# EXECUTIVE SUMMARY Draft Environmental Impact Statement and Assessment of Effect Grand Canyon National Park Fire Management Plan

This Draft Environmental Impact Statement/Assessment of Effect (DEIS/AEF) presents five alternatives designed to implement National Park Service (NPS) fire policies in Grand Canyon National Park. The EIS/AEF supports the implementation document for the fire program—the Fire Management Plan (FMP). The Fire Management Plan will be prepared subsequent to issuance of a Record of Decision (ROD) for the Final Environmental Impact Statement (FEIS).

This DEIS/AEF proposes alternatives for management of wildland and prescribed fire, protection of human life and property, restoration and maintenance of fire dependent ecosystems, and reduction of hazardous fuels. It also examines environmental impacts of each alternative.

## THE DECISION TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT

The decision to prepare this Draft Environmental Impact Statement/Assessment of Effect on the proposed Grand Canyon National Park Fire (GRCA) Management Plan was made by the Superintendent after specific issues were raised by the public during scoping. This Grand Canyon DEIS/AEF was prepared to comply with requirements of the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), and Endangered Species Act (ESA). The legal authority for preparing and implementing the Fire Management Plan is 16 U.S. Code (USC) 1 through 4 and the NPS 1916 Organic Act. NPS Director's Order 18, Wildland Fire Management, and Reference Manual 18, Wildland Fire Management, direct and guide NPS units to develop compliance Fire Management Plans (See Appendix A).

### Purpose and Need for Action

The NPS is preparing this NEPA document to update the Fire Management Plan EA dated 1992 (NPS 1992). The Secretary of the Interior, through NPS wildland fire policy directives and NPS Director's Order 18 (DO-18) Wildland Fire Management, requires parks with burnable vegetation to have a Fire Management Plan. These plans are intended to be both strategic and operational, guiding the full range of fire program activities that support land and resource management objectives.

By revising the 1992 FMP EA, the NPS seeks to adjust management direction from the existing plan to 1) accommodate new national and NPS policy and new scientific information, and 2) accomplish revised program goals and objectives.

The 1992 FMP is revised and amended annually, thus, the park's Fire Management Program is refined as knowledge of fire behavior and effects grow. The program undergoes annual review, and adjusts to reflect experience gained from management actions that achieve desired objectives and those that do not. Notably, fire managers have accelerated wildland fire use (WFU) for resource benefits, introduced aerial ignition for prescribed fires, and implemented prescribed fires under a wider range of environmental conditions to more fully meet fuel reduction objectives.

### Existing Situation

Between 1993 and 2006, more than 115,800 park acres burned. The majority (78%) was prescribed (46,459 acres) and naturally-ignited fires (46,433 acres) with desirable outcomes. Unwanted fires accounted for only 22% of the total (22,942 acres). Figure 1-1 (Chapter 1) displays annual acres burned by fire type since 1993. The fire effects monitoring program allows fire managers to evaluate effectiveness of prescribed and wildland fire-use activities, and adapt future practices as needed to better meet resource management objectives.

After more than 15 years of proactive fire management, progress toward restoring natural fire regimes to the park is measurable, but far from fully achieved. This amount of managed fire has been insufficient to remedy decades of landscape-scale fire exclusion. In many areas, multiple fire treatments will be needed to restore desired ecological conditions.

### Project Goals

To evaluate proposed actions, a team of interdisciplinary park staff identified success measures for the future Fire Management Program. These measures consist of program-specific goals

Goal 1 Protect human health and safety and private and public property
Goal 2 Restore and maintain park ecosystems in a natural, resilient condition
Goal 3 Protect the park's natural, cultural, and social values
Goal 4 Promote a science-based program that relies on current and best-available information
Goal 5 Educate, inform, consult, and collaborate with tribes, stakeholders, and the public

## ALTERNATIVE DEVELOPMENT

### Issues and Concerns Used to Develop Alternatives

In May 2001, the NPS sent a general scoping letter (Appendix B, Attachment A) to interested publics, affected agencies, and known groups about the fire management program and projects to be undertaken at GRCA to prepare a NEPA document. The letter informed recipients about the proposed updated Fire Management Plan and projects including: prescribed and wildland fire-use fires and manual/mechanical fuel reduction. The letter also described several existing park conditions that have led to increased fire potential such as overcrowded forests and activities undertaken before Grand Canyon became a national park. Eleven written responses to this letter were received by GRCA through email, U.S. mail, and hand delivery. Based on comments and issues raised during internal scoping, the NPS elevated the level of environmental analysis from an Environmental Assessment to an Environmental Impact Statement.

A Notice of Intent to prepare an EIS was published in the Federal Register on September 16, 2003. Written responses from the scoping letter and comments from public meetings helped identify fire management issues and concerns, a suitable range of alternatives, and environmental impacts.

Members of the planning team read every submission, identified specific comments in each, and coded them according to developed criteria. Major issues raised in the 2003 scoping comments are

- GRCA ecological restoration through natural fire
- Local impacts related to air and visual resource quality
- Cultural resource protection
- Wildland-Urban Interface/community protection
- Appropriate conditions for prescribed fire use
- Overall management and coordination procedures
- Coordination with adjacent landowners and neighboring land management agencies

Based on analysis of issues and concerns raised during internal and public scoping and on knowledge of park resources and professional expertise, the FMP Interdisciplinary Team determined that activities connected with fire management strategies identified in the alternatives would or could potentially effect resources and functions listed below. These resources and functions are therefore analyzed in this FMP DEIS/AEF regarding any beneficial or adverse impacts.

**Air Quality** GRCA is a Class I air quality area under the Clean Air Act, and is afforded the most stringent protection against increases in air pollution and further degradation of air quality-related values.

