and adverse.

## **WILDERNESS CHARACTER**

### ***Affected Environment***

There is no officially designated wilderness or proposed wilderness in any of the three monuments. However, in 1998, most of the roadless areas within Wupatki National Monument were closed to public access to protect the wilderness character and resources therein. A formal legal action was brought against the NPS by the Wilderness Society in 2000. Among the charges is the Service's lack of mandated wilderness suitability studies.

In response, the NPS has identified three parcels within the boundaries of Wupatki National Monument as roadless areas greater than 5,000 acres, and are thus eligible under the Wilderness Act (1964) for recommended wilderness designation. Suitability studies must be completed for these parcels:

- Big Hawk Valley, 6,154 acres
- Antelope Prairie/Crack in the Rock, 11,747 acres
- Wupatki Basin, 8,746 acres

All alternatives considered may result in transient impacts to wilderness character of this area. These may include the use of aircraft to detect and/or monitor wildland fires, as well as noise and on the ground activity from fire personnel. However, fire operations in the Wupatki roadless areas would consider preservation of wilderness character and experiences in planning and implementation. Planned activities would be conducted following the minimum requirement concept, similar to that used for mitigating potential impacts in designated wilderness.

***Methodology:*** Wilderness characteristics were derived from the Wilderness Act and were evaluated and compared based on the alternatives. Application of the minimum requirement process is integrated into all alternatives. The following threshold criteria are identified for wilderness character.

Impact Topic	Negligible	Minor	Moderate	Major	Duration of Impact
<b>Wilderness Character</b>	A change in the wilderness character could occur, but it would be so small that it would not be of any measurable or perceptible consequence.	A change in the wilderness character and associated values would occur, but it would be small and, if measurable, would be localized. Mitigation would not be necessary.	A change in the wilderness character and associated values would occur. It would be measurable, but localized. The visitor would be aware of the effects associated with the alternative and would likely be able to express an opinion about the changes. Mitigation including education measures would probably be necessary to offset adverse effects and would likely be successful.	A noticeable change in the wilderness character and associated values would occur. It would be measurable, and would have a substantial or possibly permanent consequence. The change would have substantial and possibly permanent effects on wilderness characteristics. Mitigation to offset adverse effects would be needed with success not assured.	Short-term refers to a period of 1-3 years. Long-term refers to a period longer than 3 years.

**Regulations and Policies:** Current laws and policies require that the following conditions be achieved regarding the protection of wilderness character.

Desired Condition	Source
<p>All fire management activities within wilderness, including the categories of designated, recommended, potential, proposed, and study areas are conducted in keeping with minimum requirement protocols.</p> <p>Administrative use of motorized/mechanical equipment or transport in any area (stated above) within Wupatki National Monument are authorized only:</p> <p><i>_ if determined by the superintendent to be the minimum requirement needed by management to achieve the purposes of the area as wilderness, including the preservation of wilderness character and values; or</i></p> <p><i>_ in emergency situations (search and rescue) involving the health or safety of persons actually within the area. Such management activities are conducted in accordance with all applicable regulations, policies, and guidelines, including minimum requirement protocols as practicable.</i></p>	<p>NPS Management Policies; The Wilderness Act of 1964 (16 USC 1131 et seq.); NPS Reference Manual 18 (RM-18), Wildland Fire Management; NPS Director’s Order (DO-18); Natural Resource Management Reference Manual #77; NPS Director’s Order 41 (DO-41), Wilderness Preservation and Management.</p>

### **Impacts of Alternative A – No Action**

**Impact Analysis:** Wildland fire alone would not alter the wilderness character of the area. The impacts of fire itself in the roadless areas – burned areas, blackened scenes, and new successional stages – are considered neutral or beneficial to wilderness characteristics. They should be expected in an area where the action of natural processes is encouraged. Therefore, no direct adverse effects are attributed to wildland fire itself. The impacts of fire may be considered beneficial to wilderness characteristics, since they would give evidence of the action of natural processes; these may be long-term with the establishment of young vegetation communities following fire. The potential exists for indirect adverse impacts from fire events if invasive non-native species colonize burned areas. These impacts would be localized, negligible to minor, and short-term to long-term.

Under most conditions, fires in the roadless areas of Wupatki National Monument would likely be small (<1 acre/0.4 ha). Consequently, the visitor would not be able to distinguish the areas where firefighters had worked versus the natural appearance of the area. However, suppression

of larger fires may include construction of fire lines and other disturbance, and would have a short-term, minor, adverse effect on wilderness values. Some effects may include felled or bucked trees, cut brush, and bare soil. Many fires in areas with wilderness character would be fought utilizing hand tools such as shovels and pulaskis (a hoe-axe combination tool), rather than with mechanized equipment, in order to minimize adverse impacts.

Potential direct adverse effects on wilderness characteristics would include evidence of fire suppression activities (tire tracks, firelines, aircraft use). Most of these evidences would be removed during rehabilitation concurrent with or immediately following fire suppression activities.

Temporary closures during wildland fire suppression operations to ensure visitor safety would displace some visitors, but the displacement would probably not extend beyond several hours at most. Noise from power equipment, such as chainsaws and portable pumps, may diminish wilderness character (solitude) for a few hours. Smoke from fires may restrict visibility and impact scenic views or become heavy enough to become a nuisance for short periods of time. Given the infrequency and small size of wildland fires, these direct adverse impacts of the no action alternative on wilderness characteristics would be localized, short-term, and negligible to minor.

Some impacts would be difficult to fully mitigate during fire suppression, but would be reduced through the use of MIST. Deviations from minimum requirement guidelines are acceptable when life or property is threatened. When potential damage to natural resources outweighs possible loss of life, the Superintendent may approve a deviation from these guidelines. Post-fire rehabilitation may be employed to reduce the visual and ecological impacts of large fire suppression actions. Disturbance of these areas would be for the duration of the fire activity, but would be mitigated where necessary through an approved Burned Area Emergency Rehabilitation (BAER) plan. Indirect adverse impacts of Alternative A would include a continued build-up of fuels, especially in fire-dependent vegetation communities, with a consequently increased risk of a larger, more intense wildland fire. These indirect adverse impacts on wilderness characteristics would be long-term, negligible to minor.

*Cumulative Effects:* Other factors that contribute to cumulative impacts on wilderness character include visitor use, land management activities on adjacent non-wilderness lands, and the proximity of the wilderness to populated areas. Fire management activities, vegetation removal activities, and other types of thinning projects on adjacent lands (primarily Coconino National Forest) would not measurably contribute to cumulative effects on the wilderness character of Wupatki National Monument, since no such projects are planned. Therefore, impacts to wilderness character of the area, including impacts of Alternative A, would be short and long-term, adverse and negligible to minor.

*Conclusion:* The direct and indirect impacts of Alternative A (No Action) on the wilderness character of Wupatki National Monument would be localized, short-term to long-term, adverse or beneficial, and negligible to minor. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.

The Alternative A would not produce any major adverse impacts or impairment of wilderness characteristics whose conservation is necessary to the purpose of the establishment of the park,

that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

### ***Impacts of Alternative B – NPS-Preferred***

*Impact Analysis:* Infrequent medium-scale wildfire events would be expected to occur within Wupatki (FMU-3). The preferred alternative may result in an incremental increase of acreage burned, since suppression would be done using AMR (i.e., holding fires at existing barriers rather than constructing firelines) instead of aggressive containment. There would be a minor increase in smoke production and temporarily blackened acres from potentially small increases in burned acreage by wildland fires managed under an AMR. Direct and indirect impacts of wildland fire and fire suppression would be similar to Alternative A. Thus the direct and indirect impacts on wilderness character from managing wildland fire under an appropriate suppression response would be localized, short-term to long-term, adverse or beneficial, and negligible to minor.

Wupatki National Monument falls within either WUPA-FMU-3 or WUPA-FMU-4. In FMU 3 where fire once played a role in grassland and juniper woodland, fires occurring today would not likely adversely impact wilderness character under average conditions. However, under a fire management plan that includes a ten-year treatment schedule, opportunities exist for selective protection of cultural resources at risk. In WUPA-FMU-3, manual thinning using appropriate hand-held tools would be undertaken following a minimum requirement analysis. NPS Management Policies 6.3.6 (Minimum Requirement) states: "All management decisions affecting wilderness must be consistent with a minimum requirement concept." The minimum requirement process is a method for assessing whether a proposed wilderness-related administrative activity is necessary and to identify the minimum tool for effectively carrying out the activity. The process first involves a determination as to whether a proposed management action is appropriate and necessary for the administration of the area as wilderness and does not pose a significant impact to its wilderness resources and character. If the project is found to be appropriate and necessary, then secondly the management method (tool or technique) is selected that causes the least amount of impact to the physical resources and character of wilderness. With the use of minimal tools, the potential impact to wilderness character following such projects would vary from negligible to minor, direct, adverse, short-term and localized to the immediate site. Impacts would include short periods of noise and possibly exposed stumps where vegetation was removed. Vegetation would be scattered in the immediate area, such as for erosion control in drainages and arroyos.

Prescribed fire in either WUPA-FMU-3 (or WUPA-FMU-4) is not proposed under the 10-year plan (Appendix A).

*Cumulative Effects:* The cumulative impacts of Alternative B would be similar to Alternative A, but with more restoration and maintenance of natural character of land over time. Other factors that contribute to cumulative impacts on wilderness character include visitor use, land management activities on adjacent non-wilderness lands, and the proximity of the wilderness to populated areas. Fire management activities, vegetation removal activities, and other types of thinning projects on adjacent lands would contribute to localized cumulative impacts on the wilderness character in the Wupatki National Monument roadless areas. Overall, cumulative impacts to wilderness character would be short- and long-term, negligible to minor, and adverse.

*Conclusion:* Under Alternative B (Preferred Alternative), adverse impacts to the wilderness character of Wupatki National Monument would be negligible to minor, short-term and localized as fuels are actively managed. However, long-term beneficial effects would be indirect, localized, and minor as fire is restored and wilderness character is maintained. Cumulative impacts would be short- and long-term, negligible to minor, and adverse.

The preferred alternative would not produce any major adverse impacts or impairment of wilderness characteristics whose conservation is necessary to the purpose of the establishment of the park, that are key to the natural or cultural integrity of the park, or that are actions identified as a management goal of the park.

# CONSULTATION/COORDINATION

## Public Scoping

From February 15 through July 30, 2003, the parks scoped the fire management plan with agencies, tribal governments, and potentially affected/interested public. The parks informed the public about the plan through a newsletter that outlined the parks' fire management goals and objectives and proposed alternatives. The public was invited to comment on or express any concerns about the proposal. Seventeen individuals, agencies, and interested groups commented on the plan. Appendix C includes a summary of the comments received during scoping along with a discussion of how the comments were considered in the development of this EA or will be considered in the development of the FMP.

