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Environmental Assessment

Huachuca FireScape Project

Coronado National Forest
Cochise, Pima, and Santa Cruz Counties, Arizona

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Cover Photos: Prescribed burning at Fort Huachuca in April 2007

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Summary

The U.S. Department of Agriculture, Forest Service, Coronado National Forest (Forest), prepared this environmental assessment to publicly disclose the results of an environmental impact analysis of the Huachuca FireScape Project (FireScape Project). If approved, the FireScape Project would coordinate fire and fuel reduction activities with two other Federal agencies: the Department of Defense (DOD-Fort Huachuca) and the U.S. Department of the Interior (USDI), National Park Service (NPS-Coronado National Memorial). The Forest Service is the lead agency for the National Environmental Policy Act (NEPA) review and preparation of the EA; DOD and NPS are cooperating agencies, as defined in 40 CFR 1500. Each Federal agency that manages lands on which FireScape activities are proposed will issue a separate decision document for those lands under their jurisdiction.

Located in the Huachuca, Patagonia, and Whetstone Mountains of southeastern Arizona, the proposed activities would occur in a manner consistent with a multi-jurisdictional plan developed by Federal, State, and private landowners in the area (the Huachuca Area Fire Partners). The project is intended to increase fire management flexibility, efficiency, and consistency across about 400,000 acres of adjoining Federal lands (see Figure 1).

Two alternatives are evaluated in this EA: (1) the proposed action, and (2) no action. The **proposed action** comprises both prescribed fire and non-fire treatments designed to address fuel conditions specific to 15 “ecological units” (EUs), areas with differing vegetation types that occupy unique elevations, topography, and geological features. Non-fire treatments include a variety of options for thinning dense stands of trees and shrubs, reducing surface and ladder fuels, and creating openings in forest canopy where it exists. Fire treatments consist of prescribed burning and burning piles of hand- and machine-cut materials. The actions would occur over a 10-year period and not all 400,000 acres would be treated. Up to 270,000 acres could be treated, but the actual amount is dependent on a variety of factors, including but not limited to funding, weather conditions, and resources available to accomplish treatments. Before proposed treatments may be implemented, the Coronado National Forest Land and Resource Management Plan must be amended to revise visual quality standards and guidelines for the project area, and the Coronado National Memorial Fire Management Plan must be amended to allow the use of prescribed fire in areas where it is currently prohibited.

No action would mean each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency’s jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed.

Impacts of No Action

If no action is taken, each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency’s jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed.

Impacts of the Proposed Action

Implementation of the proposed action would result in the following resource impacts:

Economic Efficiency

Planning and analysis costs would be greatly reduced, as extensive National Environmental Policy Act analysis and compliance activities would not need to be done by each Federal agency. Instead, there would be minor costs for pre-project reviews to ensure potential effects of all activities would still be within the scope of effects analyzed within this document.

Range Resources

Burned areas would not be available for grazing during the short term while soils and plants recovered from treatment activities. In the long-term, fire treatments would benefit the forage resource and therefore benefit livestock indirectly. Non-fire treatments would benefit livestock in the short term by an immediate availability of additional grazing acreage. All treatments would result in increased grazing acreages. Although disturbed areas from fire treatments may contribute to spread of invasive species, tracking and monitoring of these areas would assist the agencies in taking appropriate steps to prevent their spread.

Special Status Wildlife and Plant Species

Threatened and Endangered Species – Out of 10 federally listed species, it was determined that proposed activities may affect but are not likely to adversely affect 8 of the species. For the two remaining species, Mexican spotted owl and Sonora tiger salamander, it was determined that the proposed activities may affect and are likely to adversely these species. This means that the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects. These determinations are being reviewed by the U.S. Fish and Wildlife Service, who will issue a biological opinion on the project, prior to any decision being made.

Forest Service Sensitive and Management Indicator Species - Out of 71 sensitive species analyzed, it was determined that there would be no effect on 31 of them. For the remaining sensitive and management indicator species, modification of habitat and short-term effects may affect individuals but are not likely to cause a trend towards federal listing or contribute to significant population changes,. Conservation measures and project design criteria are intended to avoid or minimize such effects. In addition, long-term effects of proposed treatments are expected to be beneficial to most species by reducing the risk of catastrophic fire, and trending ecological processes toward historic levels.

Soil and Water Resources

Proposed activities would likely have short-term effects to soil and water resources, but the implementation of best management practices and other soil and water conservation practices would help ensure effects would be minimal.

Air Quality

The effects to air resources would be limited by use of the design criteria and best management practices to ensure that necessary air emission permits are obtained, prescribed burning is conducted in compliance with Federal, State, and local air regulatory statutes and guidelines, and prescribed burning activities are controlled to minimize visibility reduction and adverse smoke effects on Class I areas, public facilities, private lands, and other smoke-sensitive areas.

Scenic Quality

There would be short-term effects to scenic quality as areas are burned and vegetation is thinned, but the landscape would recover over a few years and there would be a long-term positive change to the landscape features.

Social Considerations

Greater protection of property, human health, and firefighter safety can be expected. Some transitory effects from temporary nuisance smoke could occur as a result of lower intensity fire from fire treatments; however, they are less than the long-term human health effects, threat to firefighter safety and threat to property that could result with possible large scale wildfire. While the proposed action would have no effect on illegal uses in the area, the occurrence of wildfire as a result of those uses would be reduced under the proposed action.

Recreation

Effects to recreationists and the recreational experiences from these types of projects would be short term and limited in scope. Implementation of the recreation design criteria would ensure that proposed activities would not have any significant effects on recreation areas or user experiences, and would ensure public safety.

Fire, Fuels and Vegetation

On treated portions of the ecological units, treatments would help reverse shrubland and woodland expansion into semi-desert grassland, resulting in an expansion of semi-desert grasslands. Also, the trend toward increased woodland and conifer forest stocking, especially of small-diameter trees and the more fire-intolerant tree species would be reversed over a large portion of the project area. The forests and woodlands would be more open and park-like, and more resistant to stand-replacing insect and fire events, as well as drought episodes.

Proposed activities would result in fuel conditions that produce manageable fire behavior, and moves vegetation and fuel conditions toward their historic conditions. Treatments would result in reduced fireline intensity (high flame lengths) and crown fire activity over a large portion of the analysis area and would move the area toward the desired condition. Treatments would result in reduced suppression costs, resource damage, and threats to the public, including the wildland-urban interface and firefighter safety. Proposed activities would also make the area more suited for future prescribed fire applications; therefore, progress would be made toward initiating the restoration of ecological processes. Those proportions of the ecological units not being treated would continue to be outside their historical range.

Prescribed burning always carries some degree of risk for a fire escape resulting from unforeseen factors, such as adverse changes in weather. However, all prescribed burning requires that a burn plan be developed to minimize the risk of fire escape.

CONTENTS

Summary i

CHAPTER 1 - PURPOSE AND NEED 1

1.1 Introduction 1
1.1.1 Background 1
1.2 Purpose of and Need for Action 2
1.2.1 Existing Conditions 2
1.2.2 Desired Conditions 4
1.3 Proposed Action 7
1.4 Decision Framework 7
1.5 Public Involvement and Issues 8
1.5.1 Issues and Analysis 8
1.5.2 Effectiveness of Accomplishing the Purpose and Need 10

CHAPTER 2 – ALTERNATIVES, INCLUDING THE PROPOSED ACTION 13

2.1 Alternatives Considered in Detail 13
2.1.1 Alternative 1 - No Action 13
2.1.2 Alternative 2 - The Proposed Action 13
2.2 Alternatives Eliminated from Detailed Study 20
2.3 Comparison of Alternatives 20

CHAPTER 3 – AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES 25

3.1 Economic Efficiency 26
3.1.1 Affected Environment 26
3.1.2 Environmental Consequences 26
3.2 Range Resources 28
3.2.1 Regulatory Framework 28
3.2.2 Affected Environment 29
3.2.3 Environmental Consequences 30
3.3 Special Status Species 36
3.3.1 Regulatory Framework 36
3.3.2 Affected Environment 36
3.3.3 Environmental Consequences 37
3.4 Soil and Water Resources 49
3.4.1 Regulatory Framework 50
3.4.2 Desired Condition 50
3.4.3 Affected Environment 50
3.4.4 Environmental Consequences 55
3.5 Air Quality 63
3.5.1 Regulatory Direction 63
3.5.2 Affected Environment 64
3.5.3 Environmental Consequences 65
3.6 Cultural and Heritage Resources 69
3.6.1 Regulatory Framework 69
3.6.2 Affected Environment 70
3.6.3 Environmental Consequences 71
3.7 Scenic Quality 72
3.7.1 Affected Environment 72
3.7.2 Environmental Consequences 72
3.8 Social Considerations 76
3.8.1 Regulatory Framework 76
3.8.2 Affected Environment 76
3.8.3 Environmental Consequences 79
3.9 Recreation 80
3.9.1 Affected Environment 80
3.9.2 Environmental Consequences 83
3.10 Fire, Fuels and Vegetation 85
3.10.1 Regulatory Direction 85
3.10.2 Affected Environment 85

3.10.3 Environmental Consequences....89

CONSULTATION AND COORDINATION....103

LIST OF PREPARERS....104

REFERENCES....105

APPENDIX....109

A - Ecological Units and Desired Conditions....111
B – Agency Standards and Guidelines....117
C – Design Criteria and Best Management Practices....120
D – Huachuca FireScape Monitoring Plan....145
E - Actions Relevant to Cumulative Effects Analyses....156
F – Fire and Fuels Analysis Maps....158

List of Tables

Table 1. Acres of fire and non-fire treatment opportunities and removal method combinations proposed for each ecological unit in the Huachuca FireScape project area....14
Table 2. Range of acres to be treated annually by treatment type....16
Table 3. Accomplishment of project needs by alternative....21
Table 4. Comparison of predicted effects by alternative....22
Table 5. Estimated planning costs by alternative....27
Table 6. Estimated treatment costs per acre....28
Table 7. Range of estimated treatment costs per year and over 10 years....28
Table 8. Threatened and endangered species considered in this analysis and summary determination of effects....38
Table 9. Summary of sensitive species analyzed with determinations of “may impact individuals but not likely to cause a trend toward Federal listing or loss of viability”....45
Table 10. Coronado National Forest management indicator species and indicator categories....47
Table 11. Fifth-code watersheds and percentages that reside in the Huachuca FireScape project area....55
Table 12. Monitoring results from two prescribed fires and one wildfire on effects to riparian areas and stream channels....58
Table 13. Acres and percent of erosion hazard by treatment (excluding wilderness areas)....59
Table 14. Acres and percent of woodland productivity potential areas by proposed treatment (excluding wilderness areas)....59
Table 15. Summary of cumulative acres by EU in each VQO....74
Table 16. Racial and Hispanic composition of 2000 population and the change since 1990....78
Table 17. Fireline intensity interpretations....87
Table 18. Total acres and percent of ecological unit (EU) available for treatment....93
Table 19. Percent of EUs affected by past, present and foreseeable actions, Alternative 2; and the percent range cumulatively affected....99
Table 20. Percent of EUs in grazing allotments....100
Table 21. Current and desired conditions of fire regime condition classes for each ecosystem unit in the project area, and desired vegetative condition....111
Table 22. FireScape monitoring indicators and priorities....153
Table 23. Past and ongoing activities of a broad nature that contribute to the existing condition....156
Table 24. Acres of past, ongoing and foreseeable actions by ecological unit (EU)....156

List of Figures

Figure 1. Map showing land ownership and boundary of areas that comprise the proposed Huachuca FireScape Project....iv
Figure 2. Areas where proposed treatments could occur within ecological units in the Huachuca FireScape project area....15
Figure 3. Geology of the Huachuca FireScape project area....51
Figure 4. Fifth-code watersheds within the FireScape project area and vicinity....56
Figure 5. Levels of particulate matter (PM10) generated by fires of 5,000 and 17,000 acres. Chart 1 shows levels of PM10 for understory fires and Chart 2 shows levels for shrub and slash fires....66
Figure 6. Views into the project area with the Huachuca Mountains in the background....72
Figure 7. Huachuca FireScape Project (HFP) impact area within Cochise, Pima, and Santa Cruz counties....76
Figure 8. Population change and projections for Arizona and counties in the impact area (Source: U.S. Department of Commerce 2005; Arizona Department of Economic Security 2006)....78

Figure 9. Modeling results showing the amount of acres that would burn at a particular flame length given the existing conditions of the vegetation and fuels within the project area 88
Figure 10. Modeled proportions of flame length ranges that could occur in each ecological unit given the existing conditions of the vegetation and fuels within the project area 88
Figure 11. Modeled results showing acres of each fire type that could occur in the project area given existing vegetation and fuel conditions 88
Figure 12. Modeled proportions of fire types that could occur in each ecological unit given the existing conditions of the vegetation and fuels within the project area 89
Figure 13. Comparison of each alternative's predicted effect on flame lengths 95
Figure 14. Modeled proportions of flame length ranges by ecological unit for Alternative 1 95
Figure 15. Modeled proportions of flame length ranges by ecological unit for Alternative 2 96
Figure 16. Comparison of each alternative's predicted effect on fire type 96
Figure 17. Modeled proportions of fire types by ecological unit for Alternative 1 97
Figure 18. Modeled proportions of fire types by ecological unit for Alternative 2 97
Figure 19. Map of fire history in the project area by decade 159
Figure 20. Modeled existing condition of fire intensity shown in flame lengths across the ecological units 160
Figure 21. Modeled condition of fire intensity shown in flame lengths after treatment across the ecological units 161
Figure 22. Modeled existing condition of crown fire potential across the ecological units 162
Figure 23. Modeled condition of crown fire potential after treatment across the ecological units 163