Levels of air pollutants, effects on human health, and decreased visibility are all concerns related to smoke from prescribed and wildland fire.

**Soundscape** The NPS is mandated by DO-47, Soundscape Preservation and Noise Management, to protect, maintain, or restore natural-soundscape resources in a condition unimpaired by inappropriate or excessive noise. Natural sounds are intrinsic environmental elements associated with parks and park purposes.

**Soils and Watersheds** NPS Management Policies (NPS 2006) and the GRCA Resource Management Plan (NPS 1997) direct park soils protection. Soil erosion, oxidation, sterilization, and compaction are concerns related to fire management strategies. As a result of some fires, soils are enriched due to nutrients released from burned vegetation. The Federal Water Pollution Control Act (the Clean Water Act) of 1972 requires consideration of impacts on U.S. jurisdictional waters and potential for polluting surface waters, thus soils and watersheds are concerns.

**Vegetation** NPS Management Policies 2006, the 1995 GRCA General Management Plan (GMP), and other NPS and GRCA policies direct protection of GRCA's naturally occurring biotic communities including vegetation. Beneficial and adverse effects of fire management strategies on vegetative communities, and potential for introducing and spreading invasive plant species, are concerns.

**Wildlife** NPS Management Policies (NPS 2006), the GRCA GMP (NPS 1995), and other NPS and GRCA policies direct protection of the park's naturally occurring biotic communities, including wildlife. Impacts of fire management strategies on individuals or habitats of park native fauna are concerns; often, plant communities and habitat are improved as a result of fire management projects and events.

**Special Status Species** The Endangered Species Act of 1973, as amended, requires examination of impacts to all Federally listed, threatened, or endangered species for any major action authorized, funded, or carried out by a Federal agency. NPS policy requires examination of impacts to state-listed and Federal candidate species.

**Cultural Resources** Consideration of impacts on cultural resources is required by the National Historic Preservation Act of 1966, as amended; NPS Management Policies 2006; and other Federal statutes, policies, and guidelines. In addition, NEPA regulations at 40 CFR 1508.27 require the intensity of potential impacts be evaluated in terms of potential adverse effects on archaeological and other cultural resources, including historic properties listed on or eligible for inclusion in the National Register of Historic Places.

**Visitor Experience** The NPS Organic Act of 1916 (16 USC) directs national parks to provide for public enjoyment, and NPS Management Policies 2006 state the NPS will promote and regulate appropriate park use, provide services necessary to meet basic needs of park visitors, and achieve each park's mission goals. Concerns include visibility impacts of long- and short-distance views from smoke, and the beneficial or negative visual impact of fire-treated areas.

**Public and Firefighter Safety** NEPA regulations at 40 CFR 1508.27 require potential impact intensity be evaluated for public health and safety.

**Socioeconomics** Socioeconomic values consist of local and regional businesses and residents, the local and regional economy, and park concessions. Activities connected with fire management strategies may have an effect on the socioeconomic environment in the park and neighboring communities that rely in varying degrees on GRCA-related tourism.

**Park Operations** Fire management actions could potentially affect several aspects of park operations including budget, personnel assignment, facility maintenance, and infrastructure. Impacts of fire management strategies on overall park operations or portions thereof are a concern.

**Wilderness Character** Over 90% of GRCA is proposed for wilderness designation. NPS Management Policies 2006 requires the NPS manage all areas proposed for wilderness designation in a manner that does not jeopardize suitability for future designation.

### Alternative Development Criteria

NPS staff used Chapter 1's program goals and objectives, NPS policies and planning guidance, and public concerns to fully develop one No Action Alternative (Existing Program) and four Action Alternatives carried into detailed analysis. In addition, alternatives were reexamined to insure they satisfied criteria based on the many acts, laws, and regulations under which GRCA operates.

Many topics were directly related to the proposed FMP's goals and objectives, and have been incorporated including reducing fire risk in the Wildland-Urban Interface (WUI); using natural fire as a process to maintain park ecosystems; coordinating with other Federal, state, county, local, and American Indian tribal governments through fire management collaboration; and protecting wilderness values through best management practices.

### Ecological Basis for Alternatives

Information on fire history and fire ecology was used to assess ecological conditions of plant communities in the past and present. Based on differences between these two sets of conditions, a series of Desired Conditions were identified cooperatively by fire managers and GRCA natural and cultural resource specialists. These Desired Conditions represent characteristics of healthy and functioning vegetation ecosystems based on existing scientific knowledge and professional judgment. In some instances there is not much detail or resolution, rather the descriptions are coarse. Desired Conditions are meant to guide fire management actions and serve as a map for achievement. Because GRCA fire strategies and tactics are to be based on the best available science, the FMP planning team recognizes that Desired Conditions will likely change over time as new information becomes available. Existing and target conditions, along with analysis of expected fire behavior under differing weather conditions, were used to determine the type, amount, and location of fire management activities for proposed alternatives. Management action refinements will occur through the adaptive management process.

## ALTERNATIVES UNDER CONSIDERATION

The NPS identified five alternatives for analysis while developing the proposed GRCA FMP. As required by NEPA, a No Action Alternative describes the existing Fire Management Program as described in the current FMP. Four action alternatives have been crafted in response to identified program goals and needs. Each aims to restore and maintain natural ecosystems and to protect people, communities, resource values, and infrastructure from unwanted fire. The five alternatives under consideration are

### Alternative 1 No Action, Existing Program

Continues the existing program including fire suppression, fire use, prescribed fire, and limited manual fuel reduction treatments, in three existing Fire Management Units (FMU).