## Review of the Environmental Assessment

The EA/AEF will be released to the public for a 30-day comment and review period. The document will also be available at the Flagstaff Area National Monuments' Visitor Centers; notices about the availability of the document will be placed in public newspapers; and press releases regarding the EA/AEF will be sent to the local media. The EA will be available for review and comment on the National Park Service Planning, Environment and Public Comment (PEPC) web page <http://parkplanning.nps.gov>. The NPS will review and consider all comments received. Following a review of public comments, the NPS will decide whether it can select an alternative and proceed with a finding of no significant impact, or whether it must prepare a notice of intent to prepare an Environmental Impact Statement for the fire management plan.

The EA/AEF will be sent to the Arizona State Historic Preservation Office for review and comment in partial completion of Section 106 of the NHPA.

A Biological Assessment, based upon the Preferred Alternative, will be submitted to the USFWS in compliance with Endangered Species Act, Section 7 consultation requirements. Any additional measures resulting from USFWS consultation to conserve protected species and designated critical habitat will be incorporated into the FMP.

## List of Preparers

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Paul Whitefield	Natural Resources, IDT Member	Natural Resource Spec.	Flagstaff Area National Monuments
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Ian Hough	Cultural Resources	Archeologist	Flagstaff Area National Monuments
John Bland	Fire Management, IDT Member	Park Ranger (Protection)	Flagstaff Area National Monuments
Eva Long	Contracting Officer's	Compliance Specialist	Intermountain Regional

<i>Name</i>	<i>Role on Project</i>	<i>Title</i>	<i>Office</i>
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John Lissoway	Project Manager/Planner, IDT Member	Partner/Planner	Wildland Fire Associates, Rangely, Colorado
Nancy Van Dyke	Technical Review and Edit	Senior Consultant	URS Corporation Denver, Colorado

## List of Principal Contributors

<i>Name</i>	<i>Role on Project</i>	<i>Title</i>	<i>Office</i>
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Palma Wilson	Administrative Oversight	Superintendent	Flagstaff Area National Monuments
Kim Watson	Park Information, IDT Member	Former Chief Ranger	Flagstaff Area National Monuments
Al Remley	Cultural Resources, IDT Member	Archeologist	Flagstaff Area National Monuments
Todd Metzger	Administrative Oversight, IDT	Chief, Resources Management	Flagstaff Area National Monuments
Michael Schneegas	Park Information	Facility Manager	Flagstaff Area National Monuments
Nancy Schultz	Park Information	Administrative officer	Flagstaff Area National Monuments
Margaret Rasmussen	Park Information	Budget Analyst	Flagstaff Area National Monuments
Carol Kruse	Facilitator	Interpretive Specialist	Flagstaff Area National Monuments
Dan Oltrogge	Fire Management, IDT Member	Chief, Fire & Aviation	Grand Canyon NP
Kathy Schon	Facilitator, IDT Member	Former Fire Ecologist	Saguaro NP

## List of EA Recipients

The following agencies, tribes, and organizations will be notified when the EA/AEF is available for public review.

### Federal Agencies

Advisory Council on Historic Preservation  
Environmental Protection Agency, Region 9  
Federal Highway Administration  
US Army Corps of Engineers

US Department of Agriculture  
Forest Service  
Coconino National Forest, Mormon Lake District  
Coconino National Forest, Peaks District  
Kaibab National Forest  
Prescott National Forest  
Tonto National Forest  
National Resource Conservation Service – Soil Conservation Service  
Office of Public Affairs

US Department of the Interior  
National Park Service  
Canyon De Chelly National Monument  
Glen Canyon National Recreation Area  
Grand Canyon National Park  
Guadalupe Mountains National Park  
Hubbell Trading Post NHS  
Montezuma Castle National Monument  
Navajo National Monument  
Organ Pipe Cactus National Monument  
Petrified Forest National Park  
Pipe Springs National Monument  
Tonto National Monument  
Walnut Canyon National Monument  
US Fish and Wildlife Service

US Geological Survey  
US Postal Service  
US Representative JD Hayworth  
US Representative Rick Renzi  
US Representative John Wettaw  
US Senator John McCain  
US Senator Jon Kyl

**Tribes/Pueblos and Native American Interests**

Havasupai Tribe  
Hopi Tribe  
Hualapai Tribe  
Kaibab Paiute Tribe  
Navajo Nation  
Cameron Chapter  
Leupp Chapter  
Tuba City Chapter  
Bodaway/Gap Chapter  
Navajo Tribal Ranchers  
Pueblo of Zuni  
San Juan Southern Paiute Tribe  
Tonto Apache Tribe

White Mountain Apache Tribe  
Yavapai Prescott Indian Tribe  
Yavapai-Apache Nation  
Zuni Heritage and Historic Preservation Office

### **State Agencies**

Arizona Governor's Office  
Arizona Department of Environmental Quality  
Arizona Department of Mines and Minerals  
Arizona Department of Public Safety  
Arizona Department of Transportation  
Arizona Department of Water Resources  
Arizona Game and Fish Commission  
Arizona Game and Fish Department  
Arizona State Land Department  
Arizona State Historic Preservation Officer  
Arizona State Parks  
Homolovi Runis State Park  
Red Rock State Park

### **Local Agencies**

City of Flagstaff  
City of Sedona  
Coconino County Government  
Doney Park  
Emery County  
Kachina Village Fire Department  
Keep Sedona Beautiful Environmental Quality Commission  
Mountaineer Fire Department  
Ponderosa Fire Advisory Council  
Timberline-Fernwood Fire Department  
Citizens Utilities/Citizens Arizona Gas  
Northern Arizona Council of Governments  
Sedona Public Library  
The Arboretum at Flagstaff  
Flagstaff Public Library  
Coconino Community College  
Bellemont Baha'I School  
Cline Library – NAU  
Colorado Plateau Research Station NAU  
Darmstadt Elementary School  
Northern Arizona University  
Navel Observatory  
Lowell Observatory  
Concordia College

Prescott College  
Sedona Public Library  
The Arboretum at Flagstaff  
University of Arizona College of Agriculture

**Regional/Local NGOs**

Affordable Housing Coalition  
Arizona Bowhunters  
Arizona – Southern California Rocky Mountain Elk Foundation  
Arizona Wildlife Federation  
Arizona Cattlemen’s Association  
Arizona Riparian Council  
Arizona Snowmobile Association  
Arizona State Association of four wheel Drive Clubs  
Flag Hiking Club  
Flagstaff Riding Club  
Forest Conservation Council  
Forest Guardians  
Friends of Walnut Creek  
Grand Canyon Trust  
Grand Canyon Wildlands Council  
Horse Trails Coalition  
Kentucky Wolf Information Center  
Kampground Owner’s Association  
Doney Park Interest Groups  
Maricopa Audubon  
Museum of Northern Arizona  
Northern Arizona Audubon Society  
National Parks and Conservation Association  
National Wildlife Federation  
People for the West  
Prescott Climbers Coalition  
Sierra Club  
Shriner’s Club  
Southwest Parks and Monuments  
Southwest Center for Biodiversity  
Southwest Forest Alliance  
The Nature Conservancy  
The Wilderness Society  
Trust for Public Land  
Wildlife Society

**Private**

A&S Distributing  
Absolute Bikes

Andy's Body Shop  
Arizona Rough Riders Four Wheel Drive Club  
Aspen Sports  
Access Fund  
BASS  
Babbit's Backcountry Outfitters  
Babbitt Ranches  
Canyon Country Outfitters  
CO Bar Livestock LTD  
Coconino Sportsmen  
DBA Hart Ranch  
DNA Legal Services  
Ducks Unlimited Inc  
Earthlight  
ENSR Consulting and Engineering  
Federal Land Exchange Inc  
Flagstaff KOA  
Flagstaff Medical Center  
Flagstaff Mountain Guides  
Flagstaff RV Sales  
Flying Heart Barn  
Flagstaff Mall  
Hanks Trading Post  
Harper's Ferry Center  
Hart Prairie  
High Desert Investments  
Hitchin' Post Stables  
Infam Associates  
Lake Mary Fishing Boat Rentals  
Lockett Ranch Inc  
Loose Spoke  
Manterola Sheep Company  
McCoy Motors  
Michelbach Ranch  
Monte Vista Marine  
Mormon Lake Bugle  
Mormon Lake Lodge  
Morrison Brother's Ranch  
Mountaintop Honey  
Mountain Man Events  
Mountain View Pediatrics  
Northland Yamaha-Kawasaki Motorsports  
Page Land and Cattle Company  
Peace Surplus Outdoor Store  
Ponderosa Outdoor/Sled Dog Inn  
Popular Outdoor Outfitters

Precision Pine and Timber  
Realty Specialists  
Ruff's Sporting goods  
Ryley, Carlock, and Applewhite  
Sanderson Ford  
Sinagua Trading Post  
Smith Contracting Inc  
SWCA Inc  
Teton Mountain Bike Tours  
Total Timber  
The Edge  
Vertical Relief  
Wells Fargo  
Windmill Ranch  
Native Plant and Seed

**Media**

Arizona Daily Sun  
Arizona Republic  
KAFF/KFLG FM  
KMGH FM  
KNAU  
KNAZ-TV  
KVNA AM and FM  
Navajo Times  
Navajo-Hopi Observer  
Red Rock News

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## GLOSSARY

The following is a list of common terms and definitions found in the Wildland and Prescribed Fire Management Policy, Implementation Procedures Reference Guide. (NIFC, Boise, ID, June 1998).

***Appropriate Management Response (AMR).*** Specific actions taken in response to a wildland fire to implement protection and fire-use objectives.

***Fire Management Plan (FMP).*** A strategic plan that defines a program to manage wildland and prescribed fires and documents the fire management program in the approved land-use plan. The plan is supplemented by operational plans such as preparedness plans, preplanned dispatch, prescribed fire plans, and prevention plans.

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

***Fire Regime.*** The fire regime classification system is used to characterize the “personality” of a fire in a given vegetation type, including the frequency that the fire visits the landscape, the type of pattern created, and the ecological effects. The following natural fire regimes are arranged along a temporal gradient from the most frequent to the least frequent fire return interval.

Fire Regime	Fire Frequency	Fire Effect to Dominant Vegetation
Fire Regime I	0-35 Years	Low severity
Fire Regime II	0-35 Years	Stand replacement
Fire Regime III	35-100+Years	Mixed severity
Fire Regime IV	35-100+Years	Stand replacement
Fire Regime V	200+Years	Stand replacement

***Fire Regime Condition Class (FRCC).*** A classification of the amount of departure from the natural fire regime.

### Condition Class 1

- The historic disturbance regime is largely intact and functioning (e.g., has not missed a fire return interval).
- The potential intensity and severity of fire are within historic range.
- The effects of disease and insects are within historic ranges.
- The hydrologic functions are within normal historic range.
- The vegetation composition and structure are resilient to disturbances.
- Nonnative species are not currently present or are present to limited extent.