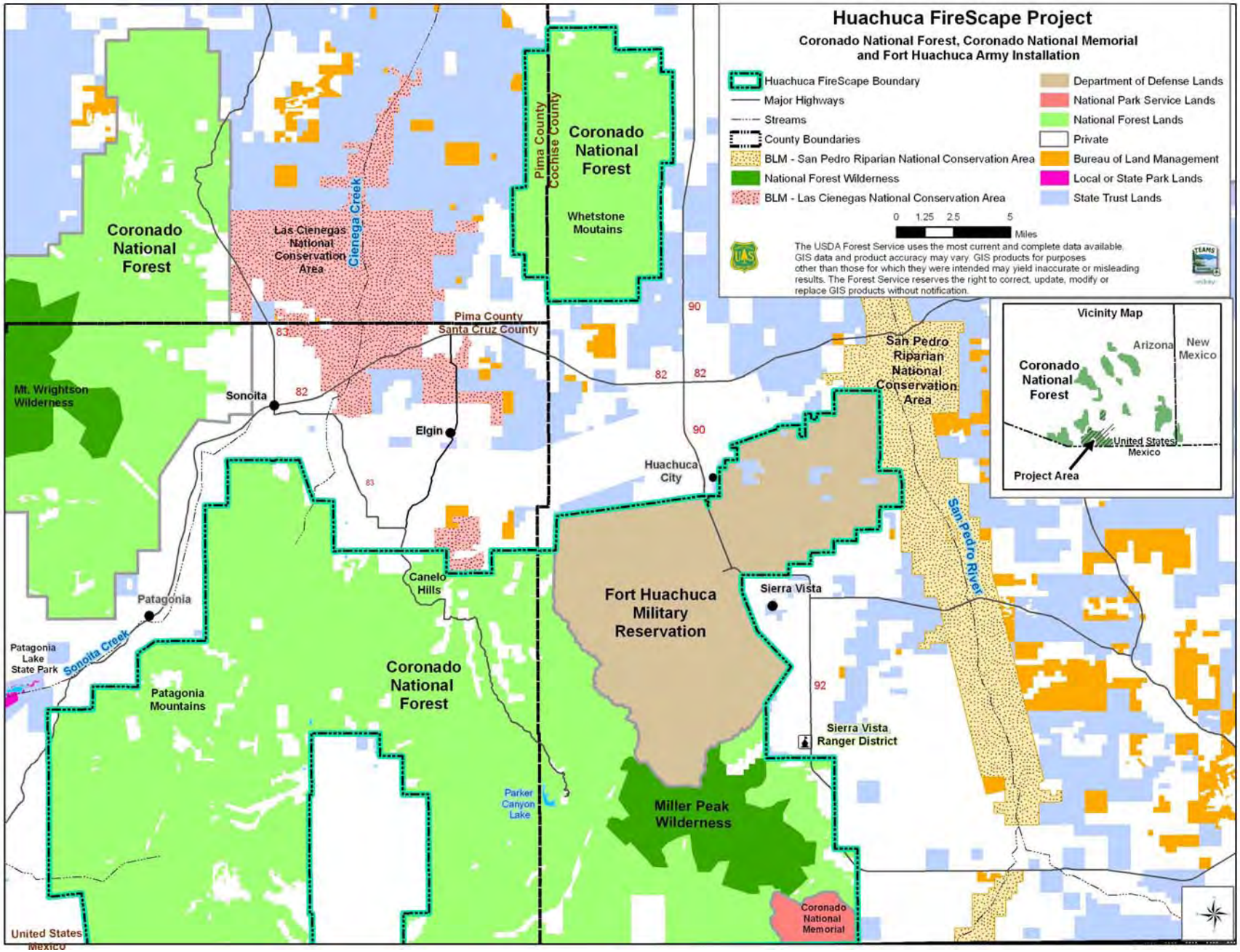


Figure 1. Map showing land ownership and boundary of areas that comprise the proposed Huachuca FireScape Project

Chapter 1 - Purpose and Need

1.1 Introduction

The U.S. Department of Agriculture (USDA), Forest Service, Coronado National Forest, is proposing the Huachuca FireScape Project (FireScape Project) to coordinate fire and fuel reduction activities with two other Federal agencies: the Department of Defense (DOD-Fort Huachuca) and the U.S. Department of the Interior (USDI), National Park Service (NPS-Coronado National Memorial). Located in the Huachuca and Whetstone Mountains of southeastern Arizona, the proposed activities would occur in a manner consistent with a multi-jurisdictional plan developed by Federal, State, and private landowners in the area. The project is intended to increase fire management flexibility, efficiency, and consistency across about 400,000 acres of adjoining Federal lands.

The Coronado National Forest has assumed the role of lead agency in completing a National Environmental Policy Act (NEPA) review of the Huachuca project. NPS and DOD are cooperating agencies in this NEPA review. This environmental assessment (EA) discloses and documents the proposed Federal actions, alternative actions, and the potential direct, indirect, and cumulative environmental impacts that would result.

1.1.1 Background

In 1996, a group of Federal, State, and private entities formed the Huachuca Area Fire Partners (HAFP) to collaborate on a comprehensive plan for managing fire and fuels across a variety of jurisdictional boundaries within the broad landscape that surrounds and contains the Huachuca Mountains.

In 2005, the group completed the HAFP Fire Management Plan (HAFP 2005), which proposes a framework for landscape-level fire management over a 500,000-acre area (including private lands), and integrates the established fire management plans of the partner organizations. The HAFP plan reports the following benefits of managing for fire on a broad landscape: 1) increased public and fire crew safety, 2) widespread improvement in ecosystem function, and 3) economic efficiency of fire management activities.

In late 2006, the Forest Service met with DOD, NPS, U.S. Fish and Wildlife Service, Arizona Game and Fish Department, The Nature Conservancy, and other Huachuca Area Fire Partners to discuss ways to implement the proposed strategy of the HAFP Plan on Federal lands. Because fire management activities on Federal lands adhere to very specific laws and regulations that are not always compatible with those of non-Federal jurisdictions, the FireScape Project was proposed to focus on Federal lands only. Concurrently, the non-Federal HAFP group is planning to implement the strategy of the HAFP plan on non-Federal lands; their actions will be integrated, to the extent practicable, with the FireScape Project.

The Huachuca Area Fire Partners

- Appleton-Whittell Research Ranch, National Audubon Society
- Arizona State Land Department
- Babocomari Ranch
- Coronado National Memorial, National Park Service
- Fort Huachuca, U.S. Army, Department of Defense
- San Pedro Riparian National Conservation Area, Bureau of Land Management
- San Rafael Ranch
- San Rafael Ranch State Park, Arizona State Parks
- Sierra Vista Ranger District, Coronado National Forest, USDA Forest Service
- Southeastern Arizona Preserves, The Nature Conservancy

Federal land in the project area is managed by four agencies: the Forest Service (Coronado National Forest), the NPS (Coronado National Memorial), the DOD (Fort Huachuca Army Installation), and the Bureau of Land Management (BLM; San Pedro Riparian National Conservation Area). At present, the Forest Service provides most of the wildland fire management resources for all agencies except the BLM. While Federal land managed by BLM is an integral part of the HAFP Fire Management Plan, the BLM has already completed NEPA compliance documentation for fire management. Therefore, although BLM lands are located within the project area boundary, there was no need to include those lands in the current analysis.

The Huachuca FireScape Project area extends from the Huachuca Mountains on the east to the Patagonia Mountains to the west, and the U.S.-Mexico international border forms the southern boundary. This area is expanded from that addressed in the HAFP plan in that it includes the Whetstone Mountains to the north of Sierra Vista (Figure 1, p. iv).

1.2 Purpose of and Need for Action

The purpose of the FireScape Project is to integrate the fire and fuel management activities of three Federal agencies across 400,000 acres of Federal lands to:

- reduce the costs, resource damage, and threats to public and firefighter safety from future wildland fires,
- restore and sustain ecological processes in fire-dependent ecosystems,
- create and maintain fuel conditions that produce manageable fire behavior and intensity,
- encourage the restoration of vegetation and fuel conditions toward their historic conditions and ecological resiliency where feasible, both in the broader landscape and within individual ecological units; and
- promote a cost-effective, efficient and coordinated fire and fuel management program among three Federal agencies.

The need for the project is based on attaining the objectives expressed in the guidance from national, regional, and local fire planning documents (described later in this section). Collectively, this guidance is intended to lead to a change in existing landscape conditions to achieve the desired future conditions of a healthy ecosystem in which a more natural fire cycle prevails. The following sections describe the existing and desired conditions of the project area.

1.2.1 Existing Conditions

Fire has played an important ecological role in the history of the grassland and woodland ecosystems of southeastern Arizona. Regular intervals of naturally occurring fire restrict the growth of shrubs in grasslands, thin forests of fire-intolerant trees, increase stream flows, and renew wildlife habitat. Since the beginning of the early 20th century, the frequency of natural fire has decreased dramatically. This decrease has been correlated with an increased demand for wildland fire suppression to protect life and property, and has led to areas of dense, overgrown vegetation and the accumulation of fuel.

In recent years, wildland fires have been documented to be primarily human-caused (74 percent), rather than of natural (lightning) origin (CNF Fire Management Plan; USDA Forest Service 2008). On Federal lands along the U.S.-Mexico border, the frequency of human-caused wildland fires has increased due to illegal smuggling and immigration activities. In places where fuel loadings are high, wildland fires burn more intensely than historic, natural fires and are very difficult to control.

Within and surrounding the FireScape project area, land ownership is a combination of Federal, State, and private lands. Across these ownerships, differing vegetation types occupy different elevations, topography, and geological features. Specific types are referred to as "ecological units" (EUs).

For the purpose of this EA analysis, 15 EUs were defined within the project area (see Table 1, Chapter 2). Characteristics of desert scrub and grassland, Madrean oak savanna and woodland, chaparral, oak-pine woodland, coniferous forest, and riparian zone are present in varying degrees among the units. Each EU is correlated with a specific fire regime[1], which defines the behavior of a fire in a particular ecosystem. In short, different fire behavior and effects are expected in different regimes.

Over the past century, fuel loadings, fire patterns, and vegetation have changed across these ecological units, mostly due to human influences such as fire suppression, grazing, water usage, and the introduction of non-native plant species. These changes have contributed to decreased quality of wildlife habitat, changes in soil nutrients, and changes to the frequency and intensity of wildfires across the landscape (HAFP 2005).

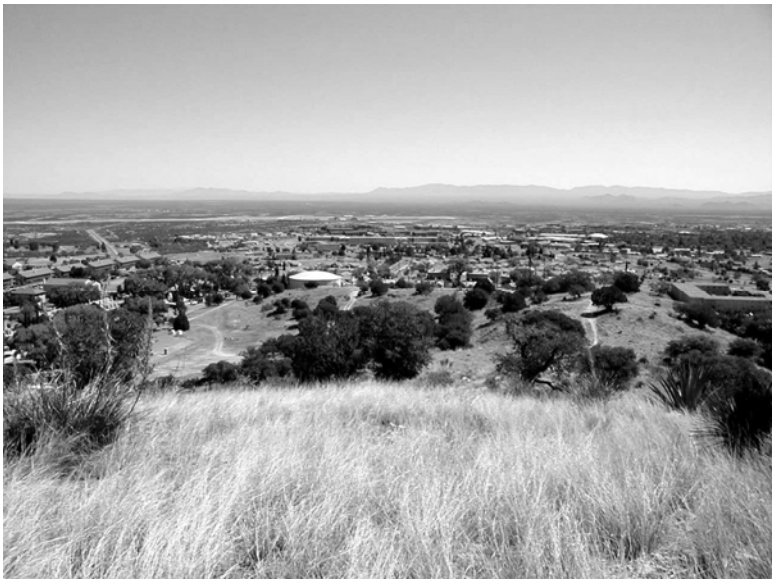
As an example, in ecological units such as the Madrean oak savannas and woodlands of the project area, field surveys show that the composition of vegetation and fuel loadings are very different from their historic range of conditions and are classified as fire regime condition class 3 (see text box in Fuels and Vegetation section of Chapter 3 for definitions, and Table 21 in the Appendix) (Hall 2008). This means that fire regimes and vegetation conditions have been significantly altered from their historical range and the risk of losing key ecosystem components is high. Trees and shrubs have grown dense due to lack of periodic fire, creating increased fuels and more crowded tree canopies. Given these conditions, a wildland fire would likely eliminate desired ecosystem components, intensify the spread of unwanted non-native species, and result in dramatically different ecological effects than what would have occurred with natural fire.

Madrean oak-savanna in the project area. Tree canopy cover currently ranges from 10 to 100 percent; historic canopy covers were generally less than 30 percent except in areas protected from fire (McPherson 1992, Abbott 1997, Miller et al. 2003 *in* HAFP 2005).

Fire history studies estimate that natural fire frequencies (often referred to as "fire return intervals") in the project area decreased dramatically beginning in the early 20th century. Reasons include the cessation of Native American burning (Baisan and Swetnam 1990, Swetnam and Baisan 1996), livestock grazing (Danzer et al. 1996, Grissino-Mayer et al. 1995, Swetnam and Baisan 1996), and fire suppression (Danzer et al. 1998, Grissino-Mayer et al. 1995, Swetnam and Baisan 1996).

[1] Factors that contribute to a specific fire regime include fuel consumption and spread patterns, intensity, severity, frequency, and seasonality (Bond, W.J. and J.E. Keeley. 2005. Fire as a global 'herbivore': the ecology and evolution of flammable ecosystems. Trends in Ecology and Evolution, 30:387-394).

The height of fire season in southeastern Arizona occurs in late spring and early summer. Throughout the spring, increasing temperatures and negligible precipitation create extremely dry conditions across the Southwest. Prior to the onset of the summer rainy season (monsoon), around late June and early July, circulation patterns draw moisture from the southeast (Schroeder and Buck 1970). Weak storm cells bring lightning but little rain. During this period, relatively few lightning fires occur, but those that do start often become large (Barrows 1978). As circulation patterns strengthen during July, storm cells transport more moisture and produce rain that reaches the ground, thereby reducing fire danger and activity. Statistics show a high frequency of lightning-ignited fires but less area burned compared to June when drier conditions prevail (Barrows 1978; Morino et al. 2000).



Example of wildland-urban interface. Military developments next to wildlands in need of fuel treatments present difficult and dangerous situations for local firefighting personnel.

Rapid residential development has recently occurred in the canyons, foothills, and valleys of the project area in close proximity to Federal lands, and area referred to as the wildland-urban interface, or WUI. Because of threats to life and property that wildland fires present in these locations, suppression has been the fire response option of choice. Treatment of vegetation and fuel is needed to decrease the severity of wildland fire at these locations, but it has been delayed or impeded by agency funding, weather, and a lack of coordinated fire and vegetation management among multiple landowners. As a result, recent management of wildland fire at the WUI has been reactive (fire suppression), rather than pro-active (vegetation and fuel treatments using mechanical methods and prescribed fire).

1.2.2 Desired Conditions

Desired conditions in the FireScape project area were defined in accordance with guidance and direction expressed in national guidelines and strategies, as well as Forest Service, DOD, and NPS land management and fire management plans. These conditions are specific to each EU. Desired conditions in each area are shown by EU in the Appendix, part A, Table 21.

1.2.2.1 Federal Fire Management Policies and Direction

Each of the three agencies who are collaborating in the FireScape Project has a discrete mission that influences its fire management policy. That policy is often complex, dynamic, and multi-faceted. Following is a listing of the overarching guidance and strategies that define individual USDA (Forest Service), USDI (NPS), and DOD fire management programs and policies.

National Level Direction

National level direction specific to the U.S. Departments of Agriculture and Interior fire management programs and policies include:

- *Managing Impacts of Wildfires on Communities and the Environment, Protecting People and Sustaining Resources in Fire Adapted Ecosystems: A Report to the President in Response to the Wildfires of 2000* (also known as the National Fire Plan, USDA and USDI 2000) which includes the goals to:
    - Invest in Projects to Reduce Fire Risk. Addressing the brush, small trees, and downed material that have accumulated in many forests because of past management activities, especially a century of suppressing wildland fires, will require significant investments to treat landscapes through thinning and prescribed fire.
    - Develop locally led, coordinated efforts between the Departments of Agriculture, the Interior, and Commerce, and other appropriate agencies through the establishment of integrated fuels treatment teams at the regional and field levels.
- *The Federal Wildland Fire Management Policy and Program Review* (USDA and USDI 2001) which directs:
    - Federal fire management activities and programs are to provide for firefighter and public safety, protect and enhance land management objectives and human welfare, integrate programs and disciplines, require interagency collaboration, emphasize the natural ecological role of fire, and contribute to ecosystem sustainability.
- *A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan (USDA and USDI 2002).* Its goals include:
    - Losses of life are eliminated, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced.
    - Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
    - Fire-adapted ecosystems are restored, rehabilitated, and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economic benefits.