The No Action Alternative assumes a similar or slightly higher level of suppression would occur as occurred 1993–2005. Successful suppression of small fires (in areas treated with past fires) should improve. However, large areas with poor access have not burned in the last 100 years, and risk of large-

scale wildfire in these areas is very high. Wildland fires managed as suppression actions averaged 1,705 acres annually from 1993-2005.

Prescribed fire would continue under a Long-Term Treatment Schedule (see Appendix D, Figure 2-3, and Map 2-4), resulting in an average 5,840 acres treated annually. As the Fire Management Program's prescribed fire portion moves into more complex burn units (like mixed-conifer areas with high fuel loads and ladder fuels), risks associated with these projects increase.

Annual acreage managed under a Wildland Fire Use (WFU) strategy is expected to increase as natural fire regimes are restored, though it is difficult to predict by how much. It is feasible to assume that acres treated under a WUI strategy could rise to an annual average 5,000 acres from the current 13-year (1993-2005) average 3,568 acres. Acres treated with future prescribed fires may actually decrease under this alternative as acres treated under WFU strategy increase and treat those future prescribed fire acres.

Under the No Action Alternative, existing manual fuel-reduction treatments would continue in piñon-juniper habitat of FMU 1 and 3 in areas not proposed as wilderness including Grand Canyon Village, Hermits Rest, Desert View, and along main routes between these developments (Highway 64 and West Rim Drive). Manual treatments in spruce-fir habitat (FMU 2) would continue, primarily aimed at prescribed fire unit preparation, WUI protection, and the main route in and out of North Rim (Highway 67). Level of activity would continue at 10-60 acres per year with an average 40 acres per year.

**Alternative 2 Mixed Fire Treatment Program**

The Mixed Fire Treatment Program Alternative would continue the existing direction of GRCA's Fire Management Program with limited changes. Changes include use of new Fire Management Units (Map 2-2) and development of a Wildland-Urban Interface treatment program involving manual/mechanical fuel-reduction methods. Alternative 2 would continue use of suppression, wildland fire-use, and prescribed fire, and manual fuel reduction treatments.

Alternative 2 assumes a similar or slightly higher suppression level would occur through the life of the plan as occurred 1993–2005. Prescribed fire would continue under a Long-Term Treatment Schedule (see Appendix D, Figure 2-4, and Map 2-5), resulting in an average 5,840 acres treated annually. As the Fire Management Program's prescribed fire portion moves into more complex burn units (like mixed-conifer areas with high fuel loads and ladder fuels), risks associated with these projects increase.

Annual acreage managed as Wildland Fire Use is expected to increase as natural fire regimes are restored, though it is difficult to predict the amount. It is feasible that acres treated under a WFU strategy could rise to an annual average 5,000 acres from the current 13-year (1993-2005) average 3,568 acres. Acres treated with future prescribed fires may actually decrease under this alternative as acres treated under other wildland fire strategies increase and treat those future prescribed fire acres.

Mechanical and manual fuel-reduction treatments in the WUI would also occur under a Long-Term Treatment Schedule (see Appendix D, Figure 2-4, and Map 2-5), resulting in an average 225 acres treated annually. Increased treated WUI acres will decrease wildland fire risks and increase safety.

**Alternative 3 Non-Fire Treatment Emphasis**

Alternative 3 would change the existing direction of GRCA's Fire Management Program through inclusion of a large mechanical/manual thinning component along with the wildland fire use and suppression program. The mechanical and manual thinning program would comprise the majority of the fire management staff's planning and implementation efforts. Thus, the wildland fire use and prescribed fire programs would be reduced due to time and/or resource constraints.

Alternative 3 Non-Fire Treatment Emphasis assumes an increase in suppression level through the life of the plan compared to 1993-2005. Acres burned under a suppression strategy would increase by an estimated 30% due to lack of effort in restoring fire regimes and fuel conditions (primarily in North Rim forests) through wildland fire-use or prescribed fire. Large areas with poor access have not burned in the last 100 years, and risk of large-scale wildfire in these areas is very high. As fuel loads increase, fires will grow more quickly with greater intensity, reducing effectiveness of firefighters and fire-suppression equipment. Wildland fires managed as suppression actions are assumed to average 2,370 acres annually through the life of the plan.

Prescribed fire would continue under a Long-term Treatment Schedule (Appendix D, Figure 2-5, and Map 2-6), resulting in an average 2,300 acres treated annually. Emphasis for most prescribed fire treatments will be in WUI to maintain light fuel loads.

Annual acreage managed as Wildland Fire Use is expected to fall due to fire staff commitments to accomplishing non-fire treatment. Fire-use fires would still be part of the Fire Management Program when staff is available to manage the fire. It is feasible that fire use acres would burn an annual average of 800 acres from the current 13-year (1993-2005) average 3,568 acres.

WUI mechanical and manual fuel-reduction treatments would occur under a Long-term Treatment Schedule (Appendix D, Figure 2-5, and Map 2-6), resulting in an average 360 acres treated annually.

**Alternative 4 Prescribed Fire Emphasis**

Alternative 4 would change the existing direction of GRCA's Fire Management Program by increasing amount of prescribed fire. The prescribed fire program would be solely responsible for achieving desired vegetative structural conditions. Any area not identified as being at desired conditions would not be eligible for management with fire use, creating a suppression response. Therefore, the wildland fire use program would initially be reduced to a few small areas.

Alternative 4 assumes an increased suppression level through the life of the plan compared to 1993–2005. Acres burned could increase by an estimated 20% due to decrease of fire-use fires and multiple prescribed fire entries needed to move an area to desired conditions. Successful suppression of small fires (in areas previously treated with fire) should improve. However large areas with poor access have not burned in the last 100 years, and risk of large wildfire in these areas is very high. As the prescribed fire portion of the Fire Management Program moves into more complex burn units (like mixed-conifer areas with high fuel loads and ladder fuels), risks associated with these projects increase, thus increasing the chance of escaped prescribed fire. Wildland fires could rise to an average 2,190 acres annually.