- The risk of loss of key ecosystem components is low.

### **Condition Class 2**

- Moderate alterations to historic disturbance regime are evident (e.g., missed one or more fire-return intervals).
- The effects of disease and insects pose an increased risk of loss of key community components.
- Riparian areas and associated hydrologic function show measurable signs of adverse departure from historic conditions.
- The vegetation composition and structure are shifted toward conditions less resilient to disturbances.
- Populations of nonnative species may have increased, increasing the risk of further increases following disturbance.

### **Condition Class 3**

- The historic disturbance regime is significantly altered; historic disturbance processes and effects may be precluded (e.g., missed several fire return intervals).
- The effects of disturbance (fire, insects, disease) may cause significant or complete loss of key community components.
- Hydrologic functions may be adversely altered; high potential for increased sedimentation and reduced stream flows.
- Invasive species may be common and, in some cases, the dominant species on the landscape; disturbance will likely increase both the dominance and geographic extent of these invasive species.
- Highly altered vegetation composition and structure predispose community to disturbance events outside the range of historic variability; disturbance may have effects not observed/measured before.

**Hectare.** A metric unit of land area equivalent to approximately 2.47 acres.

**Initial Attack.** An aggressive suppression action consistent with firefighter and public safety and values to be protected.

**Manual Fuels Reduction (or treatment).** Manipulation or removal of fuels with handtools and/or chainsaws to reduce the likelihood of ignition and/or lessen potential for damage and resistance to control. Methods include, but are not limited to, lopping, piling and burning, thinning, and hand removal.

**Mechanical Fuels Treatment.** Manipulation or removal of fuels with machinery to reduce the likelihood of ignition and/or lessen potential damage and resistance to control. Methods include, but are not limited to chipping, felling, limbing, crushing, lopping, and removing.

**Minimum Impact Management Techniques (MIMT).** The application of strategy and tactics that effectively meet suppression objectives with the least environmental, cultural, and social impacts.

**Minimum Impact Suppression Techniques (MIST).** The use of the minimum amount of forces necessary to effectively achieve the fire management protection objectives consistent with land and resource management objectives.

**Minimum Impact Prescribed Burn Techniques (MIRxT).** Tactics identified to reduce the degree of long-term environmental impacts associated with prescribed burning operations.

**Mitigation.** Actions taken with the objective of reducing impacts. Mitigating actions may be

- avoiding the impact altogether by not taking a certain action or parts of an action;
- minimizing impacts by limiting the degree or magnitude of the action and its implementation;
- rectifying the impact by repairing, rehabilitating, or restoring the affected environment;
- reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and
- compensating for the impact by replacing or providing substitute resources or environments.

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

**Prescribed Fire.** Any fire ignited by management actions to meet specific objectives. A written, approved prescribed fire plan must exist, and NEPA requirements must be met before ignition.

**Prescription.** Measurable criteria that define conditions under which a prescribed fire may be ignited, guide selection of AMRs, and indicate other required actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social, or legal considerations.

**Values to Be Protected.** Include property, structures, physical improvements, natural and cultural resources, community infrastructure, and economic, environmental, and social values.

**Wildland Fire.** Any non-structure fire, other than prescribed fire, that occurs in the wildland. This term encompasses fires previously called both wildland fires and prescribed natural fires.

**Wildland Fire Suppression.** An appropriate management response to wildland fire that results in curtailment of fire spread and eliminates all identified threats from the particular fire. All wildland fire suppression activities provide for firefighter and public safety as the highest consideration but minimize the loss of resource values, economic expenditures, and/or the use of critical firefighting resources.

## ACRONYMS

AEF	Assessment of Effect
AMR	Appropriate Management Response (fire suppression)
BAER	Burn Area Emergency Rehabilitation
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CCC	Civilian Conservation Corps
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
DO	Director's Order
EA	Environmental Assessment
ESA	Endangered Species Act
FONSI	Finding of No Significant Impact
FLAG	Flagstaff Area National Monuments
FMP	Fire Management Plan
FMU	Fire Management Unit
FR	Fire Regime
FRCC	Fire Regime Condition Class
GIS	Geographic Information System
GMP	General Management Plan
GPS	Global Positioning System
IDT	Interdisciplinary Team
LCS	List of Classified Structures
MIST	Minimum Impact Suppression Techniques
MIRxT	Minimum Impact Prescribed Burn Techniques
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO <sub>x</sub>	Oxides of Nitrogen
NPS	National Park Service

NRHP	National Register of Historic Places
RMP	Resources Management Plan
SHPO	State Historic Preservation Officer
SO <sub>x</sub>	Oxides of Sulfur
SUCR	Sunset Crater Volcano National Monument
USBOR	U.S. Bureau of Reclamation
USC	United States Code
USDA	U.S. Department of Agriculture
USDC	U. S. Department of Commerce
USDI	U.S. Department of the Interior
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
WACA	Walnut Canyon National Monument
WUPA	Wupatki National Monument
WUI	Wildland Urban Interface

# APPENDIX A. FLAGSTAFF AREA NATIONAL MONUMENTS' TEN-YEAR VEGETATION AND FIRE RESTORATION PLAN

## FLAGSTAFF FMP Draft Implementation Project List December 2004

- 2005:** Project 1: “Walnut Canyon Developed Area” Manual Treatment  
(123 acres in WACA-FMU-1)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Implement manual treatments to protect NPS visitor use and administrative areas
- 2006:** Project 2: “Sunset Crater Volcano Developed Area” Manual Treatment  
(34 acres in SUCR-FMU-1)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Implement manual treatments to protect NPS visitor use and administrative areas
- 2007:** Project 3: “Island-Ranger Archaeological Site Protection” Manual Treatment  
(not to exceed 25 acres in WACA-FMU-4)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan
- Project 4: “Walnut Canyon North” Manual Pre-treatment and Prescribed Burn  
(not to exceed 271 acres in WACA-FMU-2)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Initiate manual pre-treatments to protect sensitive resources and establish burn perimeter
- 2008:** Project 3: “Island-Ranger Archaeological Site Protection”  
Phase III: Implement manual treatments to protect high priority cultural resources at risk
- Project 4: “Walnut Canyon North”  
Phase IV: Complete manual pre-treatments  
Phase V: Complete prescribed burn

- 2009:** Project 5: “Walnut Canyon Ridges Northwest” Manual Pre-treatment and Four Prescribed Burns (not to exceed 132 acres in WACA-FMU-2)  
Phase I: Vegetation/fuels data collection & analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Initiate manual pre-treatments to protect sensitive resources and establish burn perimeter
- Project 6: “Walnut Canyon Entrance Road” Manual Pre-treatment and Prescribed Burn (not to exceed 300 acres WACA-FMU-2)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Implement manual treatments to protect sensitive resources and establish burn perimeter  
Phase IV: Implement prescribed burn on west side of road concurrently with Coconino NF “Campbell” Project
- 2010:** Project 5: “Walnut Canyon Ridges Northwest”  
Phase IV: Complete manual pre-treatments  
Phase V: Complete prescribed burns
- Project 7: “Walnut Canyon South” Manual Pre-treatment and Prescribed Burn (not to exceed 359 acres in WACA-FMU-2)  
Phase I: Vegetation/fuels data collection & analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Initiate manual pre-treatments to protect sensitive resources and establish burn perimeter
- Project 8: “Wupatki Archaeological Site Preservation and Private Property Protection” Manual Treatment (not to exceed 280 acres in juniper woodland in WUPA-FMU-3)  
Phase I: Vegetation/fuels data collection and analysis
- 2011:** Project 7: “Walnut Canyon South”  
Phase IV: Complete manual pre-treatments  
Phase V: Complete prescribed burn
- Project 8: “Wupatki Archaeological Site Preservation and Private Property Protection”  
Phase II: Develop, review & approve Project Plan  
Phase III: Implement manual treatments

- Project 9: “Walnut Canyon Ridges Southwest” Manual Pre-treatment and Two Prescribed Burns (174 acres in WACA-FMU-2)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Initiate manual pre-treatments to protect sensitive resources and establish burn perimeter
- 2012:** Project 9: “Walnut Canyon Ridges Southwest”  
Phase IV: Complete manual pre-treatments  
Phase V: Complete prescribed burn
- Project 10: “Bonito Park” Prescribed Burn (42 acres in SUCR-FMU-2)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Complete prescribed burn
- 2013:** Project 11: “Walnut Canyon Southeast” Manual Pre-treatment and Prescribed Burn (not to exceed 139 acres in WACA-FMU-2)  
Phase I: Vegetation/fuels data collection and analysis  
Phase II: Develop, review and approve Project Plan  
Phase III: Initiate manual pre-treatments to protect sensitive resources and establish burn perimeter
- 2014:** Project 11: “Walnut Canyon Southeast”  
Phase IV: Complete manual pre-treatments  
Phase V: Complete prescribed burn
- Project 12: “Walnut Canyon Archaeological Site Preservation” Manual Treatment (not to exceed 200 acres in WACA-FMU-4)  
Phase I: Vegetation/fuels data collection and analysis
- Initiate Planning/Compliance to Review and Update as Needed the Flagstaff Area National Monument Fire Management Plan.*
- 2015:** Project 12: “Walnut Archaeological Site Preservation”  
Phase II: Develop, review and approve Project Plan  
Phase III: Implement manual treatments

## **APPENDIX B. FUELS MANAGEMENT PLAN MITIGATION MEASURES:**

- 1. FLAGSTAFF AREA NATIONAL MONUMENTS' FMP DRAFT MITIGATING MEASURES: VEGETATION/FUELS MANAGEMENT PROJECTS**
- 2. FLAGSTAFF AREA NATIONAL MONUMENTS' MIMINUM IMPACT SUPPRESSION TECHNIQUES (MIST)**
- 3. DRAFT FLAGSTAFF AREA NATIONAL MONUMENTS' FMP MIMINUM IMPACT PRESCRIBED BURNING TACTICS (MIRxT)**
- 4. GUIDELINES FOR WORK CREWS: ARCHEOLOGICAL SITE HAZARDOUS FUELS REDUCTION**
- 5. DRAFT FLAGSTAFF FMP NATURAL RESOURCE PROTECTION GUIDELINES (JANUARY 2005)**
- 6. SAFETY MITIGATION**

## **FLAGSTAFF AREA NATIONAL MONUMENTS' FMP Draft Mitigating Measures: Vegetation/Fuels Management Projects**

### **I. Worker safety.**

Only fully trained and qualified Federal firefighters will be used for wildfire suppression, manual thinning, and prescribed burning operations.

All work will be conducted in accordance with the fire fighter safety standards in the “red” book and pocket guide.

### **II. Wildfire Suppression Operations.**

See Draft FLAG FMP MIST Guideline.