Agency-specific Direction

In addition, each Federal agency has its own policies and direction related to fire management and resource protection. Detailed standards and guidelines in these plans and policies are found in the Appendix, part B**.**

USDA Forest Service (Coronado National Forest)

Coronado National Forest Land Resource Management Plan (LRMP)

The Coronado National Forest LRMP (USDA Forest Service 1986, as amended) establishes standards and guidelines for fire and fuels management, and the restoration, maintenance and protection of a variety of ecosystem components. It also specifies direction for cooperation with State, local and other Federal agencies, and the protection of resources mandated by various laws (e.g., the Endangered Species Act and Clean Water Act).

In 2005, the LRMP was amended to incorporate the policies of the 2001 Federal Wildland Fire Management Policy and Review (USDA and USDI 2001). The LRMP, as amended, calls for an

appropriate management response to wildland fires. This includes an appropriate suppression response and the ability to allow natural ignitions to play, as nearly as possible, their natural ecological role Forestwide (LRMP, p. 45).

USDI National Park Service (Coronado National Memorial)

Management guidance for the Coronado National Memorial relevant to this project can be found in the *Coronado National Memorial General Management Plan* (USDI National Park Service 2004), *Natural and Cultural Resources Management Plan* (USDI National Park Service 1998), and *Coronado National Memorial Fire Management Plan* (USDI National Park Service 2005). These documents provide guidance to:

- design fire management programs to meet resource management objectives and to ensure public and firefighter safety,
- manage fire to minimize threats to sensitive and cultural resources, and
- use prescribed fire and fuel reduction to restore natural fuel loadings.

U.S. Department of Defense (Fort Huachuca Army Installation)

Management guidance of natural resources for Fort Huachuca is located in the *Fort Huachuca Integrated Resource Management Plan* (U.S. Department of Defense 2001) and fire and fuels management guidance is specified in the *Fort Huachuca Integrated Wildland Fire Management Plan* (2006). These plans call for:

- protecting life, property, military training, natural resources and historic properties from uncontrollable wildland fires;
- using prescribed fire to accomplish fuel reduction and improvement of ecological conditions and habitats; and
- managing fire to benefit natural resources and ecosystems outside of human settlements.

1.2.2.2 Other Relevant Guidance and Direction

This proposed action and alternatives are also constrained by the following laws, orders, regulation, and guidance:

Federal and State Laws

- The National Environmental Policy Act (NEPA) (1970)
- The Clean Water Act (1948) and amendments (1972)
- The Clean Air Act (1955)
- The National Forests Management Act (1976)
- The Forest and Rangeland Renewable Resource Act (1974)
- The National Historic Preservation Act (1966)
- The Archaeological Resources Protection Act (1979)
- American Indian Religious Freedom Act of 1980
- Multiple Use Sustained-Yield Act of 1960
- Endangered Species Act (ESA) of 1973 (as amended)
    - Programmatic Biological Assessment for Ongoing and Future Military Operations and Activities at Fort Huachuca, Arizona (USDI Fish and Wildlife Service 2006)

  - U.S. Fish and Wildlife Service Biological Opinion for Ongoing and Future Military Operations at Fort Huachuca (USDI Fish and Wildlife Service 2007)
- Draft Statewide Strategy for Restoring Arizona's Forests (http://www.azforests.org/)

Executive Orders

- Executive Order 11593 (protection and enhancement of the cultural environment)
- Executive Order 12898 (Environmental Justice for low income and minority populations)

1.3 Proposed Action

Activities planned within the context of the FireScape Project include prescribed fire and non-fire treatments that are designed to address conditions specific to EUs across approximately 400,000 acres of Federal lands within the project area (see Alternative 2 - The Proposed Action on page 13 for details) and proposed amendments to both the Coronado LRMP and the NPS, Coronado National Memorial Fire Management Plan. The proposed action is described in detail under the heading "Alternative 2" in Chapter 2.

Non-fire treatments would include a variety of options for thinning dense stands of trees and shrubs, reducing surface and ladder fuels, and creating openings in the forest canopy. Fire treatments would consist of prescribed burning and burning piles of hand- or machine-cut materials. Projects would be implemented incrementally over approximately 10 years. Evaluation of potential effects of site-specific actions on resources would be conducted prior to each project being implemented (see p. 14). This evaluation will ensure that the potential effects of discrete projects are equal to or less than effects disclosed in Chapter 3 of this EA. When proposed projects are beyond the bounds of this impacts analysis, additional NEPA compliance will be completed.

In addition to proposed vegetation treatment and fire management activities, the proposed action incorporates stringent design criteria, a detailed monitoring plan, a proposal to amend the Coronado LRMP to modify visual quality standards and guidelines for the project area, and a proposal to amend the Coronado National Memorial Fire Management Plan to allow prescribed fire activities in an area where they are currently prohibited.

1.4 Decision Framework

Each Federal agency that manages lands on which FireScape activities are proposed will issue a separate decision document for those lands under their jurisdiction. Each agency decisionmaker will recommend implementation of a specific alternative based on: the results of impacts analysis disclosed in this EA, public comments, the degree to which the alternative meets the purpose and need of the project, and compliance with State and Federal laws, agency policies and land management guidance.

Depending on the agency, the decisions to be made would include, but are not limited to, the following:

- selection of the alternative that best meets the purpose of and need for action;
- required mitigation measures and monitoring;
- whether to amend the Coronado LRMP to modify visual quality standards;
- whether to amend the Coronado National Memorial Fire Management Plan to allow prescribed fire activities in an area where they are currently not allowed.

1.5 Public Involvement and Issues

The proposed action was initially based on the HAFP and was refined in 2006 for a NEPA compliance review of fire management on Federal lands. On January 1, 2007, the proposed action was initially listed on the Coronado National Forest public website in a Schedule of Proposed Actions (www.fs.fed.us/r3/coronado). On September 14, 2007, a Scoping Notice, which included a description of the proposal, was distributed to the public and other agencies and placed on the Coronado website. On the same date, a news release was provided to 10 local and regional newspapers, six television stations, five radio stations and four other media outlets.

Nine letters and emails were received from two individuals, one State agency, one Federal agency, three Tribes, and two organizations. Using their comments, the interdisciplinary team developed a list of issues to address in the impacts analysis of the proposed action.

1.5.1 Issues and Analysis

Issues are defined as a point of discussion, debate, or dispute about anticipated environmental effects of implementing the proposal. The interdisciplinary team separated issues into three categories: significant issues, analysis issues, and issues eliminated from detailed analysis (see text box). Issues were derived from public comments received during the scoping process and agency resource specialists.

No significant issues were identified that would prompt the development of alternatives to the proposed action. Therefore, this analysis will discuss and compare two alternatives: the proposed action and no action. Issues eliminated from detailed analysis are discussed later in this section.

1.5.1.1 Analysis Issues

The following issues were generated from public comments and by the resource specialists on the interdisciplinary team who conducted the impacts analysis disclosed in this EA. In most cases, these issues were presented as needs for analysis or disclosure rather than as perceived causal effects of implementing the proposal. Qualitative and quantitative indicators that are used to measure effects are specified for each issue.

1. Effects of prescribed fire on range structures, grasses, and native vegetation

Members of the public and the Forest Service raised issues regarding effects to range structures such as fences, effects to range forage, and potential for spread of non-native species. These issues are analyzed in the Range Resources section in Chapter 3.

Issue Definitions

Significant Issues - Issues that cannot be addressed through project design measures or simple modifications. These issues result in the development of alternatives to the proposed action.

Analysis Issues – Issues that are not significant, but are analyzed to show the effectiveness of design criteria and mitigation measures or to show compliance with environmental laws and regulations (e.g., the Endangered Species Act).

Issues Eliminated – Issues remedied by refining the design of a project or by applying mitigation measures. They also consist of issues determined to be outside the scope of the proposed action; already decided by law, regulation, Forest Plan, or other higher level decision; irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence.

Issue Indicators:

- Changes to distribution and utilization of pastures
- Potential for adverse or beneficial effects to livestock
- Changes to forage production and spread of invasive species
- Potential for damage to structural improvements
- Effects to local range economies

2. Effects of proposed activities on special status wildlife, fish, and plant species

This issue is analyzed to disclose compliance with laws, regulations, and agency management plans regarding protection of special-status species and their habitats. A biological evaluation, assessment, and a management indicator species report have been prepared, and these are summarized in the Special-status Species section in Chapter 3.

Issue Indicator:

- Determination of effects to threatened and endangered species and their habitats
- Determination of effects to Forest Service sensitive species (FSSS; Regional Forester, September 2007), their habitats and trends toward Federal listing
- Determination of effects to management indicator species and their habitats

3. Effects of proposed activities on soil and water resources

Public comments expressed concern about the potential for proposed activities to degrade soils, riparian areas, and water resources. This issue is analyzed in the Soil and Water Resources section of Chapter 3.

Issue Indicators:

- Potential for damage to riparian vegetation and stream channels
- Potential for decreased water quantity and quality
- Potential for increased runoff
- Potential for erosion hazard
- Potential for changes in woodland and range productivity

4. Effects of proposed activities on air quality

Concerns were raised about the effects of smoke from prescribed burning on air quality. This issue is analyzed in the Air Quality section of Chapter 3 to disclose compliance with regional and state air quality requirements, as well as the Clean Air Act.

Issue Indicators:

- The duration of smoke and particulate matter emissions
- Compliance with air quality regulations

5. Effects of proposed activities on cultural and heritage resources

Members of the Ak-chin Indian Community expressed concern about the ability to gather traditional plants in areas proposed for prescribed fire. In addition, it was noted that agencies must consult with Tribal governments and ensure protection of archaeological resources prior to proceeding with

ground-disturbing activities. The issue of protecting archaeological resources and tribal cultural practices is analyzed to disclose compliance with State and Federal requirements in the Cultural and Heritage Resources section of Chapter 3.

6. Effects of proposed activities on scenic quality

Proposed activities have the potential to affect the scenic quality of the environment. This issue is analyzed in the Scenic Quality section to disclose compliance with agency regulations and management plans requiring the maintenance of scenic quality and objectives.

Issue Indicator:

- Potential changes to visual quality objectives established in the Coronado National Forest LRMP

7. Effects of proposed activities on social considerations

Proposed activities have the potential to affect local populations in the vicinity of the project area. In addition, Executive Order 12898 requires consideration of the potential effects of projects on minority or low income populations.

Issue Indicator:

- Qualitative discussion on potential effects to local populations in terms of employment opportunities, environmental changes and risk of wildland fire

8. Effects of proposed activities on visitors' recreational experiences

Proposed activities have the potential to affect the experiences of visitors recreating on any of the Federal lands in the project area.

Issue Indicator:

- Effects of proposed activities on visitors' recreational experiences and the recreation opportunity spectrum designations on National Forest lands

1.5.1.2 Issues Eliminated from Detailed Analysis

Ability to see or use access roads or trails created for proposed activities

A member of the public expressed concern about environmental damage from access roads created by proposed activities. No access roads or trails are proposed to be created. Fire managers would use existing natural and manmade features for fire-holding lines and would build minimal amounts of hand line. For these reasons, this issue was not addressed in the impacts analysis in this EA.

1.5.2 Effectiveness of Accomplishing the Purpose and Need

To determine how well the proposed action accomplishes the purpose of and need for the project in comparison to no action, the following measurement indicators will be analyzed:

- Effects on fireline intensity expressed as flame length in feet associated with fire hazard. Flame lengths generally less than 4 feet are desired allowing for safe direct attack by hand crews. Flame lengths greater than 4 feet generally require equipment to be employed such as dozers and aircraft; beyond 8 feet torching, crowning and spotting can occur.

- Effects on fire type expressed as surface, passive torching or crown fire. Low-severity surface fire is desired in order to allow for safe fire suppression action.
- Effects on fire regime condition class (FRCC). This is only a qualitative assessment discussing how FRCC is trending.
- Effects of proposed treatments on vegetation composition, density, and structure in each ecological unit.
- Effectiveness of proposed project at reducing agency costs and efficiency in accomplishing objectives.

Chapter 2 – Alternatives, Including the Proposed Action

This chapter describes and compares the alternatives considered for the Huachuca FireScape Project. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decisionmaker and the public.

2.1 Alternatives Considered in Detail

2.1.1 Alternative 1 - No Action

No action is evaluated in this EA as an alternative to the proposed action, in order to provide a baseline against which the impacts of the proposed action may be compared. When analyzing the no action alternative, it is assumed that current conditions in the project area would continue. As directed by CEQ for actions that propose projects (http://ceq.hss.doe.gov/nepa/regs/40/1-10.HTM#3), no action in this case means the proposed activity would not take place, and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward.

If no action is taken, each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency's jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed. However, because there aren't any developed proposals (outside of this one) for future fire and fuels management projects, and because the no action alternative is intended to provide a baseline of effects for comparison, this alternative is analyzed as if no future fire and fuels management activities would occur.

2.1.2 Alternative 2 - The Proposed Action

The Huachuca FireScape Project was designed to provide three Federal agencies in southeastern Arizona with a range of fire and fuel treatment options that can be prioritized and scheduled as necessary in any given year. These options were defined generically to allow for flexibility in implementation, depending on ground conditions, weather conditions, funding and other necessary resources. More importantly, the specificity of treatment for various EUs was designed collaboratively with the FWS and AGFD to achieve an optimum balance between achievement of programmatic fuel management goals and protection of species and habitat. Endangered Species Act consultation with the FWS will be conducted for each proposed treatment, as necessary, and the lead agency and cooperating agencies are expected to conduct such consultation as one entity.

The proposed action comprises both prescribed fire and non-fire treatments designed to address fuel conditions specific to each EU (Table 1, Table 2 and text below); and design criteria and monitoring requirements (see Appendix, parts C and D) to ensure that the impacts of every future site-specific treatment will conform to the bounds of effects disclosed in this EA (Chapter 3). No actions are proposed in Wilderness Areas. Non-fire treatments include a variety of options for thinning dense stands of trees and shrubs, reducing surface and ladder fuels, and creating openings in forest canopy where it exists. Fire treatments consist of prescribed burning and burning piles of hand- and machine-cut materials.