Prescribed fire would continue under a Long-term Treatment Schedule (Appendix D, Figure 2-6, and Map 2-7), resulting in an average 9,930 acres treated annually. The prescribed fire program would emphasize treating WUI areas to maintain light fuel loads and protect park communities. The prescribed fire program would also emphasize moving current vegetative structural conditions toward desired conditions outside the WUI. Time and effort needed for planning and implementing this level of prescribed fire would mean less effort toward planning and implementing non-fire treatments.
Annual acreage managed as Fire Use is expected to fall due to lack of suitable areas that meet desired conditions. It is feasible that fire-use acres would burn an annual average 500 acres from the current 3,568 acre 13-year (1993-2005) average .

Mechanical/manual fuel-reduction treatments in WUI would occur under a Long-term Treatment Schedule (Appendix D, Figure 2-6, and Map 2-7), resulting in an average 75 acres treated annually.

### Alternative 5 Fire Use Emphasis

Alternative 5 would change the existing direction of GRCA's Fire Management Program by expanding amount (acres and number of incidents) of fire use. Alternative 5 would emphasize managing fire for maintenance and restoration of fire-dependant ecosystems. Managing wildfire under a fire-use strategy would be applied in all park areas except the WUI. The prescribed fire program focus would be limited to protecting values at risk, developing defendable management action points or maximum manageable areas, and reducing wildfire risk in the WUI. Prescribed fire treatments would be phased out of the proposed wilderness area, but would occur in and around park boundaries and the WUI. Non-fire treatments would only occur in the WUI.

Alternative 5 assumes a decrease in suppression fires through the life of the plan compared to 1993–2005 because more fires will be managed under a fire-use strategy. Acres burned under a suppression strategy would decrease by an estimated 10% due to increased number of fires approved and managed under a fire-use strategy. Wildland fires managed with suppression actions would be assumed to average 1,640 acres annually. These suppression acres account for fires that would not be considered for management under a fire-use strategy for reasons including political pressures, air quality issues, staffing concerns, national preparedness concerns, etc.

Prescribed fire would continue under a Long-term Treatment Schedule (Appendix D, Figure 2-7, and Map 2-8), resulting in an average 2,720 acres treated annually. Prescribed fire would also be used as a restoration and maintenance tool, but implementation would be focused on the WUI.

Annual acreage managed as fire use is expected to increase due to acceptance of fire use as a restoration and maintenance tool. It is feasible that fire-use acres would burn an annual average 8,000 acres from the current 13-year (1993-2005) average 3,568 acres.

Mechanical and manual fuel-reduction in the WUI would be carried out under a Long-term Treatment Schedule (Appendix D, Figure 2-7, and Map 2-8), resulting in an average 245 acres treated annually.

### Elements Common to All Action Alternatvies

In addition to the alternative summary above, elements common to all action Alternatives (2-5) include

- GRCA is divided into eight new Fire Management Units (FMU)
- WUI treatment areas and priorities do not change, but implementation pace varies by alternative
- Wildland fire-use fire would not be used as a management tool in the two WUI FMU
- Highway 64 and Highway 67 are not classified in either WUI FMU, but these roads and their corridors are primary public escape routes and would be included as areas where mechanical/manual thinning is proposed. For project planning and funding purposes, work associated with these road corridors (300 feet from road centerline) would be designated WUI projects
- It is anticipated that up to 80% of proposed thinning projects would be completed under contracted services (using local or regional resources)
- Mechanical treatments are proposed for the Primary WUI FMU only
- Increased moderate/high and high burn severity in mixed-conifer compared to Alternative 1

## ALTERNATIVES ELIMINATED FROM FURTHER STUDY

During the public scoping process for this FMP DEIS/AEF several alternative actions were recommended. Others were suggested by scientists, technical specialists, and the GRCA FMP IDT. While all suggestions were considered, and several were included as alternatives or alternative elements, some were eliminated from detailed study per 40 CFR 1502.14(a). Reasons for dismissal include

- Technical or economic infeasibility

- Inability to meet objectives or resolve project need
- Duplicative with other less environmentally damaging or less sensitive alternatives
- In conflict with an approved park plan, NPS or Federal policy; thus, implementation
- requires a major plan or policy change
- In conflict with this document's purpose and need statement
- Environmental impacts too great

The following alternatives were dismissed from further study.

**Natural Fire Only**

This alternative would minimize management actions by allowing wildfire managed under a fire-use strategy to accomplish management objectives without benefit of prescribed fire or non-fire fuel-reduction treatments. All human-ignited fires would be suppressed, as would naturally ignited fires that pose unacceptable risk to human safety, park resources, or neighbors. Fire would also be suppressed if resources (staff and equipment) to manage long-term fire events were unavailable.

This alternative was dismissed from analysis due to conflicts with NPS and Federal wildland fire management policies and potential for long-term and severe air quality impacts. Also, this alternative does not adequately address overall risk of unwanted cross-boundary wildland fire due to lack of strategically placed prescribed fire projects adjacent to the boundary as in analyzed alternatives. Program goals ensuring protection of life and health and private and public property would not be met under this alternative because little or no proactive, preventive fuel reduction would occur.

**Full Suppression of All Wildland Fires**

All natural and human-ignited wildland fires would be suppressed. Wildland fire use would not occur and no prescribed fire projects would be implemented to restore or maintain natural systems. Prescribed burning would only occur in conjunction with limited manual fuel treatments around developments. Non-fire treatments to reduce fuels would be used to protect values at risk and WUI.