Aircraft water and retardant drops will only be used in extreme wildfire suppression circumstances. Water drops are preferred over retardant.

Only native plant seed from intact populations within a 100 mile radius will be used to revegetate a wildfire site during burned area rehabilitation.

### **III. Effective Communication.**

In the event of a wildfire, the fire incident commander will consult cultural and natural resource advisors as soon as possible regarding appropriate suppression tactics.

All FMP implementation projects will be jointly planned by an interdisciplinary team of fire operations, cultural resources, natural resources, and visitor services staff.

Each project implementation plan will include a standard marking system for delineating the project area boundary, cultural and natural features to be protected, etc.

Prior to manual treatment, cultural and natural resource specialists will clearly mark all resources to be protected.

The project planning team will brief all project work crews on the standardized marking system, resources to be protected, minimum impact tactics, and safety.

### **IV. Soils and Geologic Features.**

All motor vehicle use to transport equipment and personnel for manual thinning and prescribed burn projects is restricted to existing public and NPS administrative roads.

Project implementation plans will designate appropriate vehicle parking location(s), staging area(s), and access route(s).

Vegetation thinning, fire line construction, and other ground disturbance from fire management activities will be entirely restricted or minimized as much as possible on the steep slopes of Walnut Canyon, the fragile volcanic cinder slopes at Sunset Crater Volcano National Monument, and the volcanic cinder dunes and other sparsely vegetated desert terrain at Wupatki National Monument.

Field work will be suspended when the ground is very wet and muddy.

Fine and small diameter slash will be thinly scattered across the ground between canopy openings, which will reduce soil movement and provide structural cover for emerging herbaceous vegetation. Slash piles will be limited in size and burned during cold days with wet ground conditions to minimize soil scorch during burning. Other methods, such as chipping and broadcasting and/or off-site disposal, will be used when feasible to minimize the need for slash piling and burning.

Minimum impact suppression tactics and burned area rehabilitation techniques will be used to stabilize slopes and promote the recovery of native vegetation over areas disturbed by wildfire suppression and other fire management activities.

## **V. Cultural Resources.**

The Fire Incident Commander will consult with cultural resource advisors as soon as possible during wildfire suppression operations on the distribution and protection measures for cultural resources.

Aircraft water and retardant drops will only be used in extreme wildfire suppression circumstances.

Aerial ignition will not be used for any prescribed fire or wildfire suppression operation.

Depending upon resources at risk and fire behavior conditions, the most appropriate wildfire suppression response may include more passive fire containment strategies to minimize off-road vehicle use.

Within the fire-prone landscapes of the Flagstaff Area National Monuments, vegetation and wildland fuels conditions around cultural resource sites will be cyclically assessed to ensure that archaeological and historic site protection objectives are being met.

Separate project plans will be developed and approved for each manual vegetation thinning/fuels reduction and prescribed fire project, which will identify site-specific cultural resources to be protected during project implementation.

All motor vehicle use to transport equipment and personnel for manual thinning and prescribed burn projects is restricted to existing public and NPS administrative roads.

All work in proximity to archaeological and historic sites will be monitored by a NPS cultural resource specialist.

Depending upon site-specific cultural resource protection objectives, the NPS may implement a full range of treatments in proximity to archaeological and historic sites, from total avoidance to full vegetation thinning and fuels reduction.

Restoration work within 10 feet of archeological and historic features will adhere to the Archeological Site Hazardous Fuels Reduction (ASHFR) Guidelines, developed specifically for inclusion in the Flagstaff Area National Monuments' FMP. Under the ASHFR Guidelines, ground disturbance below the natural mineral soil surface is prohibited. This includes disturbance caused by uprooting vegetation or dragging vegetation across the ground surface.

Minimum Impact Prescribed Burning Tactics, being developed specifically for inclusion in the Flagstaff Area National Monuments' FMP, include a number of measures to prevent adverse effects on cultural resources.

## **VI. Vegetation and Fire Restoration.**

All motor vehicle use to transport equipment and personnel for manual thinning and prescribed burn projects is restricted to existing public and NPS administrative roads.

Vegetation and fire restoration projects will only be implemented within areas for which there is sufficient information on presettlement vegetation structure and natural fire regimes.

Within the fire-prone landscapes of the Flagstaff Area National Monuments, a variety of vegetation and wildland fuels characteristics will be cyclically measured to ensure that ecological restoration objectives are being met.

Vegetation restoration thinning will be planned and implemented to mimic the stand structure during the reference period, as documented in site-specific natural presettlement forest stand reconstruction and other historical ecology studies.

Minimum Impact Manual Thinning Treatment Guidelines are being developed specifically for FMP to guide vegetation and fire restoration projects while minimizing adverse effects on sensitive/unique cultural and natural resources.

All ponderosa pine trees greater than 16" DBH will be retained during manual vegetation restoration thinning projects.

Except under the specific circumstances described below, vegetation restoration thinning will mostly be restricted to trees 9 inches DBH or smaller.

If needed, certain trees in the 9+ to 16 inch DBH range may be felled and moved only if growing in close proximity to a cultural or natural feature to be protected (such as an archaeological site, a 16 inch DBH or larger tree, or an important raptor nesting tree or snag). The felling of trees in the 9+ to 16 inch diameter range will be limited to one tree per feature to be protected. Decisions to fell trees in the 9+ to 16 inch DBH range will be made on a tree-by-tree basis during on-site evaluations by cultural and natural resource specialists.

Small diameter trees, ladder fuels, and ground fuels will be manually thinned more intensively around ponderosa pine trees 20 inches DBH and larger, snags 12 inches diameter and larger, downed logs 12 inches diameter and larger, Gambel oaks 10 inches diameter at root collar and larger, pinyon pine 16 inches DBH and larger, alligator juniper trees 16 inches DBH and larger, within 30 feet around rare plant populations, and in proximity to other sensitive natural resource features to reduce fire damage.

During vegetation restoration thinning, appropriate proportions of seedlings, saplings, and mid-age trees will be retained to ensure future recruitment of old trees. To ensure there are adequate replacement trees after "first entry" prescribed burning, about 15 to 20% more small to medium diameter trees will be left than documented in site-specific presettlement stand reconstruction research.

Live and dead tree branches will be removed up to 7 feet above ground level to prevent fire from climbing "ladder" fuels and burning into the tree crown.

Tree limbs will be flush cut just outside the branch collar tissue on the main trunk of the tree. Limbs will be cut using best tree trimming practices to minimize breaking and tearing of limbs and bark.

Small diameter slash (up to 8 inches in diameter) will be bucked and scattered within canopy openings away from sensitive resources (archeological sites, large trees, protected and sensitive raptor breeding areas and rare plant populations).

Tree boles in the 8+ to 12 inch DBH range will be left where they are felled and bucked down, unless they are too close to a resource in need of protection from fire damage, in which case they will cut into manageable sections and either scattered between tree canopy openings, carried off-site for disposal, and/or piled and burned at carefully selected sites. Tree limbs will be bucked and scattered between tree canopy openings.

Tree boles in the 12+ to 16 inch diameter range will be left on the ground where they fall. Tree limbs will be bucked and scattered between tree canopy openings.

Scattered slash may not accumulate 1 foot higher than ground level.

Slash piles for burning will range from 3 to 6 feet in height and diameter in stable teepee shapes

Slash piles will be located on level terrain at least 30 feet away from tree crowns.

Slash piles will include sufficient fine fuels to ensure rapid, clean burning. Piles will be covered with durable, water-resistant paper, such as “Kraft Clean Burn” or suitable substitute, to ensure piles can be quickly and cleanly burned when temperature and ground moisture conditions are optimal. Light plastic wrap will not be used to cover piles. At least 75% of each pile will be covered, and the covering material will be secured from wind by leaning large diameter branches over the fuel teepee.

## **VII. Prescribed Fire.**

Prescribed fire implementation will adhere to Minimum Impact Prescribed Fire (MRxT) Guidelines, which are being developed specifically for inclusion in the Flagstaff Area National Monuments’ FMP.

Manual vegetation thinning/fuels restoration projects will be implemented prior to “first entry” and “second stage” prescribed fires to minimize the risk of severe crown fire.

“First entry” and “second stage” prescribed fires will be implemented under optimum weather and fuel moisture ranges which favor low intensity surface fire and the survival of all ponderosa pine trees 20 inches DBH and larger.

After a “first entry” and “second stage” prescribed fire have been completed within each project area, and if monitoring information reliably shows that heavy fuels have been sufficiently eliminated to reduce crown fire risk, all subsequent fires will be planned and implemented to mimic the return interval, season, patchiness, and effects of fire during the reference period, as documented in site-specific fire scar histories and forest stand reconstruction studies.

As soon as possible when vegetation structure and wildland fuels are managed to more natural conditions, the NPS will rely more on “maintenance burning” instead of manual thinning methods to naturally shape vegetation over the long-term.

### **VIII. Protected/Sensitive Species.**

The Fire Incident Commander will consult with natural resource advisors as soon as possible during wildfire suppression operations on the distribution, habitats, and protection measures for protected/sensitive species.

Aerial ignition will not be used for any prescribed fire or wildfire suppression operation.

Depending upon resources at risk and fire behavior conditions, the most appropriate wildfire suppression response may include more passive fire containment strategies to minimize off-road vehicle use.

Separate project plans will be developed and approved for each manual vegetation thinning/fuels reduction and prescribed fire project, which will identify site-specific habitats and breeding areas to be protected during project implementation.

The NPS would review each project implementation plan, and would consult with the U.S. Fish & Wildlife Service under Section 7 of the Endangered Species Act if the level of effect on protected species exceeds thresholds established during programmatic consultation for the FMP.

All motor vehicle use to transport equipment and personnel for manual thinning and prescribed burn projects is restricted to existing public and NPS administrative roads.

The NPS will strive to monitor protected/sensitive species population status and trends.

In the absence of reliable monitoring information, all known protected and sensitive raptor breeding areas (Mexican spotted owl “Protected Activity Centers”, Peregrine Falcon nest cliffs, and Northern Goshawk nest buffers) will be considered “occupied” during respective breeding periods.

Vegetation and fire restoration are primarily proposed for areas adjacent to and upwind of the inner canyon environment at Walnut Canyon National Monument, which will reduce the risk of unnaturally severe fires within MSO, Bald Eagle, Peregrine Falcon, Northern Goshawk, and rare plant species habitats.

All vegetation and fire restoration crew personnel will be informed of protected/sensitive species known to occur or potentially occur within each project area, habitat protection measures, and the importance of minimizing human disturbance.

Only one prescribed burn will be implemented per year to minimize effects on protected/sensitive wildlife. Prescribed burn blocks will be small enough that heavy smoke from burning will be limited to 24 hours and residual smoke will be limited to 72 hours.