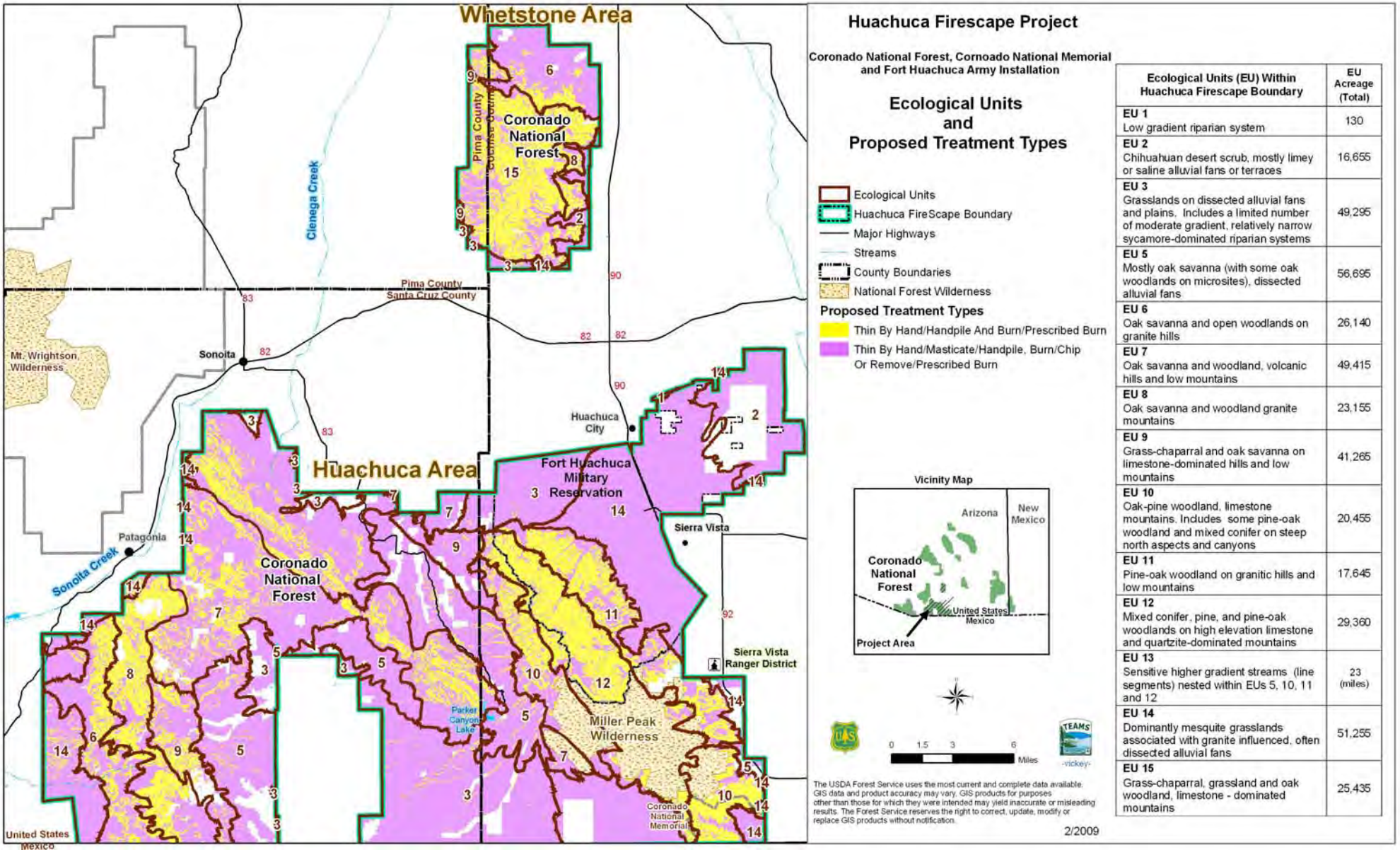
Table 1. Acres of fire and non-fire treatment opportunities and removal method combinations proposed for each ecological unit in the Huachuca FireScape project area

Ecological Unit	Acres of Treatment Opportunities[1]			Total acres available for treatment[1]	Acres that will not be treated	Size of EU (acres)
	Prescribed fire treatments	Thin by hand prune, chip, remove, handpile and burn treatments	Mastication treatments			
EU-1 Low gradient riparian systems[2]	0	0	0	0	130	130
EU-2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	5,000	500	5,000	5,000	11,655	16,655
EU-3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow, sycamore dominated riparian systems.[3]	40,000	1,000	5,000	40,000	9,295	49,295
EU-5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	45,000	1,000	10,000	45,000	11,695	56,695
EU-6 Oak savanna and open woodlands on granite hills	10,000	500	4,000	10,000	16,140	26,140
EU-7 Oak savanna and woodland, volcanic hills and low mountains	40,000	500	5,000	40,000	9,415	49,415
EU-8 Oak savanna and woodland granite mountains	10,000	500	2,000	10,000	13,155	23,155
EU-9 Grass-chaparral and oak savanna on limestone dominated hills and low mountains	20,000	500	5,000	20,000	21,265	41,265
EU-10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	10,000	500	2,000	10,000	10,455	20,455
EU-11 Pine-oak woodland on granitic hills and low mountains	15,000	1,000	3,000	15,000	2,645	17,645
EU-12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite dominated mountains	15,000	500	1,000	15,000	14,360	29,360
EU-13 Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12 (23 mi)[2]	0	0	0	0	0	0
EU-14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	40,000	500	5,000	40,000	11,255	51,255
EU-15 Grass-chaparral, grassland and oak woodland, limestone dominated mountains	20,000	500	5,000	20,000	5,435	25,435
Total	**270,000**	**7,500**	**52,000**	**270,000**	**136,900**	**406,900**

1 "Treatment opportunities" represent available acres in the ecological unit that could be treated by one of the methods described. In some cases, a single acre could receive all three treatment types. "Total acres available for treatment" represents the potential maximum acres that could be treated in each ecological unit over the estimated 10-year implementation period. Because treatment types may overlap, they do not add up to the total of acres available for treatment.

2 Although no treatment is proposed in these areas, EUs 1 and 13 are shown in the table to acknowledge the existence of the ecological units in the project area. EU 13 is measured in linear miles.

3 EU 4 has been combined with EU 3 due to only slight variations between the two EUs; therefore, EU 4 is absent from the list



Ecological Units (EU) Within Huachuca Firescape Boundary	EU Acreage (Total)
EU 1 Low gradient riparian system	130
EU 2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	16,655
EU 3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore-dominated riparian systems	49,295
EU 5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	56,695
EU 6 Oak savanna and open woodlands on granite hills	26,140
EU 7 Oak savanna and woodland, volcanic hills and low mountains	49,415
EU 8 Oak savanna and woodland granite mountains	23,155
EU 9 Grass-chaparral and oak savanna on limestone-dominated hills and low mountains	41,265
EU 10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	20,455
EU 11 Pine-oak woodland on granitic hills and low mountains	17,645
EU 12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite-dominated mountains	29,360
EU 13 Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12	23 (miles)
EU 14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	51,255
EU 15 Grass-chaparral, grassland and oak woodland, limestone - dominated mountains	25,435

Figure 2. Areas where proposed treatments could occur within ecological units in the Huachuca FireScape project area

Table 2. Range of acres to be treated annually by treatment type

Treatment Type	Range of acres treated annually
Prescribed fire	10,000 to 20,000
Thin by hand, prune, chip, remove, handpile and burn treatments	100 to 500
Mastication	5,000 to 10,000

Each proposed activity would apply a defined prescription (a plan that describes what and how much vegetation should be manipulated) and a cost-efficient treatment (a method to achieve the prescription). General prescriptions are determined by ecological unit characteristics and are intended to move the unit toward desired ecological conditions and address safety issues, generally by altering wildland fuels (including reducing surface fuels, ladder fuels, and the density of trees and shrubs). Weather factors, limited operating periods, and available funding would dictate the amount and type of activities that might be applied in any given year.

Table 1 and Figure 2 display the proposed treatment methods and acres by ecological unit. Note that the acreages in Table 1 show the *potential* maximum amount of acres that are available to be treated in each ecological unit by each type of treatment method over the estimated 10-year implementation period within the limitations shown in Table 1. Treatment methods are described starting on page 16.

Table 2 shows the approximate annual accomplishments that are anticipated to occur. These range from 10,000 to 20,000 acres of prescribed fire, 100 to 500 acres of treatments by hand crews, and 5,000 to 10,000 acres of mechanical treatments. Actual treatment acres may vary from year to year, but would not exceed the maximum range amounts. Projects would be implemented incrementally over approximately 10 years.

2.1.2.1 Non-Fire Treatments

The following list provides descriptions of the non-fire treatments that would be used. During all hand or mechanical vegetation treatments in both the wildland-urban interface (WUI) and non-WUI areas, treatments would be concentrated on removing the most hazardous fuels

Chipping - A stationary machine would be used to chip small trees, limbs, brush, and dead woody fuel. Chipped material would be spread over the treated area or loaded into a vehicle and transported to an offsite location for other uses. Chipping would be applied on slope angles of 30 percent or less.

Lop and Scatter - Lopping and scattering may be needed to facilitate prescribed burning. Felled trees and shrubs would be limbed, lopped, and bucked using chainsaws so that slash would lie close to the ground, then the slash would be spread more or less evenly over the ground.

Masticate - Mastication helps to moderate fire behavior by reducing fuel bed depth. To accomplish this, a tracked or rubber-tired machine chops, shreds, and/or grinds small trees, limbs, shrubs, and dead woody debris into chips to be left on site. The treated woody material that results is generally less than 3 feet long and not more than 6 inches in height. Mastication would be limited to areas where slope angles are 30 percent or less.

Pruning Trees - This treatment may be applied along major system road corridors, within fuelbreaks or in conjunction with fire control lines to remove ladder fuels and facilitate prescribed burning. Tree branches would be pruned using hand tools and chainsaws as close to the tree bole as possible without

damaging the bole. Trees generally would be pruned no higher than 10 feet above ground level or one-third the tree height, whichever is less.

Thin by Hand - This method involves the use of hand-tools or chainsaws to create a prescribed spacing among trees and shrubs. Trees would be selected for thinning based upon treatment objectives, tree-hazard rating, snag recruitment, health and vigor, species, size, and age, in descending order of importance. Species preference, size classes, and residual stocking levels would be determined on a site-specific basis and would be designed to achieve the desired future condition for the EU. Selective thinning would favor retention of larger and older trees in uneven-aged stands and retention of the more fire-resistant tree species and sizes while at the same time maintaining species diversity. Horizontal spacing would vary based on treatment objectives, site quality, species composition, and slope as well as a site-specific assessment of the “historic” or “natural” spacing of the vegetation setting. Cut trees may be made available to the public for utilization as firewood. Shrubs would be thinned to a minimum horizontal distance between individual or small clumps of shrubs, depending upon the slope. Horizontal spacing would be designed after consideration of treatment objectives, site quality, species composition, and slope. Within the structure defense zone space (from 0 to 300 feet from existing structures), vegetation treatments may be more intense.

Removal - Cut trees and shrubs, pruned limbs and dead and down woody debris would be removed by hand or machine to an off-site location for utilization or burning.

2.1.2.2 Fire Treatments

Prescribed Fire - Prescribed fire would be used to:

- minimize the potential for unwanted wildfires by reducing surface and ladder fuels and breaking up contiguous vegetation,
- help restore historic fire patterns and frequencies, and
- help improve forest health, wildlife habitat, meadows, and livestock forage.

Burning would be accomplished by applying low- to moderate-intensity fire using hand, mechanical or aerial firing methods. Prescribed burning would include a risk assessment process that adequately identifies and controls hazards to protect life, property, and resources.

Handpile and Burn - Cut trees, shrubs, pruned limbs, and dead and down woody material generally no smaller than 1 inch in diameter would be piled by hand and burned. Burning would occur when conditions are favorable and risk of fire spread is low. Piles would range from about 5 feet in diameter and 4 feet high to approximately 15 feet in diameter and 8 feet high, and would be located away from residual trees and shrub patches to minimize scorch to the canopies and trunks of trees.

Fire Control Line - Fire control lines (firelines) would be used to facilitate prescribed broadcast burning and handpile burning operations. Fireline construction may consist of removing herbaceous vegetation, pruning, or cutting breaks in the fuel by hand and clearing all vegetation from a strip about 3 feet in width down to mineral soil. Individual piles or groups of piles may have fireline cut around them or have the surrounding vegetation wet down with a fire hose to minimize creeping. Firelines would be rehabilitated, which may include pulling removed material back into the lines, hand constructing water diversion channels, or laying shrubs or woody debris in the lines following burning. Fire control lines may also consist of natural barriers, roads, and trails.

2.1.2.3 Implementation Process, Protective Design Criteria and Best Management Practices

Carefully crafted design criteria and prescribed best management practices would be followed to protect native wildlife, plants, fish and their habitats, as well as water, soils, scenery, air quality, and historical and archaeological sites (see Appendix, part C). As activities are proposed, fire and fuels managers will review treatment parameters to ensure that they are within the scope of the FireScape strategy and effects analysis and that they are consistent with the design criteria that bind those actions. These assessments will include site-specific surveys as defined in the Appendix, part C. Such prescreening will help to assess whether the effects of treatments fall within acceptable boundaries. Projects that cannot meet the design criteria specified in part C would require separate NEPA analysis and compliance actions in order to proceed.

For each site-specific action undertaken under the umbrella of the FireScape Project, agencies will develop an implementation plan. This plan will include, but is not limited to, the following:

- Designate fuel reduction projects and determine the appropriate EU and treatment methodologies that can be used;
- Provide for surveys as required;
- Provide for implementation of the design criteria, best management requirements, and monitoring requirements as defined in the Appendix, parts C and D;
- Require an IDT to document whether or not each specific project meets is within the scope of the activities evaluated in this EA and is within the stated acreage bounds as listed in Table 1; and
- Provide for multi-agency accounting of all implemented acres over the lifetime of this proposal.

2.1.2.4 Borderland Safety Considerations

The project area and proposed activities would occur along the United States and Mexico international border. This border presents a number of operational safety concerns especially regarding the use of prescribed fire. Fire management activities in the area are constrained by undocumented aliens (UDAs). Unattended campfires during cold months, likely left by UDAs, are increasingly the source of wildfires in this area. The safety of the UDAs, as well as that of fire personnel, is a major concern when planning and implementing fire operations in this part of the state. Fire management requires coordination with Customs and the Immigration and Naturalization Service under the Department of Homeland Security. Given this, the proposed action incorporates standard operation protocols developed by the participating agencies to address these concerns. These include:

- The Coronado National Forest Border Fire Initial Attack Protocol
- Interagency International Border Watchouts Checklist/Risk Zone checklist
- Coronado National Forest Fire Management Plan
- Interagency Border Prescribed Fire Checklist

2.1.2.5 Monitoring

Monitoring is key to understanding whether fire management activities have intended effects and it becomes the basis for adjusting activities to improve future management. During and following

project activities, monitoring would occur to evaluate resource conditions of the ecological unit where activities occur. A detailed monitoring plan is attached in the Appendix, part D.

2.1.2.6 Amendments to Existing Plans

In addition to fuel reduction activities, the proposed action to be evaluated in this environmental review will include administrative decisions whether to amend the Coronado LRMP to modify visual quality standards and guidelines for the project area, and whether to amend the Coronado National Memorial Fire Management Plan to allow prescribed fire activities in an area where it is currently not allowed.

Coronado National Forest LRMP - To accomplish the proposed action, the Coronado LRMP would be amended to establish less restrictive visual quality objectives (VQOs) for certain areas. Currently, in Management Areas 1, 3, 3a, and 7 (Prescriptions A and B), the current standard states "visual quality objectives will be met." In Management Area 4, the current standard states "visual quality objectives will be met or exceeded."

The amendment to the LRMP is proposed to state "Current visual quality objectives (VQOs) will be met. However, during Huachuca FireScape Project implementation, the VQOs of 'retention' and 'partial retention' may be temporarily changed to 'modification' as a short-term goal, conditional upon that the proposed management activity promotes the long-term achievement of the original VQO assigned to the area. When this exception is being used, the original VQO will be achieved within three years following project completion."