This alternative was eliminated from detailed analysis because it would not meet goals to restore and maintain native park ecosystems or use fire to protect wildlife, vegetation, cultural resources, and wilderness character. This alternative would not incorporate new scientific information nor conform to NPS and Federal wildland fire management policy. Specifically, research and monitoring data show conclusively that suppression of all wildland fires would lead to continued altered forest ecosystems, increased fuel loads, and future crown-fire potential as overstory canopies close. Unacceptable threats to life, property, and park boundary areas would occur over the long term.

**Full Suppression and Landscape-Level Manual Treatments**

This alternative was eliminated from detailed analysis because it does not respond to Chapter 1's purpose and need or meet goals related to fire's natural role and use to accomplish protection objectives. This alternative does not incorporate new scientific information and does not conform to NPS and Federal wildland fire management policy. Air quality protection objectives would be met in the short term because virtually no smoke emissions would be produced from management burning. Over the long term, unnatural fuel amounts would continue to accumulate, and inevitably unwanted wildfires would occur, producing heavy smoke. Ecological objectives involving beneficial effects from prescribed and wildland fire-use fire would not be accomplished. Fire promotes nutrient recycling, exposes mineral soil, regulates structure, encourages native species diversity, and maintains other ecosystem dynamics. Further, manual fuels management would not be sufficient in scope or timing to stay abreast of fuel accumulations and continued undesirable forest structure alteration over time.

**Full Suppression and Maximum Mechanical Treatments**

This alternative was eliminated from analysis because it does not respond to Chapter 1's purpose and need or meet goals and objectives. This alternative is not responsive to new scientific information (i.e., the goal to "use the adaptive management process to incorporate monitoring results and the best available scientific knowledge into all areas of fire management"), and does not conform to NPS and Federal wildland fire management policy. Without fire use benefits, fuels would accumulate and forest structure would alter further, particularly in proposed wilderness where mechanical equipment would likely not meet minimum tool requirements. Smoke impacts would be sharply reduced with this alternative, but necessary ecological benefits described above would not be realized.

**Suppression, Prescribed Fire, and Manual Treatment (No Wildland Fire Use)**

This alternative was dismissed from detailed analysis because it conflicts with NPS and Federal wildland fire management policies. Without the wildland fire use strategy, this alternative would only accomplish those goals and objectives for which prescribed fire and manual treatments apply. For instance, the stated goal to "…restore park ecosystems to a natural, resilient condition by the re-establishment of natural fire regimes…" would only be partially met with prescribed fire. It is anticipated that without fires managed under a fire use strategy, much more time would be required to accomplish fuel reduction and ecosystem objectives, particularly where applying manual treatment strategies to mimic the same ecosystem effect is concerned. Further, those FMU with high departure from desired conditions would be at more risk of undesirable outcomes (e.g., extreme fire behavior, stand-replacement fire, threats to park values) if wildland fire use is not part of the strategy.

**Suppression, Wildland Fire Use, and Manual Treatment (No Prescribed Fire)**

This alternative was eliminated from detailed analysis because it does not meet goals and objectives related to protection of human health and safety, private and public property, and natural and cultural resources. Management would not have flexibility to determine timing and location of wildfires as with planned prescribed fires. Fire's ecological benefits would be similarly reduced, particularly near park boundaries. Prescribed fire would not be used as a strategy to consume residual debris from manual treatments near values at risk. Debris disposal costs would escalate as would potential suppression costs. Under a fire use strategy, a fire's size and duration may have to be sharply reduced in some cases if preventive fuel reduction using prescribed fire were not a management option.

## AFFECTED ENVIRONMENT

A list of specific impact topics was developed to compare environmental impacts of fire management activities among the five alternatives. These topics were selected based on Federal law and regulations, executive orders, agency management policies, Federal wildland fire management policies, information from subject matter experts, tribal consultation, and concerns expressed by the public or other agencies during public scoping periods.

The existing environment that could be affected by actions proposed in the Grand Canyon FMP DEIS/AEF is described in Chapter 3.

Existing conditions establish the baseline for analysis of effects found in Chapter 4 (Environmental Consequences).

## ENVIRONMENTAL CONSEQUENCES

An impact analysis for each impact topic was completed for each alternative in the FMP DEIS/AEF. Beneficial and adverse environmental consequences are described in detail in Chapter 4. Consequences of

each alternative are summarized below. Table 2-11 (Chapter 2) provides a matrix of impacts by topic and alternative.

**Alternative 1 No Action, Existing Program**

**Biological Environment Environmental Consequences Alternative 1**

Alternative 1 implementation would result in minor to moderate beneficial effects to vegetation composition and structure to forest types above Grand Canyon's rim. Some effects to composition and structure are less than other alternatives due to current fire-severity mitigations that limit fire intensities and tree mortality in mixed-conifer forests. Other reasons for reduced beneficial impacts to other forests include lack of proposed treatments primarily in spruce-fir and piñon-juniper forest types. Beneficial cumulative impacts would occur in all forest types in areas where fire or non-fire treatments occur, but adverse impacts would occur in areas not planned for treatment and not treated in the past.

Adverse impacts will occur in Alternative 1 to special status plants from direct impacts from fire and fire-related activities including trampling, crushing, or damaging plants from handline construction and manual thinning. Negligible to moderate adverse impacts from possible exotic plant increase will occur from fire and non-fire activities like vehicle use, thinning projects, and increased human/animal activities.

A wide range of impacts to wildlife and special status wildlife will occur from implementation of Alternative 1. Whether impacts are beneficial or adverse depends on each species' necessary habitat components. Wildlife that prefers open, early successional habitats would experience beneficial impacts. Examples would be northern sagebrush lizard, northern goshawk, American peregrine falcon, and the greater western mastiff bat. Wildlife that prefers closed canopy forests in late successional stages would be impacted adversely, but current fire-severity mitigation measures would limit adverse impacts. Species examples that would experience adverse habitat impacts include Mexican spotted owl, hermit thrush, and pigmy owl.