Prescribed fires will not occur between March 1 and August 31 at Walnut Canyon National Monument until at least three fire return cycles have been completed, and monitoring information reliably shows that heavy fuels have been sufficiently eliminated to ensure low smoke levels.

Prescribed fires will be planned and timed to avoid protected/sensitive wildlife species breeding areas during their respective breeding seasons.

Prescribed fires will be planned and timed to minimize smoke within protected/sensitive wildlife species habitats.

As a result of high ponderosa pine and Douglas fir tree mortality after the 2000-2002 drought, there are currently ample numbers of large diameter snags and replacement downed logs within areas proposed for prescribed burning. If monitoring information suggests that numbers of tall snags and large diameter logs are declining to less than an average of 2 per acre across each project planning area, fire line will be constructed around remaining snags and logs prior to prescribed fire.

#### *Mexican Spotted Owl:*

All vegetation and fire restoration activities within Mexican spotted owl (MSO) Protected Activity Centers (PACs), protected habitat, and restricted habitat will be consistent with the MSO Recovery Plan (U.S. Fish & Wildlife Service 1995), except for limited manual treatments to protect cultural resources from fire damage.

No manual vegetation thinning and fuels reduction activities will occur during MSO breeding season (March 1 to August 31) within PACs, protected habitat, restricted habitat, and other areas within ¼ mile of steeply sloping (>40%) terrain.

No vegetation restoration or prescribed fire activities will occur on steeply sloping terrain or the riparian corridor within Walnut Canyon National Monument.

Manual vegetation thinning and fuels reduction activities within MSO PACs will mostly be limited to small areas of vegetation meeting the definition of unrestricted habitat (ponderosa pine vegetation on level terrain, with less than 10% Gambel oak cover) and limited to thinning trees less than 9 inches DBH. Exceptions are anticipated in protected and restricted habitat where small areas around 165 high priority archaeological sites at high risk from wildfire damage would be manually treated. At each site, less than ½ acre would be thinned, and one tree in the 9-16 inch DBH range may be felled and moved. Cumulatively, no more than 83 acres would be thinned, and no more than 165 medium diameter trees would be felled while implementing the 10 Year Vegetation and Fire Restoration Plan to meet cultural resource protection objectives.

Within PACs, protected habitat, and restricted habitat, manual vegetation thinning and fuels reduction projects will be planned and implemented with regard for maintaining existing levels of Gambel oak cover and retaining oaks with stems greater than 5 inches diameter at root collar.

No vegetation restoration or prescribed fire activities will occur within a 100 acre buffer area around known MSO nesting areas (“nest core buffers”), except where site-specific manual vegetation thinning and fuels reduction treatments may be needed to protect an archaeological or historic site from fire damage.

#### *Bald Eagle:*

No manual vegetation thinning and fuels reduction activities will occur within ¼ mile of Bald Eagle winter roosts or perches between October 15 and April 15.

If recommended by the natural resource specialist on the Project Implementation Team and identified in the Project Implementation Plan, small diameter trees, ladder fuels, and ground fuels within 50 feet of Bald Eagle winter roosts or perches may be reduced during manual thinning projects to protect them from severe fire.

*Peregrine Falcon:*

No manual vegetation thinning and fuels reduction activities will occur within ¼ mile above Peregrine Falcon nesting cliffs between March 1 and August 15.

*Northern Goshawk:*

No manual vegetation thinning and fuels reduction activities will occur within active Northern Goshawk breeding territories between March 1 and September 30.

*Golden Eagle:*

The use of most appropriate suppression response and Minimum Impact Suppression Tactics would reduce impacts to Golden Eagle habitat at Wupatki National Monument.

*American pronghorn:*

The use of most appropriate suppression response and Minimum Impact Suppression Tactics would reduce human disturbance and impacts to pronghorn habitat at Wupatki National Monument.

*Rare Plant Populations:*

Each project area will be cyclically surveyed for rare plant populations.

Rare plant populations within prescribed burn blocks will be monitored according to standardized procedures to assess fire management related changes.

Depending upon vegetation and fuels conditions around rare plant populations within fire-prone landscapes, some rare plant population areas may be manually treated to protect them from severe fire.

Areas around rare plant populations that are fire-intolerant or for which fire ecology is not known will not be burned during prescribed fires.

**IX. Visitor Enjoyment.**

Project plans will be reviewed and approved by the Management Team for Flagstaff Area National Monuments to ensure coordination and minimal conflicts with other NPS operations during FMP implementation.

Whenever possible, work around primary visitor-use areas will be scheduled during off-peak visitation periods.

Small-diameter trees and brush will be flush cut at ground level to eliminate stumps.

Strips of denser vegetation will be left standing where needed between primary visitor use areas and NPS administrative facilities or other modern features to maintain natural scenic quality.

Only cyclic manual thinning treatments will be used in close proximity to NPS facilities and visitor use areas to minimize the threat of fire damage to facilities, to minimize facility closures during periods of severe fire risk or due to wildfires, and to maintain scenic quality in proximity to visitor use areas.

Cyclic vegetation thinning and fuels reduction treatments within ¼ mile of NPS facilities and visitor use areas will adhere to Facility and Visitor Use Area Vegetation and Fuels Management Guidelines being developed specifically for the Flagstaff Area National Monuments' FMP.

## **X. Environmental Protection.**

No herbicides may be applied without separate management review under current environmental compliance procedures.

Chainsaws will be refueled on tarps to prevent fuel spill contamination.

Mechanized equipment will be maintained in good operating condition so that exhaust emissions are kept to a minimum.

As existing chainsaws are due for replacement, the NPS will replace them with models that produce lower emissions and run quieter.

## **XI. Smoke Management**

Press releases, other media, and personal contacts with neighbors will be used to inform the public several days in advance of a planned prescribed fire.

Prescribed fires will be ignited on days when weather conditions are reliably forecast for smoke to rise and disperse.

As much slash from manual thinning as feasible will be disposed of through chipping/broadcasting, pile burning, or off-site disposal prior to prescribed burning.

In order to provide sufficient time for slash to cure and burn with less smoke, prescribed fires in should be completed no earlier than one year after manual thinning projects.

Prescribed fire blocks will be small enough for groundcover over the area to burn in less than one day, and for most large logs to burn in less than three days.

The number of proposed prescribed fire blocks proposed in the FMP will effectively generate smoke only a few days per year for burning slash piles.

The total number of proposed prescribed fire blocks in the FMP will effectively require only one prescribed fire per year to maintain vegetation under the natural fire regime.

## **XII. Non-native Invasive Plants.**

Fire management vehicles will be washed to remove mud and plant seed prior to being deployed on wildfire suppression, vegetation restoration, or prescribed fire operations.

Vegetation will be monitored according to standardized procedures to assess fire management related changes in invasive plant species cover.

During manual vegetation and fuels reduction projects, invasive species in proximity to sensitive cultural and natural resources will first be manually removed using methods which minimize seed dispersal.

Areas of high-density species that increase under wildfire and prescribed burning and which can be feasibly contained will be controlled using manual methods.

The season and timing of prescribed burning may be adjusted to suppress the reproduction of invasive plant species.

Areas covered with high-density, fire-tolerant invasive plants may be excluded from prescribed burns if burning would further exacerbate their reproduction and spread.

Areas which are at high risk of invasion by fire-tolerant invasive plants may be excluded from prescribed burning to maintain native vegetation integrity.

## **FLAGSTAFF AREA NATIONAL MONUMENTS' MINIMUM IMPACT SUPPRESSION TECHNIQUES (MIST)**

### **General Discussion:**

These tactics were adapted from the “Red” book MIST guidelines and examples from other fire management plans. The IDT revised and added to this collection to address specific resource protection goals and features.

Suppression tactics will have an impact on the landscape. Following the Minimum Impact Suppression Tactics (MIST) guidelines outlined below can reduce the degree of long-term impacts associated with wildland fire suppression tactics. It is important that decision makers are aware of the long-term impacts fire suppression tactics can have on the landscape, and very carefully weigh those long-term impacts to fire suppression safety issues related to wildland fire incidents.

MIST does NOT compromise firefighter safety, or the effectiveness of the suppression effort, which might put other assets at risk. Safety zones and escape routes will be a factor in determining fireline location.

MIST DOES aim to only use suppression tactics that will have minimal long-term impact, while achieving a satisfactory fire suppression outcome. While MIST emphasizes suppressing wildland fire with the least impact to the land, actual fire conditions and good judgment will dictate the actions taken. Consider what is necessary to halt fire spread and containment within the fireline or designated perimeter boundary, while safely managing the incident.

Resource advisors will be consulted or notified (when fire situation allows) prior to and during suppression operations.

The following are MIST standards that will be used in Flagstaff Area National Monuments' FMP:

### **Use of Motor Vehicles:**

- In keeping with the Flagstaff Area National Monuments' FMP fuel reduction model, all motorized vehicles used to transport equipment and personnel would be restricted to established roadways, unless the Incident Commander assesses that the fire is an immediate threat to resources. Off-road vehicle travel is to be used minimally, and unnatural trails properly restored in a timely fashion after incident is complete.
- The route to the fire from the nearest trail or road will be flagged. Flagging will be removed by the last person to leave the area.

### **Fireline Construction Location:**

- Fireline construction will be minimized by taking advantage of natural barriers, rock outcrops, trails, roads, streambeds, cinder barrens and other existing fuel breaks. Allow the fire to burn to natural barriers.
- Where possible, on-site archeological clearance will be obtained prior to line construction.
- Consult with natural resource specialist (time permitting) to avoid constructing line that will negatively impact sensitive species.
- Consider the potential for introduction of noxious weeds and mitigate by removing weed seed from vehicles, personal gear, cargo nets, etc.
- Consider impacts to riparian areas when siting water handling operations.
- Use longer draft hoses to place pumps out of sensitive riparian areas.
- Plan travel routes for filling bladder bags to avoid sensitive riparian areas.

### **Fireline Construction Methods:**

- Select procedures, tools and equipment that least impact the environment.
- Firelines will be the minimum width necessary to halt the spread of the fire and will be routed to avoid impacts to natural and cultural resources vulnerable to the effects of fire and fire suppression activities.
- Prioritize the use of water or foam for wet line construction.
- As a last resort, use mechanized equipment when constructing fire line.
- If utilizing mechanized equipment constructing fire line, use excavators and rubber tired skidders rather than bulldozers when constructing mechanical line.
- Adjacent to fireline: limb only enough to prevent additional fire spread.
- Inside fireline: remove or limb only those fuels which would have potential to spread fire outside the fireline.
- Unburned material may be left within the final line.
- Clearing and scraping will be minimized.
- Minimize bucking to establish fireline: preferably move or roll downed material out of the intended constructed fireline area. If moving or rolling out is not possible, or the downed log/bole is already on fire, build line around it and let the material be consumed.