Coronado National Memorial Fire Management Plan - To accomplish the proposed action, the Coronado National Memorial Fire Management Plan must be amended to allow prescribed fire activities to occur in fire management unit 1 (550 acres in the southeastern corner of the Memorial), an area where such treatment is currently not allowed. Currently, the fire management plan states: "FMU 1 is located in the southeastern corner of the memorial . . . and is predominantly vegetated with the invasive species Lehmann lovegrass (*Eragrostis lehmanniana*). No prescribed fire will occur in this unit because little is known about Lehmann lovegrass' response to fire. Preliminary results from ongoing studies indicate that Lehmann lovegrass is fire tolerant, and disturbances such as fire may increase the population by opening areas up to be reseeded by the nonnative grass. It has shown a strong recovery after fire due to its large seed bank (Erika Geiger pers. comm. 2004). Therefore, aggressive suppression will occur in this unit. Manual and/or mechanical strategies will be used around structures to be protected."

The fire management plan would be amended to read: "FMU 1 is located in the southeastern corner of the memorial . . . and is predominantly vegetated with the invasive species Lehmann lovegrass (*Eragrostis lehmanniana*). In addition to manual and/or mechanical treatments in this area, the use of prescribed fire will be allowed as a tool to reduce fuels and thereby reduce the risk to structures, employees, and visitors in Coronado National Memorial. Potentially, fire might be used to help maintain or restore native plant species. Because of its location at the mouth of the watershed and the high fire incidence in the area, fuel treatments in FMU1 will be extremely important, and prescribed fire is one of the most cost-effective hazard reduction treatments.

Lehmann lovegrass is well adapted to fire, but there is recent research that documents the potential to use fire without adversely affecting native plant communities (Geiger 2006). Prescribed burning must be used cautiously in areas with or near Lehmann lovegrass and monitoring should be performed to ensure that objectives are being met."

2.1.2.7 Relationship to Present and Future Fuels-related Projects

The proposed action evaluated in this EA is bounded by the maximum number of acres to be managed, by treatment type, within each EU (Table 2). Within the next 10 years, other fuel management projects that are not within the scope of the FireScape Project analysis may be proposed by the Forest Service, DOD, or Coronado National Memorial. These projects will undergo additional site-specific NEPA analysis. Such future projects are not included in the total acres of treatment opportunity in Table 1, and their potential effects are factored into the cumulative effects in this EA. The effects of fuel reduction projects for which a decision has been made prior to the completion of this EA will also be included in the cumulative impacts analysis in Chapter 3.

2.2 Alternatives Eliminated from Detailed Study

There were no significant issues identified from scoping of this project and thus no issues that led to further development of issues. The interdisciplinary team did develop several early versions of the proposed action that were eventually eliminated from further analysis based on the deliberative process within the team. These included:

- Inclusion of Actions on Private Lands. This was eliminated from the final proposal because no action on federal jurisdictions was dependent on actions on private lands. While coordinated actions are considered under cumulative effects of this document, there did appear to be any defined Federal Actions on Private lands,

- Inclusion of Wildland Fire Use on the Coronado National Memorial. This element of the proposal was dropped because upon further review of the fire management plan guiding the Memorial, it was determined that this action was not needed.

2.3 Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in the table is focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 3. Accomplishment of project needs by alternative

Purpose and Need Element	Alternative 1 – No Action	Alternative 2 – Proposed Action
Reduce the costs, resource damage, and threats to public and firefighter safety from future wildland fires	This alternative would not contribute to helping reduce resource damage, and threats to public and firefighter safety from future wildland fires. Estimated costs of planning and analysis for 10 years would range between $1,800,000 and $3,300,000.	This alternative would reduce fireline intensity and crown fire potential resulting in less resource damage, and threats to public and firefighter safety from future wildland fires. Estimated costs of planning and analysis for 10 years would be $300,000.
Restore and sustain ecological processes in fire-dependent ecosystems	This alternative would not contribute to the restoration of ecological processes in fire-dependent ecological units discussed above and in the HAFP (2005). EUs in which the natural ecological process includes fires of lower intensity and severity would continue to be susceptible to high-intensity and severity wildfires.	This alternative would help initiate the restoration of ecological processes in fire-dependent ecological units. Vegetation and fuel conditions would be moved toward their historic conditions. This would enable prescribed fire to be applied safely or for lower severity fires to occur naturally.
Create and maintain fuel conditions that produce manageable fire behavior and intensity	This alternative would not create and maintain fuel conditions that produce manageable fire behavior and intensity. Fuel conditions producing high-intensity, severe wildfires would continue.	This alternative would reduce surface, ladder and crown fuels, making the area more suited for future prescribed fire applications.
Move vegetation and fuel conditions toward their historic condition and ecological resiliency where feasible, both in the broader landscape and within individual ecological units.	This alternative would not contribute to moving vegetation and fuel conditions toward their historic condition. Shrubland and woodland expansion into grasslands would continue and forests and woodlands would become denser. Fire-dependent EUs would continue to be in or progressing toward FRCC 3.	In this alternative, vegetation and fuel conditions would be moved toward their historic conditions. Where treatments area being applied, shrubland and woodland expansion would be reduced, grassland increased, forests and woodlands would be more open and park-like. Treated areas would move toward the desired condition of FRCC 1.

Table 4. Comparison of predicted effects by alternative

Issue Analyzed	Alternative 1 – No Action	Alternative 2 – Proposed Action
Effects on range structures, livestock, local range economies, grasses and native vegetation	There would be no direct effects. Indirect effects could occur in the case of a severe fire, which could negatively affect range structures, forage resources, and allotments.	Treatments would cause some grazing deferments in the short term but would benefit forage resources in the long term. Short-term effects to range structures may occur but project design criteria are designed to prevent this. Long-term benefits to local range economies are predicted. Non-native grasses will continue to increase across the range and may increase in the short term due to some of the proposed actions. Implementation design criteria will limit this effect and monitoring protocols will allow managers to assess the relationship between the treatments and the potential increases.
Effects of proposed activities on special status wildlife, fish and plant species	There would be no direct effects to special status species. Indirect effects could occur in the case of a severe fire. Extreme fire behavior events could threaten small, localized populations of species, reduce important habitat features, or cause mortality of various individuals. In the absence of severe fire, the natural progression of vegetation could degrade some habitats over time.	**Threatened and Endangered Species:** Out of 10 species analyzed, the proposed activities are expected to be discountable, insignificant, or completely beneficial to 8 species[1]. For two species (Mexican spotted owl and Sonora tiger salamander), the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects[2]. **Sensitive Species:** Of the 48 species analyzed, the biologist determined that proposed activities may impact individuals but not likely to cause a trend toward Federal listing or loss of viability. **Management Indicator Species:** Proposed activities would not contribute significantly to changes in Forestwide populations.
Effects of proposed activities on soil and water resources	There would be no direct effects. There could be indirect effects in the case of a severe wildfire, which could affect soil productivity, increase erosion and increase peak flows.	Use of design criteria and best management practices would protect soils, riparian areas, stream channels and water quality and quantity. Long-term beneficial effects would occur with reduced risk of severe fire.
Effects of proposed activities on air quality	There would be no direct effects to air quality. Indirect effects could occur from a severe wildfire, which could create large quantities of particulate matter impairing visibility and possibly causing health hazards. Emissions from wildfire may also occur over a period of a few days to several weeks as opposed to intermittent days over several years for a prescribed fire project.	The effect on air quality is expected to be short term because once smoke has dispersed, emissions are diluted and transported from local airsheds. Permits are issued by ADEQ only if conditions are favorable for burning. An indirect beneficial effect from proposed treatments is a reduction in the emissions that would be released from wildfires in the area.
Effects of proposed activities on cultural and heritage resources	There would be no direct effects to cultural and heritage resources. Indirect effects could occur in the case of a severe fire, which could adversely affect known heritage resources or traditional cultural properties.	Use of design criteria would prevent direct effects to heritage resources and traditional cultural properties. Indirect effects of fuel reduction activities could be considered beneficial, as impacts from wildfires that may affect heritage resources would be reduced.

Table 4. Comparison of predicted effects by alternative

Issue Analyzed	Alternative 1 – No Action	Alternative 2 – Proposed Action
Effects of proposed activities on scenic quality	There would be no direct effects to scenic resources. Indirect effects could occur in the case of a severe fire, because areas that currently have trees would continue to have a burned appearance during both the short and long term, while areas that currently have shrubs as the dominant vegetation would continue to have a burned appearance only during the short term.	Proposed activities would create negative scenic effects in the short term in the form of burned areas, slash, cut trees and shrubs. Design criteria would help mitigate effects. Long-term benefits from this project would include a lower risk of large damaging wildfires and a healthier forest with greater diversity. A LRMP amendment would be required to allow treatments on National Forest lands with short-term effects to comply with visual quality objectives.
Effects of proposed activities on social considerations	There would be no direct effects to local communities and populations. Indirect effects could occur in the case of a severe fire, creating conditions that could threaten life, property, and human health.	With reduced risk of severe fire, greater protection of property, human health, and firefighter safety can be expected. There would be no disproportionately high and adverse human health or environmental effects on low-income or minority communities.
Effects of proposed activities on visitors' recreational experiences	There would be no direct effects to recreation experiences. Indirect effects could occur in the case of a severe fire, and could include restrictions and closure of the area to the general public, smoke emissions into the air and blackened scenery or burned recreational facilities	There would be short-term direct and indirect effects to recreationists while activities take place in areas where people may wish to recreate. Design criteria would help minimize effects.

1 May affect, is not likely to adversely affect (MANLAA) individuals or habitat
2 May affect, is likely to adversely affect (MALAA) individuals or habitat (see definitions, p. 37)

Chapter 3 – Affected Environment and Environmental Consequences

This section describes the resources of the project area and discloses the impacts to those resources if no action is taken and if the proposed action is implemented. It also presents the scientific and analytical basis for the comparison of alternatives presented in Table 4. The technical specialists who prepared the following discussions used the best available scientific and commercial information in their analyses.

Some of the environmental effects are confined to the action and the project areas. Others are cumulative with environmental effects from other past, present, and foreseeable actions within and outside the project area. Past, present and reasonably foreseeable activities relevant to the cumulative effects analysis are listed in the Appendix, part E. Cumulative effects of these activities with proposed activities are discussed in each resource section, as applicable.

National Park Service *Management Policies* 2006 require analysis of potential effects to determine whether actions would impair park resources (NPS 2006). The fundamental purpose of the National Park System, established by the Organic Act and reaffirmed by the General Authorities Act, begins with a mandate to conserve park resources and values. National Park Service managers must always seek ways to avoid, or to minimize to the greatest degree practicable, adversely impacting park resources and values. However, the laws do give the National Park Service the management discretion to allow impacts to park resources and values when necessary and appropriate to fulfill the purposes of park, as long as the impact does not constitute impairment of the affected resources and values.

Although Congress has given the National Park Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement that the National Park Service 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 National Park Service manager, would harm the integrity of park resources or values. An impact to any park resource or value may constitute an impairment, but an impact would be more likely to constitute an impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

1. necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
2. key to the natural or cultural integrity of the park; or
3. identified as a goal in the park's general management plan or other relevant National Park Service planning documents.

Impairment may result from National Park Service 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 here for each of the resource topics carried forward in this chapter.

This environmental assessment includes evaluations of impairment for six resource topics on NPS lands (Fire, Fuels and Vegetation; Range Resources; Special Status Species; Soil and Water Resources; Air Quality; and Cultural and Heritage Resources). Potential impacts resulting from

implementation of Alternative 2 – the Proposed Action, have been determined to have no major, adverse impacts to a resource or value whose conservation is (1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of Coronado National Memorial; (2) key to the natural or cultural integrity of the memorial; or (3) identified as a goal in the monument's general management plan or other relevant National Park Service planning documents; therefore there would be no impairment of the memorial's resources or values. Implementation of this alternative would not result in any unacceptable impacts and is consistent with section 1.4.7.1 of NPS *Management Policies* 2006.

3.1 Economic Efficiency

This section evaluates the effectiveness of how well the proposed project reduces agency costs and efficiency in accomplishing objectives (see Effectiveness of Accomplishing the Purpose and Need on p. 10).

3.1.1 Affected Environment

Currently, the Federal agencies involved in coordinated fire management contend with limited time and money to accomplish fuel reduction treatments. Because Federal agencies must often take time to complete National Environmental Policy Act (NEPA) analysis and documentation prior to undertaking such activities, fire managers end up spending much of their limited time and funding on such procedural requirements.

On average, the effected Federal offices spend about $50,000 to $100,000 a year to plan and prepare the NEPA documentation for fuels management projects. Multiplied by three Federal agencies each doing their own NEPA documentation, costs could range anywhere from $150,000 to $300,000 per year. In addition, the time taken to accomplish these tasks can interfere with limited periods in which fire managers have to perform treatment activities such as prescribed burning. The Huachuca FireScape Project was proposed to help contend with these issues; to provide flexibility to carry out treatments in a variety of places without the expenses of individual NEPA documentation for like projects.

3.1.2 Environmental Consequences

3.1.2.1 Criteria Used for Analysis

This analysis considered two primary factors:

- The cost of planning and NEPA analysis
- The cost of proposed treatments

Assumptions used in this analysis include the following:

- The analysis timeframe is a 10-year period; the same as the estimated life of the environmental analysis.
- The planning costs were estimated by the Forest Service and apply to all Federal agencies.
- Planning costs will be incurred by the Federal agencies regardless of the selected alternative. The planning cost for this NEPA document, which is intended to cover a 10-year period, is estimated at approximately $300,000.

- Planning costs estimated for the proposed action do not include on-the-ground surveys or project design and layout because such data collection is generally required under each alternative and has relatively the same costs.
- The no action alternative assumes that proposed treatments would not occur, and any future fire management activities are undefined. However, the planning of future fire management activities would require NEPA analysis and documentation, therefore, average costs for planning future projects has been estimated
- Treatment costs per acre were estimated by Forest Service specialists and apply to all Federal agencies.
- The estimated treatment acreages are presented as ranges (see table below: low range (those acreages potentially treated at a historical average), high range (those acreages potentially treated a level if increased funding and labor would be available).
- Treatment acreages apply to the entire planning area (all agencies).
- The hand pile and burn, thin by hand, removal, and/or chipping treatments are usually implemented as a combination of all or part of those four treatments.
- All estimated costs are in 2008 dollars.

3.1.2.2 Alternative 1 - No Action

If no action is taken, each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency's jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed. The no action alternative would incur planning costs over the 10-year period. In addition to this NEPA document (approximately $300,000), other piecemeal multi-agency future NEPA documents for site-specific treatments done by each agency over the 10-year period would also occur. The Forest Service estimated the cost per individual agency NEPA document to be between $50,000 and $100,000 per year in the form of environmental assessments (EAs) and categorical exclusions (CEs). Table 5 shows the estimated planning costs per year and for the 10-year period. No treatment costs are estimated because future actions are undefined.

Table 5. Estimated planning costs by alternative

Planning type alternative	Cost per year at $50,000 per NEPA document	Total cost for 10 years	Cost per year at $100,000 per NEPA document	Total cost for 10 years
No Action - Yearly CEs and/or EAs; three agencies	$150,000	$1,800,000	$300,000	$3,300,000
Proposed Action - Single EA for all agencies with subsequent implementation and monitoring reviews	NA	$ 300,000	NA	$ 300,000

3.1.2.3 Alternative 2 - Proposed Action

Planning costs for the proposed action would be greatly reduced. Under this alternative, the primary environmental documentation costs would consist of this environmental assessment, and incidental costs of pre-project reviews to ensure project effects would remain within the scope of approved activities. Estimated treatment costs are shown in the following tables. These costs were estimated by the Forest Service and stated in 2008 dollars.