**Cultural Environment Environmental Consequences Alternative 1**

Potential direct effects from planned fire management activities vary depending on project location and activities type. In general, ground-disturbing activities can be anticipated, and vulnerable resources avoided, resulting in short-term, local negligible to minor adverse effects under NEPA, and potentially adverse effects to cultural resources for NHPA compliance.

Unplanned fire management activities and wildland fire-use responses are unpredictable; it is sometimes difficult to avoid or treat cultural resources where these fire types occur. These unplanned actions may result in short- to long-term, local to regional, negligible to major, adverse effects.

**Physical Environment Environmental Consequences Alternative 1**

Alternative 1 was the basis of comparison for all air quality impacts; impacts are negligible to human-health and air quality for all pollutants. Proposed treatments and suppression fires will cause minor to moderate adverse impacts on soil erosion and sediment transport, but these same fires will also cause minor to moderate beneficial impacts to soil nutrients available to plants. All intensities of short-term adverse impacts will occur to natural soundscape from fire apparatus use including chainsaws, engines, and helicopters. Long-term cumulative impacts to natural soundscape will be adverse, major, long term, but those impacts will occur regardless of fire activities, and are due primarily to commercial overflights. Overall effects to wilderness character would be beneficial, negligible to major, local to regional, and short to long term since the goal is to reach the natural range of variability for vegetation type which would enhance wilderness values. Adverse impacts would be negligible to major, local to regional, short to long term. Other components of wilderness character such as soundscape and cultural resources may have

major adverse impacts, although mitigation measures listed in Chapter 4 for soundscapes and cultural resources intend to lower intensity to moderate or below.

Impacts to visitors will be adverse during fire management activities due to smoke's visual and health impacts. Long-term impacts to visitor experience will be beneficial and negligible to moderate as forest aesthetics improve. A moderate to major beneficial impact will occur socioeconomically from increased engagement and collaboration with other government agencies and local communities.

**Alternative 2 Mixed Fire Treatment**

**Biological Environment Environmental Consequences Alternative 2**

Alternative 2 implementation would result in increased beneficial effects to vegetation composition and structure to forest types above the rim as compared with Alternative 1 due to relaxation of current fire severity mitigations that limit fire intensities and tree mortality in mixed conifer forests. Proposed treatments in spruce-fir and piñon-juniper forest types are limited and thus reduce some beneficial impacts to those vegetation types. Beneficial cumulative impacts would occur in all forest types in areas where fire or non-fire treatments occur, but adverse impacts would occur in areas not planned for treatment and not treated in the past. Alternative 2 proposes use of mechanical equipment to assist with non-fire treatment projects. There is a noteworthy increase in fuels treatment acreage in the wildland-urban interface compared to Alternative 1.

Adverse impacts will occur in Alternative 2 to special status plants from direct impacts from fire and fire related activities including trampling, crushing, or damaging plants from such activities as handline construction and manual/mechanical thinning. Negligible to moderate adverse impacts from possible exotic plant increases will occur from fire and non-fire activities like vehicle use, thinning projects and increased human/animal activities.

A wide range of impacts to wildlife and special status wildlife exist from implementation of Alternative 2. Whether impacts are beneficial or adverse depends on each species' necessary habitat components. Wildlife that prefers open, early successional habitats would experience beneficial impacts and those benefits would be greater in Alternative 2 than in Alternative 1 from increased allowable fire severity (which may create more forest openings). Wildlife that prefers closed canopy forests in late successional stages would be adversely impacted.

**Cultural Environment Environmental Consequences Alternative 2**

Potential direct effects from planned fire management activities vary depending on projects location and activity type. In general, ground-disturbing activities can be anticipated and vulnerable resources avoided, resulting in short-term, local, negligible to minor, adverse effects under NEPA, and potentially adverse effects to cultural resources for NHPA compliance. Addition of mechanical thinning in the WUI may slightly increase adverse impacts from soil erosion and disturbance, but could also increase beneficial impacts by reducing risk of unwanted fire in cultural landscapes.

Unplanned fire management activities and wildland fire-use responses are unpredictable; it is sometimes difficult to avoid or treat cultural resources where these fire types occur. These unplanned actions may result in short- to long-term, local to regional, negligible to major, adverse effects.

**Physical Environment Environmental Consequences Alternative 2**

Alternative 2 proposes the same number of fire-treated acres as Alternative 1, so air quality impacts would be the same, which are negligible to human-health and air quality for all pollutants. Proposed treatments and suppression fires will cause minor to moderate adverse impacts on soil erosion and sediment

transport, but these same fires will also cause minor to moderate beneficial impacts to soil nutrients available to plants. All intensities of short-term adverse impacts will occur to natural soundscape from fire apparatus use including chainsaws, engines, and helicopters. Addition of mechanical thinning operations will increase noise impacts in the WUI which will add adverse impacts to natural soundscape. Long-term cumulative impacts to natural soundscape will be adverse, major, and long term regardless of fire activities due to commercial overflights.

Overall effects to wilderness character would be beneficial, minor to major, local to regional, and short to long term since the goal is to reach the natural range of variability for vegetation type which would enhance wilderness values. Adverse impacts are negligible to major, local to regional, short to long term. Other components that make up wilderness character such as soundscape and cultural resources may have major adverse impacts. Mitigation measures listed in Chapter 4 for soundscapes and cultural resources intend to lower intensity to moderate or below.