- Snags or trees will be felled only when essential for control of the fire or for safety of personnel. Make all cuts flush with the ground.
- Identify hazard trees with flagging, glow sticks, or a lookout.
- During fireline construction, cut shrubs or small trees only when necessary. Make all cuts flush with the ground.
- When using indirect attack:
  - Do not fall snags on the intended unburned side of the constructed fireline unless they are an obvious safety hazard to crews
  - Fall only those snags on the intended burn-out side of the line that would reach the fireline should they burn and fall over.

### **Mop-up Phase:**

- Consider using “hot-spot” detection devices along perimeter (aerial or hand-held).
- Use extensive cold-trailing to detect hot areas.
- Cold-trail charred logs near fireline: do minimal scraping or tool scarring. Restrict spading to hot areas near fireline.
- Minimize bucking of logs to check for hot spots or extinguish fire: preferably roll the logs and extinguish the fire.
- When ground is cool return logs to original position after checking.
- Refrain from piling: burned/partially burned fuels that were moved should be arranged in natural positions as much as possible.
- Consider allowing larger logs near the fireline to burn out instead of bucking into manageable lengths. Use a lever, etc. to move large logs.
- Personnel should avoid using rehabilitated firelines as travel corridors whenever possible.
- Aerial fuels (brush, small trees, and limbs): remove or limb only those fuels which if ignited have potential to spread fire outside the fireline.
- Burning trees and snags:
  - *Be particularly cautious when working near snags* (ensure adequate safety measures are communicated).
  - The first consideration is to allow a burning tree/snag to burn itself out or down.
  - Identify hazard trees with flagging, glow-sticks or a lookout.

- If there is a serious threat of spreading firebrands, extinguish with water or dirt.

### **Restoration of Fire Area:**

- Pick up and remove all flagging, garbage, litter, and equipment. Dispose of trash appropriately.
- Backfill cup trenches and scarify wide firelines.
- Construct waterbars to prevent erosion.
- Place “boneyards” in a natural or random arrangement.
- Position cut ends of logs so as to be inconspicuous to visitors and camouflage where possible.
- Flush cut stumps, camouflage with soil and ground material.

### **Wilderness Fire Campsites:**

- In general, back country camping within the monuments is prohibited.
- Consider impacts on present and future visitors.
- Use existing campsites if available.
- If existing sites are not available, select impact resistant sites a minimum of 200’ from water resources.
- Practice “Leave No Trace” methods of camping.
- Establish several small camps rather than one large one.
- Use stoves and minimize camp improvements.
- Vary travel routes to the greatest extent possible to reduce impact.
- Open campfires are not permitted.

### **Aircraft Helicopters:**

- Minimize use.
- Balance fire fighter safety and resource protection against the impacts of helispot construction.
- Use natural openings for helicopter landing. If tree felling is necessary, avoid high visitor use locations unless the modifications can be rehabilitated. Fall, buck, and limb only what is necessary to achieve a safe and practical operating space.

- Establish helispot in weed free area to avoid the transport of noxious weeds into the wilderness.
- Consider using a long line remote hook if helicopter is only needed for logistical support.

**Retardant Aircraft:**

- Retardant shall be only used as a last resort.
- The effects of slurry retardant drops on arch sites and natural scenery are generally severe and should be avoided unless the situation requires it.
- Prior to the use of retardant drops, every effort should be made to consult with the Superintendent and resource advisors.
- Use environmentally friendly retardant when ever possible.
- Use SEAT's when ever possible.
- Use water drops where practical.
- Minimize number of drops to what is *essential* for control of the fire.
- Assess risks to sensitive watersheds from chemical retardants and foam.
- Fire managers should weigh use of retardant with the probability of success by unsupported ground force. Retardant may be considered for sensitive areas when benefits will exceed the overall impact. This decision must take into account values at risk and consequences of expanded fire response and impact on the land.

## **FLAGSTAFF AREA NATIONAL MONUMENTS' FMP Minimum Impact Prescribed Burning Tactics (MIRxT)**

### **General Discussion:**

Strategic considerations for prescribed fire projects over the life of the Flagstaff Area National Monuments' FMP, and objectives linked to manual treatment/prescribed fire project implementation plans include:

- Prior to Rx burn, manual pre-treatment of vegetation/fuels will be completed according to MIMTT to protect sensitive resources.
- After medium-term Fire Management Plan objectives have been met for restoring vegetation structure to reference conditions, reducing accumulated fuels, and mitigating the landscape-level risk of severe fire, a strategic shift to maintenance prescribed burning according to the natural historical fire return interval (every 4 to 14 years) should prevent excessive accumulations of needles, bark flakes, and other fuels, as well as the growth of seedling thickets.
- As soon as stand conditions and fuel loads allow, the timing of prescribed burning should mimic the seasonal and inter-annual variation documented in fire history studies for the Flagstaff Area National Monuments and regional climate reconstruction records for the reference period.

The following operational tactics were adapted from the Flagstaff Area National Monuments' MIST guidelines, the Flagstaff Area National Monuments' ASHFR guidelines, a Working Paper prepared by the Ecological Restoration Institute, "Protecting Old Trees from Prescribed Fire," and in consultation with USFWS to protect the Mexican Spotted Owl and designated Critical Habitat within Walnut canyon NM [note: ESA Sect. 7 consultation is still pending]. The IDT adapted and augmented these examples to address specific resource protection goals and features for the Flagstaff Area National Monuments' FMP.

Prescribed burning operations will have an impact on the landscape. The following Minimum Impact Prescribed Fire Tactics (MIRxT) are identified to reduce the degree of long-term environmental impacts associated with prescribed burning operations. It is important that decision makers are aware of the trade-offs between the short-term impacts of prescribed burn operations versus achieving the medium- or long-range objectives of the Flagstaff Area National Monuments' FMP. MIRxT does NOT compromise firefighter safety, or the effectiveness of the effort. Safety zones and escape routes will be a factor in determining the burn area perimeter. MIRxT DOES serve as the primary means of communicating tactics to work crews that will minimize impacts to sensitive cultural and natural features. While MIRxT emphasizes prescribed burning with the least impact to the land, actual fire conditions good judgment will be needed to effectively implement them. Consider what is necessary to halt fire spread and containment within the project burn area, while safely completing the burn.

In the unlikely event a prescribed fire becomes a wildfire, Flagstaff Area National Monuments' MIST will be implemented.

The following are minimum impact tactics for prescribed fire (MIRxT) that will be used in Flagstaff Area National Monuments' FMP:

**Use of Motor Vehicles:**

- All motorized vehicles used to transport equipment and personnel are restricted to established roadways.

**Staging and Access:**

- Each Rx project implementation plan will identify parking, staging, access, equipment service, water and fueling area(s).
- For safety and resource protection, the route to the burn block from the nearest trail or road will be flagged. Flagging will be removed by the last person to leave the area.
- All project work crews will be briefed on the standardized marking system, objectives, resources to be protected, minimum impact tactics and safety.

**Resource Protection:**

- Sensitive cultural and natural features will be marked in advance of prescribed fire ignition.
- Fireline will be routed, constructed, and improved in advance to avoid sensitive cultural and natural features.

**Fireline Routing and Construction:**

- Fireline construction will be minimized by taking advantage of natural barriers, rock outcrops, trails, roads, streambeds, cinder barrens and other existing fuel breaks. Allow the fire to burn to natural barriers.
- Prioritize the use of water or foam for fire line construction.
- When possible, long hose lays and portable pumps will be used to construct wet or foam lines.
- Select procedures, tools and equipment that least impact the environment.
- Firelines will be the minimum width necessary to confine fire within the project burn area.
- Vegetation/Fuels will be managed according to the MIMTT guidelines adjacent to fireline to minimize risk of fire escape.

- Slash, debris and litter from fireline construction may be placed within the project burn area.
- If placing slash, debris and litter inside the project burn area exacerbates fuel loads and increases fire intensity in proximity to sensitive resources and fire line, then it will be disposed of off-site according to MIMTT guidelines.
- Clearing and scraping will be minimized.
- Any fire susceptible living trees and snags that are within falling distance of the fire line of the project burn area will be lined and received fuels treatment in accordance with the MIMTT.
- Identify hazard trees with flagging, glow sticks, or a lookout.
- During fireline construction, cut shrubs or small trees only when necessary. Make all cuts flush with the ground.

#### **Ignition Phase:**

- Avoid firing through monitoring plots and sensitive resources.
- Fueling of equipment (drip torches, chainsaws, etc.) shall be completed in designated areas.
- Utilize ignition techniques and fire spread patterns, such as backing fires, short run, strip head fires, and spot ignition, that result in low intensity fire while still meeting Rx burn objectives.

#### **Mop Up Phase:**

- Consider using “hot-spot” detection devices along perimeter (aerial or hand-held).
- Use extensive cold-trailing to detect hot areas.
- Restrict spading to hot areas near fireline.
- Minimize scraping and tool scarring.
- Allow stumps, logs and large fuels near the fire line to burn out instead of extinguishing.
- Use a lever to roll large logs instead of bucking into sections or dragging.
- When ground is cool return logs to original position after extinguished.
- Burned/partially burned fuels that were moved should be scattered in natural positions as much as possible.
- Burning trees and snags:

- *Be particularly cautious when working near snags (ensure adequate safety measures are communicated).*
- The first consideration is to allow a burning tree/snag to burn itself out or down.
- Identify hazard trees with flagging, glow-sticks or a lookout.
- If there is a serious threat of spreading firebrands, extinguish with water or dirt.
- If there is a serious threat of a burning tree or snag falling outside the fire line, extinguish with water, foam or dirt and consider felling as a last resort.

#### **Restoration of Fire Area:**

- Personnel should avoid using rehabilitated firelines as travel corridors whenever possible.
- Pick up and remove all flagging, garbage, litter, and equipment. Dispose of trash appropriately.
- Backfill cup trenches and scarify wide firelines.
- Construct waterbars to prevent erosion.
- Place “boneyards” in a natural or random arrangement.
- Position cut ends of logs so as to be inconspicuous to visitors and camouflage where possible.
- Flush cut stumps, camouflage with soil and ground material.

#### **Wilderness Fire Campsites:**

- In general, back country camping within the monuments is prohibited.
- If camping is needed for cold-trailing or monitoring purposes, practice “Leave No Trace” methods of camping.
- Open campfires are not permitted.

## **Guidelines for Work Crews: Archeological Site Hazardous Fuels Reduction**

The following guidelines are for manual vegetation thinning and wildland fuels removal activities within the treatment perimeter around sensitive archeological features. The treatment perimeter will be marked in advance by the fire project archeologist. Certain sites may require less intensive treatments, and such sites will be marked differently according to a standard system established in the Project Plan. The Fire Project Archeologist will be familiar with the range of treatments and marking system, and will guide work crews accordingly. Work should proceed at each designated site according to the general sequence outlined below.