Table 6. Estimated treatment costs per acre

Treatment type	Estimated $/acre
Thin by hand with: chip, pile and burn, and/or remove	$1,000.00
Masticate	$ 200.00
Prescribed fire	$ 50.00

Based on the estimated treatment acreages and their associated cost per acre, total project costs are displayed in the table below by low and high treatment acreage potentials. The table also displays the estimated costs per year and over the 10-year period.

Table 7. Range of estimated treatment costs per year and over 10 years

Treatment type	Cost low range	Cost high range
Thin by hand with: chip, pile and burn, and/or remove per year	$ 50,000	$ 500,000
Masticate per year	$ 200,000	$ 1,000,000
Prescribed fire per year	$ 300,000	$ 500,000
Total Project Per Year	$ 550,000	$ 2,000,000
Total Project for 10 Years	$5,500,000	$20,000,000

3.2 Range Resources

This section addresses issue No. 1, which identified public concerns that proposed treatments could affect range grasses and the spread of non-native grasses. No grazing occurs on the Coronado National Memorial or Fort Huachuca; therefore, this analysis will focus primarily on Coronado National Forest lands but applies to range resources found throughout the analysis area.

3.2.1 Regulatory Framework

Regulatory guidance for range resources on National Forest lands can be found in the Forest Service Manual and the Coronado National Forest LRMP. Because grazing does not occur on Fort Huachuca or the Coronado National Memorial, agency regulations governing range resources are not applicable to this analysis. In addition, there are several laws that influence rangeland management on Federal lands. See the FireScape Project Range Report in the administrative record for more details.

3.2.2 Affected Environment

Rangeland ecological condition data have been collected periodically since the 1950s and most recently on all allotments between 1998 and 2007. Indicators of resource conditions such as the amount of bare soil and the amount of plant litter show marked improvements from conditions measured in the mid 1960s. Nevertheless, conditions on portions of some allotments remain less than desirable. This data also indicates a significant increase in shrub and tree canopy cover, particularly mesquite (*Prosopis velutina*), point-leaf manzanita (*Arctostaphylos pungens),* acacia (*Acacia* spp.), wait-a-minute *(Mimosa biuncifera),* oak *(Quercus* spp.*)* and juniper *(Juniperus* spp.). This increase in canopy has resulted in both a reduction in quantity and quality of forage for livestock. Increased canopy reduces sunlight to herbaceous (forage) species reducing both the palatability and quantity of forage produced. Some stands, especially Acacia and mimosa, have become so thick that livestock access to forage is greatly reduced or lost all together. Production utilization studies have been completed on many allotments in recent years. These studies have shown that, generally, actual use has been within capacity, but many of the authorizations (permits) are in excess of what current studies indicate. Current resource conditions for each of the ecological units are summarized as follows (please refer to Figure 2 and Table 1 for unit location and descriptions).

EU 1 and EU 13 - These ecological units, which consist of riparian and stream areas, are sensitive to livestock grazing and major emphasis is placed on managing for their health. Often upland forage goes unutilized due to the needs of these riparian areas and associated species. Historically these areas were overgrazed. Livestock preferred them during the warmer time of the year. Recent management has centered on timing grazing of riparian-associated pastures during cooler times of year when livestock prefer the warmer upland areas. Although these areas are quite productive, restrictive utilization limits are in place, and they are not relied upon for livestock forage. A number of stream reaches have been fenced to completely exclude livestock grazing where it is difficult to manage use or for special emphasis reasons such as habitat needs for special status species. Ecological conditions vary but trends on most areas are static if not upward.

EU 2 – In the Coronado National Forest, this ecological unit is restricted to small areas on the east and south sides of the Whetstone Mountains. The bulk of this unit is on Fort Huachuca, which is not grazed at this time. Most of the forage produced is within the included areas of mesquite grasslands. Ecological conditions on the Coronado National Forest portions are mostly fair with static trends.

EU 3 - This ecological unit is one of the major producers of livestock forage. Ecological conditions are generally good with upward or static trends. Some lower condition areas are dominated by Lehmann lovegrass, a non-native species that has displaced native species in some areas.

EU 5 - This ecological unit is a major producer of livestock forage where tree and shrub canopies are open enough to allow forage production and livestock are able to access it. Ecological conditions vary from poor to good with predominately static trends; however, some areas are in a downward trend due to increasing tree and shrub canopies. Lower condition ratings are primarily due to higher tree and shrub canopy, which also restricts livestock access to some areas available forage. Some of the deeper/sandier sites within this unit are dominated by Lehmann lovegrass, which contributes to lower condition rating.

EU 6 - This ecological unit produces significant amounts of livestock forage; however, approximately 15 to 20 percent of the unit is on slopes greater than 40 percent, which is considered as non-capable range. Ecological conditions vary from poor to good depending mostly on tree and shrub canopy cover. Dense canopy limits forage production quality and quantity and livestock access to it.

EU 7 - This ecological unit produces significant amounts of livestock forage although availability is limited by dense tree and shrub canopy on many areas. Also, approximately 30 to 40 percent of the unit is on slopes greater than 40 percent, which is classed as non-capable for livestock grazing. This is especially true of the more mountainous higher elevations. Although the ecological condition of forage is generally good, many areas are in fair or poor condition due to dense tree and shrub canopy.

EU 8 - Large portions of this ecological unit are classed as either non-range (produces less than 50 lbs. of forage per acre) or as non-capable (on slopes over 40 percent). Capable range consists of basins and gently sloping ridge tops. Ecological conditions on capable areas are generally good; however, some areas of fair condition are due to heavy tree and shrub canopy. Trends are generally static.

EU 9 - This ecological unit is a major producer of forage. Ecological conditions are generally fair to good with static trends. Approximately 10 percent the unit is classed as non-capable due to slopes of over 40 percent. Rough limestone outcrops sometimes limit cattle access. Deeper soil sites are especially productive. Tree and shrub competition is generally not a problem.

EU 10 - Much of this ecological unit is classed as non-range or non-capable. A high percentage of steep slopes and low forage production make most of the unit unsuitable for grazing. Some grazable areas do exist; however, they are often remote and difficult for cattle to utilize. Ecological condition is generally good with static trends.

EU 11 - This ecological unit is largely (70 percent) classed as non-capable for livestock grazing due to steep slopes (greater than 40 percent) and currently is non-range, producing insufficient forage to support livestock grazing. Most capable range areas are at the lowest elevations and adjacent to the riparian areas. Most of the allotments within this unit are currently vacant and likely to remain so.

EU 12 - This unit is essentially all non-range and those areas that do produce forage are classed as non-capable or are inaccessible to livestock. Ecological conditions are fair due to dense over story of trees and shrubs.

EU 14 - Although this ecological unit is a major producer of livestock forage, production is significantly reduced by competition from mesquite. Mesquite competes very successfully for moisture and soil nutrients to the detriment of forage species. Non-native species, especially Lehmann lovegrass are a problem in many area of this unit. Because of these factors, ecological condition is poor and at best fair with mostly static trends.

EU 15 - The highest elevations of this ecological unit are 90 percent non-capable. The mid and lower elevations contain much capable range; however, the areas are highly dissected, capable range areas being intermingled with non-capable range. Dense tree and shrub canopies moderately limit forage production. The main effect is limited access to forage due to dense trees and shrubs and rugged topography. Ecological conditions are mostly fair to good with static trends

3.2.3 Environmental Consequences

3.2.3.1 Criteria Used for Analysis

There are primarily five concerns with the proposed action in regards to range management. These include effects of proposed activities on livestock, use patterns, range structures, forage production, and the range economy. Measurement indicators for analysis will consist of qualitative discussions on:

- Changes to distribution and utilization of pastures
- Potential for adverse or beneficial effects to livestock
- Potential for damage to range structures
- Changes to forage production and spread of invasive species
- Effects to local range economies

3.2.3.2 Alternative 1 – No Action

Direct and Indirect Effects

Under Alternative 1, there would be no direct effects as proposed activities would not occur. Current conditions and processes would continue. While future undefined fuel reductions treatments may occur, there would be little if any significant change in forage conditions that would benefit the range resources that can be measured at this time. However, there could be indirect effects if a wildfire were to occur. Because wildfire events are unplanned and unexpected as regards to location, intensity, and extent, and because they often resist control, they present a much greater potential to negatively affect forage resources, threaten livestock, destroy or damage range structures, disrupt allotment management efforts, and have greater negative economic effect on the local ranching economy.

Wildfire may directly result in the injury or death of livestock contained within fenced pastures or open range allotments. Fire may also indirectly harm livestock by affecting the surrounding environment. Forage may be consumed in a fire, limiting its availability and use, and grazing capacity of the pasture. Grazing is often deferred following a fire to allow for forage plant recovery, resulting in further constraints on immediate forage availability. Wildfire may damage structures such as water developments and fences, which are critical to the management of livestock because they either provide necessary resources directly to the animals, or support management of other critical resources such as forage.

Because of an overabundance of fuels, wildfires in the present landscape often burn at high intensities and result in severe, widespread resource damage. A wildfire could be potentially damaging to the soil and ultimately to forage production. Severe high-intensity burns could remove large acres from production and contribute to the spread of weeds across a wide area.

Economically the no action alternative would continue to limit the Forest's ability to balance permitted grazing with grazing capacity without reducing permitted numbers. Opportunities to increase available forage would remain limited and therefore have a negative economic impact on the ranching operations dependent on National Forest grazing. This would have further economic impact on the local economy.

Cumulative Effects

If no treatments occurred, the only cumulative effects that could occur would result if there were a high-intensity, large-scale wildfire. In combination with other actions or events, a wildfire would prevent or defer grazing on allotments, and likely lead to an overall reduction in available forage.

3.2.3.3 Alternative 2 – Proposed Action

Direct and Indirect Effects

Changes to Distribution and Utilization of Pastures

Fire treatments would result in a temporary loss of forage both before and after burning. In order to have sufficient fuel to carry fire, planned burn areas must be rested one growing season prior to the

burn. At least one growing season rest must follow the burn to allow for recovery of plants to provide soil and plant health, and forage. Burned areas would be unavailable for grazing until these needs are met. Therefore, additional growing seasons of rest may be required. In the long term, fire treatments would benefit the forage resource and therefore benefit livestock indirectly. Once recovered, forage quality and quantity would be enhanced.

Generally, non-fire treatments would not require grazing deferment. In many cases, non-fire treatments would benefit livestock in the short term by an immediate availability of additional grazing acreage. Some areas would require adequate rest and deferment to allow for increases in forage plant densities once the competing overstory (shrubs/trees) is removed. Once treated and desired herbaceous species have increased in density, many of these areas can be treated with fire to maintain their desired condition. Wildfire intensity would be reduced and have fewer negative effects on the forage resource and livestock/allotment management.

All treatments would result in increased grazing acreages. This would allow for increased flexibility in allotment management, allow the Forest to retain permitted numbers due to increased available forage (eliminating the need to reduce permitted numbers), offer possible opportunities for increases in permitted livestock numbers, and therefore have a positive effect on local economies. Wildfire intensity would be reduced allowing for greater beneficial effects of maintaining forage quality and quantity. There may still be some disruption of allotment management. However, the increase in grazing acres created by the proposed action would provide alternative grazing areas while areas burned by wildfire recovered.

Effects to Livestock

The removal of older plant growth may create greater accessibility to plants and plant parts. Improved grazing opportunities may result in greater nutrition and performance in the animal. Removal and thinning of dense stands of shrubs and trees can change livestock use patterns. Generally, this will be beneficial; however, in some cases this may increase access in areas sensitive to livestock grazing.

Restoration of a more natural fire regime through fire use can not only improve grazing opportunities for livestock by modifying vegetation, but can help prevent more severe and widespread damage to critical livestock resources. By managing fire only in circumstances where the impact to ongoing permitted activities such as livestock grazing can be mitigated, the negative effects of fire on livestock can be minimized during a single event and over time.

Effects on Structural Improvements

Fire has the potential to damage or destroy existing structural improvements (fences, waterlines, etc.) on the forest. A design criterion for this project (see Appendix, part C) has been included to ensure that prior to treatments, a site-specific evaluation is undertaken to determine the risk of loss, cost-effectiveness of the improvement, and the cost of replacement for individual improvements. By managing fire only in circumstances where the impact to ongoing permitted activities can be mitigated, the deleterious effects of fire on range structures and improvements can be minimized during a single event and over time. It is expected that the loss of structural improvements to fire will decrease in the future as fuel loads are reduced, the risk of high-intensity wildfire is minimized, and vegetation is returned to that of historic conditions.

Although non-fire treatments have far less potential to negatively affect livestock than fire and may result in more immediate benefits to livestock, there is still the potential of damage from non-fire treatments such as mastication. Mastication has some potential to damage structural improvements,

particularly fences and pipelines that are obscured from view by shrubs or other dense vegetation being treated. However, project design criterion R-2 provides for protection or replacement of range infrastructure that could be damaged by project activities (see Appendix, part C).

Ranching is an important part of the economy of Southeastern Arizona; therefore, actions that affect the availability of forage, the ability of cattle to utilize that forage, and the number of permitted livestock have an effect on the viability of individual ranching operations and therefore on the economy of the area. Therefore, opportunities to sustain or increase available livestock forage have a positive impact on the economy. Current direction is to balance permitted use with capacity. To do this, reductions in permitted grazing must occur where necessary or additional forage resources must be found and made available to livestock. This includes sustaining the viability of existing and planned structural range improvements, sustaining the quality of forage resources and, where possible, increasing the availability of forage.

Effects on Forage Production

All treatments could have direct and indirect effects on forage resources. These treatments are especially compatible with range management objectives in mesquite savanna, oak woodlands and other shrub and tree dominated habitat types because they help to maintain openings for forage production for livestock and wildlife. Fire generally increases forage production on many grasslands, with some exceptions on semiarid and arid grasslands, and increased livestock gains have been attributed to the increased nutritive quality of forage growing on recently burned areas. Site-specific evaluation should be undertaken to determine the potential effects of fire on the forage base of a particular pasture.

Standing mature forage consumed by fire constitutes a loss. To prevent further loss of forage following a fire, grazing must be delayed to allow for the recovery of forage plants and to prevent localized excessive grazing use. Deferred grazing periods and restocking rates after a fire would depend on the severity of the fire as well as other site-specific criteria, and could affect the recovery of the particular plant community. Design criterion R-1 specifies coordination with grazing permittees to provide proper rest periods for plant and soil recovery (see Appendix, part C).

Spread of Invasive Species

The spread of invasive species into burned areas could also potentially affect the long-term production of forage. Invasive weeds, if left unchecked, could degrade or reduce livestock foraging areas by occupying habitat or injuring livestock. Once established, it could be difficult to control or eradicate invasive plant species, therefore it is important to track weed occurrences, determine their proximity to a fire, determine the likelihood of their spread, and take the appropriate steps to prevent their proliferation within burned areas.