Long-term impacts to visitor experience will be minor to major, beneficial as forest aesthetics improve. Socioeconomic impacts of Alternative 2 will be moderate to major, beneficial from increased engagement and collaboration with other government agencies and local communities. Impacts to park operations will be adverse, negligible to moderate from increased mechanical thinning operations and overall program costs.

### Alternative 3 Non-Fire Treatment Emphasis

**Biological Environment** **Environmental Consequences** **Alternative 3**

Implementation of Alternative 3 would result in decreased beneficial effects and increased adverse effects to vegetation composition and structure in forest types above the rim compared to Alternative 1, due to lack of fire treatment outside the WUI. Cumulative impacts would be adverse, major, regional, and long term to departure of the historic fire regime across all vegetation types, due to lack of prescribed and wildland fire-use fires. Alternative 3 proposes the largest increase in mechanical equipment use to assist with non-fire treatment.

Adverse impacts will occur in Alternative 3 to special status plants from direct impacts from fire and fire-related activities including trampling, crushing, or damaging plants from activities such as handline construction and manual/mechanical thinning, but impacts will be less than in Alternatives 1 and 2 due to fewer treatment acres. Negligible to moderate adverse impacts from possible exotic plant increase will also occur from fire and non-fire activities like vehicle use, thinning projects and increased human/animal activities.

A wide range of impacts to wildlife and special status wildlife will occur from implementation of Alternative 3. Whether impacts are beneficial or adverse depend on each species' necessary habitat components. Wildlife that prefers open, early successional habitats would experience beneficial impacts, but those benefits would be less than Alternatives 1 and 2 from lack of treatment in those forests. Wildlife that prefers closed canopies, and forests in late successional stages would be impacted adversely, but impacts would be reduced since most forested habitat would not be treated.

**Cultural Environment** **Environmental Consequences** **Alternative 3**

Potential direct effects from planned fire management activities vary depending on project location and activity type. In general, ground-disturbing activities can be anticipated, and vulnerable resources avoided, resulting in short-term, local, negligible to minor, adverse effects under NEPA, and potentially adverse effects to cultural resources for NHPA compliance. Addition of mechanical thinning in the WUI may slightly increase adverse impacts from soil erosion and disturbance, but could also increase beneficial impacts by reducing risk of unwanted fire in cultural landscapes.

Unplanned fire management activities and wildland fire-use responses are unpredictable; it is sometimes difficult to avoid or treat cultural resources where these fire types occur. These unplanned actions may result in short- to long-term, local to regional, negligible to major, adverse effects.

**Physical Environment Environmental Consequences Alternative 3**

Alternative 3 proposes the smallest number of fire-treated acres, so air quality impacts would be less than in Alternatives 1 and 2, and would be beneficial, moderate to major to human-health and air quality for all pollutants. Proposed treatments and suppression fires will cause minor to moderate adverse impacts on soil erosion and sediment transport, but these same fires will also cause minor beneficial impacts to soil nutrients available to plants. All intensities of short-term adverse impacts will occur to natural soundscape from fire apparatus use including chainsaws, engines, and helicopters. Mechanical thinning operations will increase noise impacts in the WUI more than any other alternative increasing adverse impacts to natural soundscape. Long-term cumulative impacts to natural soundscape at will be adverse, major, and long term, but impacts will occur regardless of fire activities due primarily to commercial overflights.

Overall effects to wilderness character would be beneficial, moderate to major, local to regional, short to long term since the goal is to reach the natural range of variability for vegetation type which would enhance wilderness values. Adverse impacts would range negligible to major, local to regional, short and long term. Other components that make up wilderness character such as soundscape and cultural resources may have major adverse impacts. Mitigation measures listed in Chapter 4 for soundscapes and cultural resources intend to lower intensity to moderate or below.

Long-term impacts to visitor experience will be beneficial and minor to major as forest aesthetics improve. Most of that improvement will be in the WUI, and accomplished with non-fire treatments. Socioeconomic impacts of Alternative 3 will be beneficial and moderate to major from increased engagement and collaboration with other government agencies and local communities. Impacts to park operations will be adverse and beneficial as total program costs decrease, but fewer acres are treated and that treatment comes at the highest cost/acre.

**Alternative 4 Prescribed Fire Emphasis**

**Biological Environment Environmental Consequences Alternative 4**

Implementation of Alternative 4 would result in adverse and beneficial effects to vegetation composition and structure to forest types above the rim compared to Alternative 1, due to lack of wildland fire use and its effects. Relaxation of fire-severity mitigations that currently limit fire intensities and tree mortality in mixed-conifer forests will help improve beneficial impacts. Beneficial cumulative impacts would occur in all forest types in areas where fire or non-fire treatments occur, but would be less than Alternatives 1 and 2. Adverse cumulative impacts would occur in areas not planned for treatment and not treated in the past.

Adverse, negligible to moderate impacts will occur in Alternative 4 to special status plants from direct impacts from fire and fire-related activities including trampling, crushing, or damaging plants from such activities as handline construction and manual/mechanical thinning. Adverse impacts similar to all alternatives from possible exotic plant increases will occur from fire and non-fire activities like vehicle use, thinning projects, and increased human/animal activities.

A wide range of impacts to wildlife and special status wildlife exists from implementation of Alternative 4. Whether impacts are beneficial or adverse depend on each species' necessary habitat components. Wildlife that prefer open, early successional habitats would experience beneficial impacts, but benefits would be less in Alternative 4 than Alternative 2 from lack of wildland fire use, which helps create better mosaic forest openings compared to prescribed fire. Wildlife that prefer closed canopies and forests in late successional stages would be impacted adversely.