### **Monitoring:**

- All manual vegetation thinning and wildland fuels reduction work in proximity to cultural resources must be guided and monitored by a fire project archeologist at all times.

### **Work Restrictions:**

- Off-road vehicle use is prohibited.
- Disturbing the ground below the mineral soil surface is prohibited except under the direct guidance of the fire project archeologist assigned to the crew. This includes disturbance caused by uprooting vegetation or dragging vegetation across the ground surface.
- The work crew leader will be briefed on other equipment, weather-related, seasonal, or other work restrictions, as outlined in the project plan.

### **Project Area Access:**

- Utilize designated vehicle staging areas and hiking routes to the project area.

### **Invasive Plant Species:**

- Remove any non-native plant species from treatments sites first. Place the entire plants, or the plant parts that bear seeds, in plastic bags or other suitable containers, and move off-site for disposal.

### **Dead and downed wood:**

- *Sites without flammable contents:* Carry small diameter fuels (6 inches dia or less) at least 12 feet beyond the marked site perimeter and broadly scatter across openings between the surrounding tree canopy.
- *Sites with flammable contents:* Carry medium-large diameter fuels (> 6 inches dia) at least 40 feet beyond the marked site perimeter and broadly scatter across openings between the surrounding tree canopy. Orient large diameter wood with the same side up as before it was moved.

### **Brush and small diameter trees.**

- Prune or cut shrubs growing in contact with stone masonry or other identified cultural features. Do not remove cacti, agaves, yuccas, or other succulents.
- Cut all ponderosa, piñon, and junipers measuring 9 inches DBH or less within the flagged perimeter.
- Flush cut stumps as close to the ground as possible.

- Unless the project implementation plan includes different guidelines for slash disposal, remove slash from the treatment perimeter according to the slash disposal methods outlined below.
- Shape vegetation with an irregular boundary around the marked site perimeter to blend with the surrounding vegetation and maintain a natural appearance.

#### **Tree limbs:**

- On the remaining conifer trees and snags to be retained within the treatment perimeter, cut and remove all of the lower dead and living branches up to 7 feet above the ground.
- In close proximity to flammable or fire-sensitive cultural resources, living and dead tree limbs may be cut up to 7 feet above the highest point of the flammable feature.
- Flush cut limbs with the limb “collar” at the main tree trunk to speed healing of the cut.
- Limb trees symmetrically to give them natural shapes.
- Unless the project implementation plan includes different guidelines for slash disposal, remove slash from the treatment perimeter according to the slash disposal methods outlined below.

#### **Needlecast and Leaf Litter:**

- Only if instructed to do so by the fire project archeologist, gather pine needle and litter accumulations that exceed 3 inches deep from around sensitive archeological features. Remove litter within 5 feet of masonry architecture and rock art, and within 15 feet of identified flammable features.
- Attempt to leave the lower 2 to 3 inches of needles and litter intact to prevent mineral soil disturbance.
- Gather up needle cast and litter by hand for removal rather than raking to prevent mineral soil disturbance.

#### **Medium diameter trees and snags (9-16 in DBH range):**

- *If the Lead Forestry Technician concurs that a medium diameter tree can be safely and controllably felled*, cut and remove any medium-diameter trees or standing snags marked by the Fire Plan Implementation Team (FPIT).

#### **Disposal of wood, vegetation, slash, litter, etc.**

- Carry, do not drag, all wood, vegetation, slash, litter, etc. to disposal locations.
- Carry small diameter slash (6 in dia or less) at least 15 feet beyond the marked site perimeter and broadly scatter across openings between the surrounding tree canopy.
- Carry medium-large diameter slash (> 6 in dia) at least 40 feet beyond the marked site perimeter and broadly scatter across openings between the surrounding tree canopy.
- Scatter slash flat on the ground, less than 1 foot above the ground. Do not hang slash in trees or mid-story vegetation.
- Do not scatter slash near other natural resource features flagged for protection (large diameter trees, snags, etc.).
- Scatter slash out of view of visitor use areas.
- On steep slopes, avoid scattering wood, slash, etc. on the slope directly above or below the site.

- On steep slopes, trees should be felled or placed with the crown pointing down-slope to mimic a natural tree fall.
- When there is insufficient area within the project boundary for proper disposal of the volume of slash being generated, excess slash will be removed off-site for disposal, or piled and burned on-site according to separate guidelines established in the project plan.

**FLAGSTAFF AREA NATIONAL MONUMENTS' FMP**  
**Natural Resource Protection Guidelines**  
**(January 2005)**

Measures for reducing fire risk to large diameter trees (ponderosa pines > 16 in dbh), large diameter Gambel oaks, alligator junipers, raptor nest/perch trees, important snags, etc.

*Adapted from:* Ecological Restoration Institute. 2003. Protecting Old Trees From Prescribed Fire. Working Papers in Southwestern Ponderosa Pine Forest Restoration. Northern Arizona University. 4 pp.

**Manual pre-treatments for trees/snags to be protected:**

- Carefully remove thick accumulations of needles and bark flakes that have accumulated under the crowns of trees, without raking into mineral soil.
- Carefully remove fine fuels 2-3 feet away from the trunks of trees and snags.
- Remove dead and downed tree trunks and branches from beneath the canopy of trees and snags.
- Remove most seedling, saplings, and trees < 9" DBH growing under or within a 30 feet radius of the desirable tree crown. Depending upon local small diameter tree densities, remove 50 to 80% of the trees between the 30 feet limit and a larger 50 feet radius around the tree crown. Do not remove small diameter trees in a perfect circular pattern, but create an irregular spacing pattern that blends with the surrounding vegetation at the 50 feet perimeter. The removal of trees 9" DBH and larger requires on-site determination by the FPIT.
- Trim dead and live branches 6 to 8 feet above the ground.
- Do not pile slash. Buck, lop and scatter small-diameter slash (typically < 6" dia. Sections) between the surrounding tree canopy openings. In order of descending preference, large diameter slash should be: (a) chipped and broadcast to be consumed in subsequent burns; (b) carried off-site for piling and burning; or (c) carried off-site for disposal at the local landfill. On-site piling and burning may only be used as a last resort [note: resource protection guidelines are still needed for this activity].

**Prescribed burning:**

- Incorporate appropriate weather and moisture parameters into burn plans to reduce fire intensity and the risk of large tree mortality.
- Prescribed burn only during periods of favorable weather and fuel moisture to prevent large tree mortality.
- Utilize ignition techniques and fire spread patterns that result in low-intensity fire. Backing fires, short run strip headfires, and spot ignition techniques assist in reducing tree mortality.
- Prescribed burning is prohibited during periods of severe drought, when trees are more vulnerable to heat stress.
- Consider burning at night if this is the best way to keep fire intensities low while accomplishing fire management objectives.

## Safety Mitigation

According to NEPA regulations (40 CFR 1508.20) “mitigation” actions do the following:

- Avoid the effect altogether by not taking a certain action or parts of an action
- Minimize impacts by limiting the degree or magnitude of the action and its implementation
- Rectify the impact by repairing, rehabilitating, or restoring the affected environment
- Reduce or eliminate the impact over time by preservation and maintenance operations during the duration of the action
- Compensate for the impact by replacing or providing substitute resources or environments

Appendix B lists the various mitigation techniques that would be used in implementing the suppression, manual thinning, and prescribed burn activities that could occur under the monuments’ FMP. The mitigation includes Mitigation for Vegetation/Fuels Management Projects, Minimum Impact Suppression Tactics (MIST), Minimum Impact Prescribed Burn Tactics (MIRxT), and mitigation specific to cultural and natural resource protection.

Public and firefighter safety is the number one priority in fire management. The Federal Fire Policy states “firefighter and public safety is the first priority, and all fire management plans and activities must reflect this commitment.” NPS Wildland Fire Management Policy (DO-18) echoes this direction: “The NPS is committed to protecting park resources and natural ecological processes, but firefighter and public safety must be the first priority in all fire management activities”. Therefore, the following safety measures would be included in the Flagstaff Area National Monuments’ FMP:

- Portions of the monuments may be restricted by order of the Superintendent when there is any threat to the public or firefighters from a wildland fire or fire management activities.
- Smoke warning signs will be posted on roadways and/or traffic control will be instituted during wildland fires as directed by the Burn Boss, Incident Commander, Safety Officer, or a visitor protection representative.
- All fire personnel will receive annual training in all wildland fire safety standards [including the 10 Standard Fire Orders, the 18 Situations That Shout “Watchout”, Downhill/Indirect Line Checklist, Four Common Denominators of Fatality Fires, Lookouts-Communications-Escape Routes-Safety Zones (LCES), and Risk Management/Situational Awareness].
- Fire personnel assigned to fireline operations will complete a minimum of 32 hours of basic wildland fire training, including modules on basic firefighting, basic fire behavior, and Standards for Survival; and an annual minimum of 16 hours of refresher (FFT1 and above) and 8 hours refresher for FFT2 and non-operations personnel likely to be on the fireline.
- All project plans will address safety in an attached job hazard analysis.
- A safety briefing will be given prior to initiating work on any project.
- Every Incident Action Plan (IAP) will include a safety message.
- Every project or incident will have at least one person charged with incident safety oversight, complex situations will require multiple safety officers.

- All personnel will be authorized and obligated to exercise emergency authority to stop and prevent unsafe acts.
- All employees will have the right to turn down unsafe assignments; they will also have the responsibility to identify safe alternatives to accomplish the mission.
- All personnel on wildland fires will be equipped with proper personal protective equipment (PPE) as described in Chapter 3 of RM-18. All personnel will carry a fire shelter on wildland fires at all times unless in a designated safety zone.
- All visitors to wildland fires on the Flagstaff Area National Monuments will be equipped with Nomex clothing, gloves, hardhat, and fire shelter, and will be accompanied by an operationally qualified person that can maintain communications with the incident management team and that can recognize potential problem fire behavior.
- All personnel engaged in wildland fire activities on NPS lands will adhere to the health screening/medical surveillance and fitness requirements of RM-18, Chapter 3.

## APPENDIX C. SUMMARY OF PUBLIC SCOPING COMMENTS

The parks heard from seventeen commentors (by email, phone and letter) during the public scoping period. Relevant comments are presented in the table below, along with an explanation of how the parks considered the comment in the development of the EA or will consider the comment in the development of the FMP.