Fire use presents some potential negative consequences for forage production primarily through direct consumption by fire and displacement by invasive vegetation after a fire. However, long-term benefits such as improved nutrition and maintenance of foraging areas within woody vegetation communities are expected to exceed the negatives, given appropriate pre- and post-fire management such as grazing deferment, reseeding, and noxious weed prevention and management. Also, the overall risks associated with fire would be reduced after the implementation of fire. It is expected that fire use would not adversely affect long-term production of forage. By managing fire only in circumstances where the impact to ongoing resource objectives such as forage production can be mitigated, the deleterious effects of fire on forage can be minimized during a single event and over time. Modification of fuel conditions and forest structure using fire in optimum situations will create landscape conditions that more closely resemble the historic landscape conditions that are less

susceptible to severe, high-intensity wildfires in the future. Non-fire treatments offer the opportunity to reduce fuel loads on areas where high fire intensity would cause long-term damage to residual herbaceous plants and possibly damage soil.

Forage Production by Ecological Unit

Opportunities to increase and maintain livestock forage in each of the ecological units through the proposed action are as follows:

EU 1 and EU 13 - There is no action being proposed for these ecological units--acreages are small and Forest direction dictates that there is no practical opportunity to increase available livestock forage in these two units. Treatments in other ecological units would help minimize use in these areas.

EU 2 - Due to the small acreage of this ecological unit on the Coronado there is little opportunity to significantly increase forage production. Mastication may yield an increase in forage production, but due to the soil condition and moisture increases would be somewhat limited.

EU 3 - The primary benefit of treatments in this unit would be to maintain forage quality. The best treatment for accomplishing that is burning. A small increase in forage production would be gained by removal of some trees; however, this would not be as important as maintaining existing production and forage quality.

EU 5 - There are significant opportunities to improve forage production, quality, and access in this unit. In areas of tree and shrub canopies greater than 40 percent, forage production could increase as much as 100 percent (double) and possibly more. Unitwide, increases in forage production would probably average between 25 and 40 percent. Reduction in canopy cover would increase quality of existing forage through reduced plant competition for water, sunlight, and soil nutrients. Thinning of dense stands of trees and shrubs would allow livestock to access new and previously unavailable forage.

EU 6 - There are significant opportunities to improve forage production, quality, and access in this unit. In areas of tree/shrub canopies greater than 40 percent forage production could increase as much as 100 percent (double) and possibly more. Unit-wide increases in forage production would probably average between 25 percent and 40 percent. Reduction in canopy cover would increase quality of existing forage through reduced plant competition for water, sunlight, and soil nutrients. Thinning of dense stands of trees and shrubs would allow livestock to access new and previously unavailable forage. Treatments that increase forage on slopes over 40 percent would not benefit livestock.

EU 7 - Potential to increase forage is not as significant as in EU-5 or EU-6 because of greater percentage of non-capable area. However, on the capable portions of the unit potential increases in forage production is just as great.

EU 8 - Opportunities to enhance forage production are limited in this ecological unit because the unit is predominately non-capable range. Where treatments occur on low gradient ridge tops and within wide shallow basins some benefit will be gained. The benefit will be primarily maintained forage quality and desired ecological conditions.

EU 9 - Although limey soils are limiting opportunities to increase forage production are still available to increase forage production and quality. Access to forage is limited in many areas by large stands of cat claw and mimosa.

EU 10 - Opportunities in this unit are extremely limited if non-existent due to the low acreage of capable area. It is not recommended to attempt to utilize forage increases that may occur in this unit. Incidental use may occur but will not be considered part of the forage base.

EU 11 - Grazing opportunities are limited in this ecological unit. Since most of the allotments are currently unstocked and likely to remain so, any increases in forage quality or quantity would likely not be utilized by livestock except on the Miller Canyon allotment and possibly on small portions of the Lyle Canyon Allotment and Lone Mountain Allotment. Miller Canyon allotment is the only allotment that would significantly benefit.

EU 12 - There is virtually no opportunity to increase forage production for livestock in this unit because the unit is virtually all non-capable.

EU 14 - Treatments in this ecological unit have significant potential to increase forage production; however, that increase may come from non-native species such as Lehmann lovegrass. Removal/thinning of mesquite would reduce competition with forage species but Lehmann lovegrass is established at levels that may very well out-compete native grass species as the area responds to mesquite removal. Evaluation of each treatment site will be necessary to determine what the exact response might be.

EU 15 - Although limey soils are somewhat limiting there is still potential to significantly increase forage production and quality in this ecological unit; however, much of the increase may come from non-native species, especially Lehmann and Boer's lovegrasses in the lower elevations. Treatment sites would need to be evaluated as to what the response might be. Forage production increases would probably only amount to 10 to 20 percent. Reduction in tree and shrub density would probably serve to retain production rather than increase it.

Cumulative Effects

From the range management standpoint, cumulative effects would mainly be realized on an allotment-by-allotment basis. The primary exception to this will be community economics. Actions similar to the proposed action have been occurring on the district for many years. Recent treatments similar to the proposed action include three mastication projects of 1,000 acres each, wildfires including the Merritt Fire (3,600 acres), the Ryan Fire (44,000 acres), the 103 fire (800), Oversite Fire (3,800 acres), San Antonio Fire (2007-1,400 acres, 2006-800 acres); prescribed burns including the Merritt Burn (3,600acres), and the Border I and II burns (2,900 acres). All of these have reduced canopy cover to one extent or another. The mastication projects have increased forage availability on approximately 600 acres on the Lochiel Allotment, 1,400 acres on the Dusquesne Allotment, and 1,000 acres on the Hayfield Allotment. The full effect of these projects is not yet known. However, increased livestock distribution has occurred on all of these allotments. The Hayfield Allotment has had problems dealing with two large wildfires (San Antonio fires 2006 and 2007) in two years. So no increased grazing has occurred; however, other actions (mastication) have already helped to ameliorate the effects of the wildfires.

Once the full effects of the mastication project are realized, these types of situations will be more easily dealt with in the future. Mastication projects on the Duquesne will begin to have a positive effect once new waters are installed. Whether or not there will be increases in permitted grazing has yet to be seen; however, greater flexibility will be realized within the next several years. Should the proposed action be implemented this allotment will gain greater viability. The Lochiel is a small allotment and will gain increased viability from recent mastication projects once new planned waters are in place. The Lochiel has also had to deal with the effects of the San Antonio Fire of 2007 as well

as a smaller fire also in 2007 (name unknown). The Lone Mountain Allotment has had to limit grazing on a number of pastures due to both wildfire (103 Fire) and prescribed fires (Border I and II). Once these areas are recovered and available for grazing, flexibility will be enhanced and the need to limit permitted livestock numbers because of additional projects and wildfire occurrences will be reduced. The Lone Mountain generally has to deal with small to moderate wildfires annually. Two factors put this allotment at higher potential for wildfire. First, due its large size there is simply more area for fires to ignite in and, second, its location adjacent to Mexico leaves it susceptible to fires started by illegal immigrants and drug traffickers from Mexico. Therefore, this allotment will benefit from all past and future projects that increase its forage base. The Lyle Canyon Allotment has benefited from the effects of the Merritt Wildfire and the Merritt prescribed fire; however, these fires destroyed an important water source (pipelines) that have yet to be replaced, and an alternate water source has failed (dry well). Once these problems are corrected, increased forage on this area will have positive effects on management of the entire allotment. As a greater number of projects are completed, more if not all allotments will benefit in similar ways. As more allotments are positively affected, the local economy will benefit.

3.3 Special Status Species

This section addresses issue No. 2, which focuses on effects of proposed activities on threatened, endangered, sensitive, and management indicator wildlife, fish and plants.

3.3.1 Regulatory Framework

The project biologist prepared a biological assessment (BA), biological evaluation (BE) and a report on management indicator species (MIS) to analyze the potential impacts of the proposed action on special-status wildlife, fish and plant species and their habitat in the project area. These analyses were conducted with the cooperation of biologists from the U.S. Forest Service (CNF), the Department of Defense (Ft. Huachuca), the National Park Service (Coronado NM), the U.S. Fish and Wildlife Service, and The Nature Conservancy (SE Arizona Preserves). Included are species listed by the U.S. Fish and Wildlife Service as threatened, endangered, or proposed for listing under the Endangered Species Act (ESA); designated critical habitat for species listed under the ESA; species designated as sensitive by Region 3 of the Forest Service (USDA Forest Service 2007); and management-indicator species on the Coronado NF (LRMP 1986, as amended). The key findings and determinations from the BA, BE and MIS reports are summarized in this section. The reports are available from the project administrative record.

3.3.2 Affected Environment

Pages 85, 87, and 50 describe the existing vegetation, fuels, and watershed conditions in the project area that shape the existing condition of wildlife, fish and plant habitats. The Huachuca, Whetstone, and Patagonia Mountains of southeastern Arizona lie at the center of the “sky island” region of southwestern North America (McLaughlin 1995). The region is noted for its high level of biodiversity.

Species have evolved over time in the presence of fire. Depending upon climate, vegetation, and other ecological variables, these listed species adapted to natural fire frequency and severity. Historic grazing, wildfire suppression and human development have resulted in unnaturally high accumulations of fuel and higher intensity fires, ultimately resulting in losses of threatened, endangered, proposed, sensitive and management indicator species habitat. Since we cannot currently

control the effects of a wildland fire in these areas under the present fuel conditions, wildland fires could have severe, undesirable effects.

3.3.3 Environmental Consequences

This section is summarized from over 250 combined pages of the BA, BE and MIS reports, which are available from the project record. It is important to note that stringent conservation measures and design criteria based on the inherent values and characteristics of each unit would be followed to protect native wildlife, plants, fish and their habitats, as well as water, soils, scenery, air quality, and historical and archaeological sites (see Appendix, part C). Measures developed for the protection of other resources may also provide for the protection of wildlife, fish, and plants, and thus are considered an integral part of this analysis. As activities are proposed, fire and fuels managers will review treatment parameters to ensure that they are within the scope of the FireScape strategy and effects analysis and that they are consistent with the design criteria that bind those actions. Such prescreening will help to ensure the effects of treatments fall within acceptable boundaries.

It is also important to note that for all species analyzed, the analysis addresses effects to species at the most intensive treatment level - the potential maximum acres that could be treated over the estimated 10-year implementation period (270,000 acres). This analysis is conducted as if treatments will occur at the most intensive level allowed by the prescriptions while implementing all required minimization measures. Treatment effects will likely be less than that expected under the maximum potential treatment scenario because:

- site-specific treatments will be designed for each project within the overall Huachuca FireScape project area;
- resource advisors will coordinate site-specific burn and implementation plans with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to identify site-specific measures to protect Federally listed and sensitive species, and species of concern;
- Project wide management areas would be delineated to avoid impacts to sensitive areas.

The following sections are organized to discuss direct and indirect effects of the no action alternative and the proposed action alternative on three groupings of special status species: threatened and endangered species, sensitive species, and management indicator species. Cumulative effects for all species are summarized at the end.

3.3.3.1 Threatened and Endangered Species

Consultation with the USFWS regarding this proposed action is on going. Prior to decision, a biological opinion will be issued that is anticipated to be consistent with the analysis presented in this EA.

Alternative 1 - No Action

If no action is taken, each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency’s jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed. Under the no action alternative, there would be no direct effects to species or their habitat from treatment activities. In the absence of any kind of human-caused or natural disturbance, indirect effects would

occur from the natural progression of vegetative growth and change. Fire risk in the project analysis area would likely increase and contribute to severe wildfires. It is likely that stand-replacing wildfires would continue to occur at recent levels or increase in frequency and severity. In the case of wildfires, the effects are especially difficult to assess because of the many and great uncertainties related to management of such fires. The timing, location, extent, and severity cannot be accurately predicted. However, wildfires could result in a reduction of important habitat features such as travel corridors, nesting or foraging habitat, and hiding cover.

Table 8. Threatened and endangered species considered in this analysis and summary determination of effects

Species	Listing Status	Effects Determination
Jaguar *(Panthera onca)*	Endangered	MANLAA
Lesser long-nosed bat (*Leptonycteris curasoae*)	Endangered	MANLAA
Mexican spotted owl (*Strix occidentalis lucida*)	Threatened w/ critical habitat	Species: MALAA Critical Habitat: MANLAA
Chiricahua leopard frog (*Lithobates chiricahuensis*)	Threatened	MANLAA
Sonora tiger salamander (*Ambystoma mavortium stebbinsi*)	Endangered	MALAA
Gila chub *(Gila intermedia)*	Endangered w/ critical habitat	MANLAA
Gila topminnow *(Poeciliopsis occidentalis occidentalis)*	Threatened	MANLAA
Huachuca water umbel (*Lilaeopsis schaffneriana* ssp. *recurva*)	Endangered w/ critical habitat	MANLAA
Canelo Hills ladies tresses *(Spiranthes delitescens)*	Endangered	MANLAA
Pima pineapple cactus *(Coryphantha scheeri* var. *robustispina)*	Endangered	MANLAA

Definitions for Effects Determinations

May affect, is *not* likely to adversely affect (MANLAA) - the effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

May affect, is likely to adversely affect (MALAA) - if any adverse effect to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not: discountable, insignificant, or beneficial (see definition of "is not likely to adversely affect"). In the event the overall effect of the proposed action is beneficial to the listed species, but is also likely to cause some adverse effects, then the proposed action "is likely to adversely affect" the listed species. If incidental take is anticipated to occur because of the proposed action, a determination of "is likely to adversely affect" should be made. A determination of "is likely to adversely affect" requires the initiation of formal Section 7 consultation.

Alternative 2 - Proposed Action

Direct and Indirect Effects

The following summarizes and provides rationale for the effects determinations for each listed species analyzed.

Jaguar (*Panthera onca*)

Due to the jaguar's ability to disperse long distances, its ability to opportunistically forage on a variety of prey species, and the small likelihood that the jaguar would occur in the United States, effects to the species are very minor. Although there may be a slight modification of prey habitat, reproduction, numbers, and distribution of jaguars would not be changed by the proposed action.

Therefore, **the proposed action may affect, but is not likely to adversely affect the jaguar or its habitat.**

Rationale - The proposed action may affect this species because treatment areas occur within suitable and potentially occupied habitat. The proposed action is not likely to adversely affect the jaguar because:

- The jaguar is a wide-ranging species and although travel corridors may be thinned, treatments are not expected to prevent jaguars from using the travel corridors or entering the United States.
- Treatments will benefit the main prey species of jaguars (e.g., deer and javelina).

Lesser long-nosed Bat (*Leptonycteris curasoae*)

Because lesser long-nosed bat may be indirectly affected by proposed activities when food sources are damaged or destroyed, the cumulative treatment of 236,000 acres of potentially suitable foraging habitat could result in a slight change in the numbers or distribution. Since the proposed project incorporates conservation measures to minimize effects to bat roosts and foraging habitat, the proposed treatments are not likely to change the species distribution. Therefore, **the proposed action may affect but is not likely to adversely affect the lesser long-nosed bat or its habitat.**

Rationale - The proposed action may affect this species because treatment areas occur within suitable and potentially occupied habitat. The proposed action is not likely to adversely affect the lesser long-nosed bat because:

- treatments would be planned to minimize adverse effects to lesser long-nosed bat forage plants and roosts;
- treatments would reduce the density of encroaching shrubs and trees;
- treatments will reduce the potential for major wildfires in lesser long-nosed bat foraging and roosting habitat.