**Cultural Environment** **Environmental Consequences** **Alternative 4**

Potential direct effects from planned fire management activities vary depending on project location and of activity type. In general, ground-disturbing activities can be anticipated, and vulnerable resources avoided, resulting in short-term, local, negligible to minor, adverse effects under NEPA, and potentially adverse effects to cultural resources for NHPA compliance. Addition of mechanical thinning in the WUI may slightly increase adverse impacts from soil erosion and disturbance, but could also increase beneficial impacts by reducing risk of unwanted fire in cultural landscapes.

Unplanned fire management activities and wildland fire use responses are unpredictable; it is sometimes difficult to avoid or treat cultural resources where these fire types occur. These unplanned actions may result in short- to long-term, local to regional, negligible to major, adverse effects.

**Physical Environment** **Environmental Consequences** **Alternative 4**

Alternative 4 proposes the most prescribed-fire treated acres, but lack of wildland fire use means total acres treated with fire are very similar to Alternatives 1, 2, and 5, so air quality impacts would be similar to those alternatives. Proposed treatments and suppression fires will cause minor to moderate adverse impacts on soil erosion and sediment transport, but these same fires will also cause minor to moderate beneficial impacts to soil nutrients available to plants. All intensities of short-term adverse impacts will occur to natural soundscape from fire apparatus use including chainsaws, engines, and helicopters. Additional prescribed fire operations will increase noise impacts. Long-term cumulative impacts to natural soundscape will be adverse, major, and long term, but impacts will occur regardless of fire activities due primarily to commercial overflights.

Overall effects to wilderness character would be beneficial, negligible to major, local to regional, short to long term since the goal is to reach the natural range of variability for vegetation type which would enhance wilderness values. Adverse impacts would range negligible to major, local to regional, short to long term. Other components that make up wilderness character such as soundscape and cultural resources may have major adverse impacts. Mitigation measures listed in Chapter 4 for soundscapes and cultural resources intend to lower intensity to moderate or below.

Long-term impacts to visitor experience will be beneficial and moderate as forest aesthetics improve. Socioeconomic impacts of Alternative 4 will be beneficial and moderate to major, from increased engagement and collaboration with other government agencies and local communities. Impacts to park operations will be beneficial and negligible to major from reduction of total program costs and lowest cost/acre.

**Alternative 5 Wildland Fire Use Emphasis**

**Biological Environment** **Environmental Consequences** **Alternative 5**

Alternative 5 implementation would result in major beneficial effects to vegetation composition and structure to forest types above the rim with the emphasis on wildland fire use for restoring and maintaining fire regimes. Relaxation of fire severity mitigations that currently limit fire intensities and tree mortality in mixed-conifer forests will help improve beneficial impacts. Beneficial cumulative impacts would occur in all forest types in areas where fire or non-fire treatments occur. Adverse cumulative impacts would occur in areas not planned for treatment and not treated in the past.

Adverse, negligible to moderate impacts will occur in Alternative 5 to special status plants from direct impacts from fire and fire-related activities including trampling, crushing, or damaging plants from such activities as handline construction and manual/mechanical thinning. Adverse impacts similar to all

alternatives from possible exotic plant increase will occur from fire and non-fire activities like vehicle use, thinning projects, and increased human/animal activities.

A wide range of impacts to wildlife and special status wildlife will occur from implementation of Alternative 5. Whether impacts are beneficial or adverse depends on each species' necessary habitat components. Wildlife that prefer open, early successional habitats would experience beneficial impacts similar to Alternative 2, but with a slight increase in beneficial impacts due to increased mosaic of fire effects associated with wildland fire use. Wildlife that prefer closed canopies and forests in late successional stages would be impacted adversely.

**Cultural Environment Environmental Consequences Alternative 5**

Potential direct effects from planned fire management activities vary depending on project location and of activity type. In general, ground-disturbing activities can be anticipated and vulnerable resources avoided, resulting in short-term, local, negligible to minor, adverse effects under NEPA, and potentially adverse effects to cultural resources for NHPA compliance. Addition of mechanical thinning in the WUI may slightly increase adverse impacts from soil erosion and disturbance, but could also increase beneficial impacts by reducing risk of unwanted fire in cultural landscapes.

Unplanned fire management activities and wildland fire use responses are unpredictable; it is sometimes difficult to avoid or treat cultural resources where these fire types occur. These unplanned actions may result in short- to long-term, local to regional, negligible to major, adverse effects.

**Physical Environment Environmental Consequences Alternative 5**

Alternative 4 proposes the most acres of wildland fire use, but lack of prescribed fire shows that total acres treated with fire are very to similar Alternatives 1, 2, and 4, so air quality impacts would be similar to those alternatives. Proposed treatments and suppression fires will cause minor to moderate adverse impacts on soil erosion and sediment transport, but these same fires will also cause minor to moderate beneficial impacts to soil nutrients available to plants. All intensities of short-term adverse impacts will occur to natural soundscape from fire apparatus use including chainsaws, engines, and helicopters. Additional wildland fire-use operations will increase noise impacts. Long-term cumulative impacts to natural soundscape will be adverse, major, and long term, but impacts will occur regardless of fire activities due primarily to commercial overflights.

Overall effects to wilderness character would be beneficial, minor to major, local to regional, and short to long term. The goal is to reach the natural range of variability for vegetation type which would enhance wilderness values. Adverse impacts range negligible to major, local to regional, short to long term. Other components of wilderness character such as soundscape and cultural resources may have major adverse impacts. Mitigation measures listed in Chapter 4 for soundscapes and cultural resources intend to lower intensity to moderate or below.

Long-term impacts to visitor experience will be beneficial, minor to major as forest aesthetics improve. Socioeconomic impacts will be beneficial and moderate to major, from increased engagement and collaboration with other government agencies and local communities. Impacts to park operations will be beneficial and adverse.