<b>Comment</b>	<b>How Comment Was Considered in the Development of the EA and/or FMP</b>
(2) Requests to receive a hard copy of the FMP	The FMP will be sent to anyone who requests a copy.
(2) Comments expressing support for Alternative A	The parks acknowledge the comment.
Recommendation that parks review FMPs at Grand Canyon National Park as research for Flagstaff Area National Monuments FMP	The staff at Flagstaff Area National Monuments have reviewed and intend to use information from FMPs from Grand Canyon National Park, Chiricahua National Monument, and Sequoia Kings Canyon National Park as examples while preparing the Flagstaff Area National Monuments FMP. Because the vegetation is most similar to Grand Canyon National Park, this plan will likely be borrowed from more heavily. The Fire Management Officer for Grand Canyon National Park, who is also the lead Fire Management Officer for the Flagstaff Area National Monuments and a member of the Flagstaff Area National Monument interdisciplinary team, is also involved in the development of the Flagstaff Area National Monuments FMP.
(3) Comments expressing support for Alternative C	Alternative C was dismissed because interagency planning at the landscape level could not be fully attempted until an estimated 10 years of work has been completed by the respective agencies to improve resource conditions and reduce the risk of severe fire within the monuments and the Flagstaff Wildland Urban Interface.
Recommendation to allow for the commercial use of trees	The series of Antiquities Act proclamations and congressional legislation designating and adjusting the boundaries of the Flagstaff Area National Monuments (refer to Appendix B) does not specifically provide for the commercial harvest of trees for firewood or lumber. The sale or

	<p>commercial use of natural products from NPS areas is otherwise prohibited under 36 CFR §2.1(c)(3)(v). Therefore, this alternative was dismissed from consideration.</p>
<p>Recommendation that there be no management of fires that do not threaten irreplaceable historical and archeological resources</p>	<p>Federal policy requires the NPS to manage all wildland fires. At Wupatki National Monument and Walnut Canyon National Monument, all fires would likely threaten cultural resources because of the high density of sites. The strategies proposed in the preferred alternative would reduce the risk of ecosystem-altering fire in fire-adapted vegetation, at the same time reducing the risk to cultural resources. This may eventually allow the NPS more discretion to utilize less aggressive suppression responses under a wider range of circumstances.</p>
<p>Concerns about prescribed fire escaping onto adjacent private property</p>	<p>Prescribed fires, proposed at Walnut Canyon National Monument, always pose some risk of escape. To greatly minimize this risk, prescribed fires would only be implemented when weather conditions and fuel moisture ensures low flame movement speed and low risk of fire spotting or blowing across the burn area boundary. Most of the closest private properties around Walnut Canyon National Monument are separated by all-weather improved roads, the paved entrance road, and Interstate 40 which serve as landscape level fire breaks. Much of the area downwind (northeast) of the monument has been chained to create pastures, and remaining trees are sparse. The Coconino National Forest and the Greater Flagstaff Forest Partnership are currently planning vegetation and fire restoration to reduce the risk of severe crown fire across the entire area to the northwest between Walnut Canyon National Monument and the City of Flagstaff. Current geographic features and management direction on adjacent Coconino National Forest lands would ensure that an escaped fire from Walnut</p>

	Canyon National Monument could be quickly contained before threatening private property.
Concerns about firefighter safety	Firefighter safety is the primary management concern and objective under the preferred alternative. The proposed strategies would not place firefighters in undue jeopardy while performing their duties.
Concerns about the personal health impacts of smoke and request for advanced notification of any smoke generating activity	A number of measures to mitigate smoke impacts are proposed for incorporation into the FMP, including: (1) Public notice, media relations, and neighbor contacts in advance of a prescribed fire; (2) Prescribed fire would be implemented when weather conditions are optimal for smoke to rise and disperse; (3) A limit of one prescribed fire per year; and (4) A target for each prescribed fire to generate smoke for less than 24 hours, with residual burning not to exceed 72 hours.
Concerns about the aesthetics of post fire scenery	The preferred alternative proposes strategies to promote low severity ground fires in fire-adapted vegetation. This would result in short term impacts to natural scenery when the understory herbaceous and shrub vegetation, along with some thickets of tree seedlings and saplings, is blackened after a fire. Over the long term, effects on scenery would likely be beneficial as stands of larger diameter trees with more open canopies develop at Walnut Canyon National Monument and Sunset Crater Volcano National Monument, and more open grasslands are restored to Wupatki National Monument.
Concerns about adverse effects to archeological resources	The NPS assumes that the threat to archeological resources from severe wildfire is greater than the vegetation and fire restoration strategies in the preferred alternative. The preferred alternative proposes to integrate vegetation thinning and fuels reduction treatments to protect only cultural sites which are in fire-prone landscapes, with primary emphasis on sites which possess structural features or artifact

	assemblages which could be destroyed by fire. Careful standards are being developed to ensure this work has negligible effects on archeological resources.
Request to receive a copy of the EA	The EA will be sent to anyone who requests a copy.
Desire to see focus on long-term improvements	The preferred alternative provides a short-to medium-term framework of vegetation and fuels reduction treatments to alleviate the immediate risk of severe, stand-replacing fire, with an eventual shift to maintenance burning and most appropriate suppression response to allow fire to naturally shape the ecosystem over time.
Support for NPS management of fire.	The parks acknowledge the comment.
Support for NPS stated objectives in addressing wildland fire management	The parks acknowledge the comment.
Encouragement for NPS to frame its development of alternatives according to ultimate goals of fire management, 1) safe human communities, 2) wild self-sustaining ecosystems in healthy condition, 3) managed ecosystems in healthy condition... with safe NPS buildings, cultural sites, and historic structures. Fire should play a natural role, where safe and managed otherwise	The FMUs and implementation strategies in the preferred alternative are consistent with the recommendations provided by the commentor.
Recommendation that rigorous identification and mapping of the landscape must be a central feature of the NPS planning effort	The FMUs and strategies proposed in the preferred alternative are primarily developed from: (1) Recent vegetation maps based upon combined field sampling and interpretation of 1:12,000 aerial photography; (2) Fire regime condition class assessments of dominant vegetation formation classes completed in 2003, with heavy reliance upon assigning the correct natural fire regime.
Questions about data needs for each individual monument, about how needs will be addressed, and about projects being done without some data	Good quality scientific information on current vegetation associations, composition/cover/structure, changes since the reference period, and natural fire regimes is available for Walnut Canyon National Monument, while considerable vegetation change information is needed for Sunset Crater Volcano National Monument and Wupatki National

	<p>Monument. Scientific information on reference period conditions is currently being developed for FMU 3 at Wupatki National Monument, and assessment of vegetation and fuels conditions at cultural sites is proposed. Scientific information on reference period conditions would still be needed for FMU 3 at Sunset Crater Volcano National Monument to guide vegetation and fire restoration decisions. The preferred alternative does not propose vegetation and fire restoration projects for these areas (except for limited manual fuels reduction in proximity to high-risk archaeological sites), or for the remaining areas of vegetation not adapted to frequent fire regimes.</p>
<p>Request that NPS practice adaptive management</p>	<p>Adaptive management principles incorporated into the preferred alternative include: (1) the interdisciplinary organization of the fire management program; (2) project review and approval by the NPS management team and other operational functions at the monuments; (3) incorporation of cyclic monitoring data collection; (4) annual review of fire program accomplishments, FMP strategies, and implementation effects; (5) the establishment of a specific FMU at Wupatki National Monument and Sunset Crater Volcano National Monument for which additional scientific information must be acquired to guide vegetation and fire restoration decisions; (6) built in commitment to renew the NEPA and other consultation processes should fire management strategies be changed or should the scope of effects on the cultural resources or the environment under the preferred alternative be exceeded.</p>
<p>Questions about monitoring occurring at the project-level or as an aggregate of the plan revision; about monitoring criteria to address how effectively the amended plans meet goals/objectives; about funding for monitoring; about outcomes, beyond</p>	<p>The preferred alternative proposes that a monitoring plan be incorporated into the Flagstaff Area National Monuments FMP to measure vegetation/fuels changes, prescribed fire effects, and archeological site conditions, for short-term use in</p>

<p>project implementation, that will be monitored by NPS</p>	<p>planning individual projects, and for long-term use to assess whether broader fire management objectives are being met. Monitoring would be funded as part of each fire management project or as work shared with other nearby NPS areas with more fire management capabilities. Proposed monitoring criteria include vegetation composition, cover, structure, base crown height, bulk crown density, invasive plants, prescribed fire weather and behavior, and vegetation/fuels in proximity to archeological sites. Vegetation/crown fire risk attributes would be measured for planning purposes prior to each vegetation or fire restoration project (on a 10 year cycle), with some attributes measured more frequently up to 5 years after project implementation. Vegetation/fuels in proximity to cultural sites is proposed on a 10 year cycle. Information on protected/sensitive species status and trends is acquired independently by the Flagstaff Area National Monuments natural resource program.</p>
<p>Recommendation to incorporate restoration objectives into each alternative (comment included references on restoration prescriptions)</p>	<p>The preferred alternative would rely on site-specific, pre-settlement vegetation reconstruction and fire scar histories to establish restoration objectives for vegetation structure, fire return intervals, and the timing of prescribed fire.</p>
<p>Specific suggestions with regard to fire management in watersheds and near waterways, in riparian areas, in rare ecosystem elements, outside of high elevation areas, in the understory, in fine fuels, without disturbing soils, outside of roadless areas, in the wildland urban interface, when cultural resources are present, without mechanized equipment, without herbicides, with limited rehabilitation of burned areas</p>	<p>The planning framework, FMUs, and fire management strategies in the preferred alternative are consistent with the suggestions for avoiding or mitigating impacts to rare/unique/sensitive ecosystem components and wilderness values.</p>
<p>Request that risk, hazard, and value maps consider impacts of a fire-start wherever it might occur to narrow the definition of an "unwanted" fire</p>	<p>The primary mapped information used for the preferred alternative was fire regime condition class maps for dominant vegetation within the monuments. Recent</p>

	<p>fire events, public facilities, utilities, and private property are also shown on planning maps. These maps are included in the EA. Fire history records are also summarized in the EA.</p>
<p>Recommendation that collaborative fire management approaches not devalue the monuments' mandates, advocates caution for Alternative C</p>	<p>Except for protection of firefighter safety and the protection of public and private property, the protection of cultural and natural resources remains the primary fire management goal for the Flagstaff Area National Monuments. Alternative C was proposed as a full implementation scenario under the Federal Collaborative Approach for Reducing Wildland Fire Risks to Communities and the environment: A 10 Year Comprehensive Strategy. Over the last two years, the NPS has engaged in the collaborative planning process of the Coconino National Forest and the Greater Flagstaff Forest Partnership for the lands surrounding Walnut Canyon National Monument and Sunset Crater Volcano National Monument. Many concepts and resource impact concerns identified by the stakeholders have been used to refine the ecological restoration strategies and mitigating measures in the preferred alternative. However, Alternative C was dismissed because interagency planning at the landscape level could not be fully attempted until an estimated 10 years of work has been completed by the respective agencies to improve resource conditions and reduce the risk of severe fire within the monuments and the Flagstaff Wildland Urban Interface.</p>
<p>Comment of general support for management strategies in Alternative B</p>	<p>The parks acknowledge the comment.</p>