Mexican Spotted Owl (*Strix occidentalis lucida*)

Due to direct and indirect effects to Mexican spotted owls and their habitat from mechanical treatment and prescribed burning within the action area**, the proposed action may adversely affect the Mexican spotted owl and may affect, but is not likely to adversely affect, its critical habitat.**

Rationale

- Activities associated with prescribed burning and thinning treatments can directly affect the nesting or wintering Mexican spotted owl through auditory or visual disturbance.
- Fuel treatments that are strategically located may decrease the likelihood of high-severity fire spreading into critical habitat.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.
- Prescribed burning or thinning activities may indirectly affect the spotted owl by changing the owl's habitat structure.
- Mexican Spotted Owl Recovery Plan (USDI Fish and Wildlife Service 1995) pine-oak forest habitat structure guidelines would be followed in setting project objectives.

- Well-designed treatments that reduce the extent and severity of wildfires while maintaining suitable owl habitat are likely to be beneficial in the long-term.
- The proposed action may treat up to 11,600 acres (38 percent) of 23,573 acres within designated PACs in the action area. The maximum number of PACs that could be affected by treatments over the life of this plan is 24 (77 percent of those occurring within the action area).

Chiricahua leopard frog

Chiricahua Leopard Frog (*Lithobates chiricahuensis*)

Due to indirect effects to Chiricahua leopard frog and their habitat from mechanical treatment and prescribed burning within the action area**, the proposed project may affect but is not likely to adversely affect the species and its habitat.**

Rationale - The proposed action may affect this species because treatment areas occur in watershed containing suitable and occupied habitat. The proposed action may affect but is not likely to adversely affect the species and its habitat because:

- Treatment activities could produce insignificant amounts of ash deposition and sediment deposition in potential, suitable, or occupied habitat.
- Project wide manageable areas, avoiding certain riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers, will greatly reduce the amount of sediment/ash produced and introduced to frog habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.
- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production/movement to minimize more local effects to the species.
- Monitoring will guide implementation to ensure significant impacts to the species or at a watershed scale do not occur.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

Sonora Tiger Salamander (*Ambystoma mavortium stebbinsi*)

Due to direct and indirect effects to Sonora tiger salamander and their habitat from mechanical treatment and prescribed burning within the action area**, the proposed action may adversely affect the Sonora tiger salamander and its habitat**.

Rationale - The proposed action may affect this species because treatment areas occur in watershed containing suitable and occupied habitat. The proposed action may adversely affect the Sonora tiger salamander because:

- Prescribed fire and treatment activities could result in incidental mortality of terrestrial salamanders.
- Treatment activities could produce ash deposition and sediment deposition in occupied habitat.
- Project wide manageable areas, avoiding certain riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to salamander habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.
- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production/movement to minimize more local effects to the species.
- Yearly monitoring will guide project implementation to ensure significant impacts to the species or at a watershed scale do not occur.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

Gila Chub (*Gila intermedia*)

Due to indirect effects to Gila chub and critical habitat from mechanical treatment and prescribed burning within the action area**, the proposed action may affect, but is not likely to adversely affect, the Gila chub and its critical habitat**.

Rationale - The proposed action may affect this species because treatment areas occur in watersheds containing suitable and occupied habitat. However, the proportion of any watershed containing occupied habitat or unoccupied suitable habitat would be insignificant. Conservation measures would minimize effects because:

- Although treatment activities could produce some ash deposition and sediment deposition in occupied habitat, there is a low likelihood some individuals will be impaired or die as a result.
- Project wide manageable areas, avoiding certain riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to Gila chub habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.
- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production/movement to minimize more local effects to the species.

- Monitoring by the Forest Service will guide implementation to ensure significant impacts to the species or at a watershed scale do not occur.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

Gila Topminnow (*Poeciliopsis occidentalis occidentalis*)

Due to indirect effects to Gila topminnow and their habitat from mechanical treatment and prescribed burning within the action area, **the proposed action may affect but is not likely to adversely affect, the Gila topminnow**.

Rationale - The proposed action may affect this species because treatment areas could occur in watersheds containing suitable and occupied habitat. Conservation measures will minimize effects of the proposed action is likely to adversely affect the Gila topminnow because:

- Although treatment activities could produce some ash deposition and sediment deposition in occupied habitat, there is a low likelihood individuals would be impaired or die as a result.
- Project wide manageable areas avoiding certain riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers would greatly reduce the amount of sediment/ash produced and introduced to Gila topminnow habitat. Such measures would avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels. The proportion of a watershed with occupied habitat or suitable unoccupied habitat would have insignificant indirect effects.
- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that would be used to further control sediment and ash production/movement to minimize more local effects to the species.
- Monitoring would guide implementation to ensure significant impacts to the species or at a watershed scale do not occur.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

Huachuca Water Umbel (*Lilaeopsis schaffneriana* spp. *recurva*)

Riparian buffers and other conservation measures would result in avoidance of significant direct and indirect effects to the species. **Therefore, the proposed action may affect but is not likely to adversely affect, the Huachuca water umbel or its critical habitat.**

Rationale - The proposed action may affect this species because treatment areas are adjacent to suitable and potentially occupied, and occupied habitat. The proposed action is not likely to adversely affect the Huachuca water umbel because:

- The proposed treatments are not expected to directly affect the Huachuca water umbel.
- The proposed treatments are likely to reduce the risk of increased stream flows caused by catastrophic wildfire that would degrade or remove water umbel habitat.

- Project wide manageable areas, avoiding certain riparian areas, limiting the amount and timing of treatment with the watershed, and developing site-appropriate buffers will greatly reduce the amount of sediment/ash produced and introduced to salamander habitat. Such measures will avoid or greatly minimize the cumulative effects of treating multiple areas within the same watershed.
- The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.
- Best management practices identified within the Forest Service Handbook offer a variety of mechanisms that will be used to further control sediment and ash production/movement to minimize more local effects to the species.
- Monitoring will guide Forest Service implementation to ensure significant impacts to the species or at a watershed scale do not occur.

Canelo Hills Ladies Tresses (*Spiranthes delitescens*)

Riparian buffers and other conservation measures would result in avoidance of significant direct and indirect effects to the species. **Therefore, the proposed action may affect but is not likely to adversely affect, Canelo Hills ladies tresses or its habitat.**

Rationale - The proposed action may indirectly affect this species because proposed treatments could occur in habitats adjacent to occupied, suitable, and potentially occupied habitat. The proposed action is not likely to adversely affect the Canelo Hills ladies tresses because:

- Reducing the threat of catastrophic wildfire that could depopulate an entire site and potentially increasing water flow via thinning may benefit the species.
- The Forest Service will survey and protect riparian areas that may contain the species with a site-appropriate buffer. This buffer will protect plants from adverse effects including scouring floods.
- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

Pima Pineapple Cactus (*Coryphantha scheeri* var. *robustispina*)

Conservation measures would result in avoidance of significant direct and indirect effects to the species. However, because surveys may not reveal all cacti within treatment areas some mortality of individuals could result. Due to potential direct effects to Pima pineapple cactus and their habitat from mechanical treatment and prescribed burning within the action area**, the proposed project may affect but is not likely to adversely affect the species and its habitat.**

Rationale - The proposed action may affect this species because it may occur within proposed treatment areas. The proposed action may affect but is not likely to adversely affect the species and its habitat because:

- The Forest Service would survey treatment areas with suitable habitat and protect all documented plants from moving vehicles and slash deposition.
- A blackline/mineral soil ring would encircle each known plant with a site-appropriate buffer to avoid impacts from broadcast burning.
- In suitable habitat for Pima pineapple cactus no broadcast burning would be conducted where Lehmann lovegrass is the primary grass component.

- The proposed action is designed to reduce the risk of catastrophic wildfire. Catastrophic wildfire is expected to have considerably greater impacts to the species than the proposed action.

3.3.3.2 Sensitive Species

Alternative 1 - No Action

Since no proposed activities would occur with this alternative, there would be no direct effects to sensitive species. Future fuels activities may occur that are not specified at this time and are categorized in the cumulative effects section. Indirect effects could occur with a severe wildfire. It is likely that stand-replacing wildfires will continue to occur at recent levels. This would result in a reduction of desirable native habitats. Extreme fire behavior events could threaten small, localized populations of species, reduce important habitat features, or cause mortality of various individuals. In the absence of severe fire, the natural progression of vegetation could degrade some habitats over time.

Alternative 2 - Proposed Action

Direct and Indirect Effects

Seventy-eight sensitive species were analyzed for potential effects (see biological evaluation in the administrative record). Of those, 31 had determinations of “no impact” because known habitat areas would be excluded from treatment, conservation measures would prevent adverse effects, or effects would be beneficial. For these reasons, these species were not analyzed in detail (rationale for no impact determinations are contained in Appendix A of the biological evaluation). The remaining species analyzed in detail had determinations of “**may impact individuals but not likely to cause a trend toward Federal listing or loss of viability**” (effects are expected to be insignificant, or discountable; see Table 9). Reasons for the “may affect but not likely to adversely affect” determination vary between species but generally consist of the following:

- Modification of habitat and forage areas
- Direct mortality of individuals
- Indirect effects to prey species
- Short-term effects to pond, stream and riparian habitats
- Short-term effects to nesting and roosting areas

Conservation measures and project design criteria are intended to avoid or minimize such effects but because some short-term effects are likely, a ‘may affect” determination is necessary. In addition, long-term effects of proposed treatments are expected to be beneficial to most species by reducing the risk of catastrophic fire, and trending ecological processes toward historic levels. Please refer to the biological evaluation for detailed analyses.

Table 9. Summary of sensitive species analyzed with determinations of "may impact individuals but not likely to cause a trend toward Federal listing or loss of viability"

Amphibians	**Reptiles**
Western Barking Frog *(Eleutherodactylus Augusti Cactorum)*	Slevin's Bunchgrass Lizard *(Sceloporus Slevini)*
Lowland Leopard Frog (*Rana Yavapaiensis)*	Mountain Skink *(Eumeces Callicephalus)*
Ramsey Canyon Leopard Frog *(Rana Subaquavocalis)*	Giant Spotted Whiptail *(Aspidoscelis Burti Stictogrammus)*
Great Plains Narrow-Mouthed Toad *(Gastrophryne Olivacea)*	Green Ratsnake *(Senticolis Triaspis)*
Birds	Brown Vinesnake *(Oxybelis Aeneus)*
Northern Goshawk *(Accipiter Gentilis)*	Mexican Gartersnake *(Thamnophis Eques Megalops)*
Gould's Wild Turkey *(Meleagris Gallopavo Mexicana)*	Arizona Ridge-Nosed Rattlesnake *(Crotalus Willardi Willardi)*
Whiskered Screech Owl *(Otus Trichopsis)*	**Snails**
Broad Billed Hummingbird *(Cynanthus Latirostris)*	Huachuca Springsnail *(Pyrgulopsis Thompsoni)*
Violet-Crowned Hummingbird *(Amazilia Violiceps)*	**Plants**
Lucifer Hummingbird *(Calothorax Lucifer)*	Goodding's Onion (*Allium Gooddingii*)
Northern Buff-Breasted Flycatcher *(Empidonax Fulvifrons Pygmaeus)*	Chiricahua Rock Cress (*Arabis Tricornuta*)
Arizona Grasshopper Sparrow *(Ammodramus Savannarum Ammolegus)*	Lemmon Milkweed (*Asclepias Lemmonii*)
Baird's Sparrow *(Ammodramus Bairdii)*	Greene Milkweed (*Asclepias Uncialis Spp. Uncialis*)
Fish	Huachuca Milkvetch (*Astragalus Hypoxylus*)
Longfin Dace *(Agosia Chrysogaster)*	Bush-Violet (*Browallia Eludens*)
Sonora Sucker *(Catostomus Insignis)*	Smooth Babybonnets (*Coursetia Glabella*)
Insects	Arid Throne Fleabane (*Erigeron Arisolius*)
Huachuca Giant Skipper *(Agathymus Evansi)*	Rutter's False Goldenaster (*Heterotheca Rutteri*)
Mammals	Lemon Lily (*Lilium Parryi*)
Arizona Shrew *(Sorex Arizonae)*	Huachuca Mountains Lupine (*Lupinus Huachucanus*)
Mexican Long-Tongued Bat *(Choeronycteris Mexicana)*	Supine Bean (*Macroptilium Supinum*)
Western Red Bat *(Lasiurus Blossevillii)*	Wiggins Milkweed Vine (*Metastelma Mexicanum* (=*Cynanchum Wigginsii*))
Pale Townsend's Big-Eared Bat *(Corynorhinus Townsendii Pallescens)*	Toumey Groundsel (*Packera Neomexicana* Var. *Toumeyi* (=*Senecio N.* Var. *T.*))
Pocketed Free-Tailed Bat *(Nyctinomops Femorosaccus)*	Virlet Paspalum (*Paspalum Virletii*)
Greater Western Mastiff Bat *(Eumops Perotis Californicus)*	Beardless Chinchweed (*Pectis Imberbis*)
White-Nosed Coati *(Nasua Narica)*	Huachuca Groundsel (*Senecio Multidentatus* Var. *Huachucanus (=S. Huachucanus*))

3.3.3.3 Management Indicator Species

National Forest Management Act implementing regulations (36 CFR 219.19) and Forest Service Manual (FSM) 2600 guidance require that Forest Plans identify certain vertebrate and/or invertebrate species as management indicator species (MIS), and that these species be monitored "in order to assess the effects of management activities on their populations and the populations of other species with similar habitat needs which they may represent (FSM 2620.5)." Thirty-three MIS and one group (primary and secondary cavity nesters) in eight indicator groups are identified in Appendix G of the Coronado National Forest Land and Resource Management Plan (USDA Forest Service 1986, pages 128-129). Several species occur in more than one group (Table 10) and/or are also classified threatened, endangered, or sensitive species. Species that are also listed as threatened, endangered, or sensitive species are discussed in the BE or BA; analysis is not repeated in the MIS report. Species occurring in more than one indicator group are only discussed in one group; analysis is not repeated under different groupings.

Management indicator species are displayed in the Forest Plan in eight indicator groups. The indicator groups themselves are general descriptions of a desired condition (diversity, riparian, dense canopy, etc.) but are not statements of a quantifiable plant community or habitat type identified in the Forest Plan. Several species occur in more than one group and/or are also classified threatened, endangered, or sensitive species. Species that are also listed as threatened, endangered, or sensitive species are discussed in the BE or BA; analysis is not repeated in the MIS report. See individual reports for rationale used to determine whether a species warranted detailed analysis or was dropped from further discussion.

The eight groups consist of cavity nesters, riparian species, species needing diversity, species needing herbaceous cover, species needing dense canopy, game species, special interest species, and threatened and endangered species. Many of the species in the eight groups overlap between groups (e.g. a species needing diversity may also be a listed species). The following summary does not include species not present or without habitat in the project area, and species analyzed in previous sections. See the MIS report in the administrative record for details.

Alternative 1 - No Action

Since no activities would occur with this alternative, there would be no direct effects to management indicator species. Future fuels activities may occur that are not specified at this time and are categorized in the cumulative effects section. Indirect effects could occur with a severe wildfire. It is likely that stand-replacing wildfires will continue to occur at recent levels. This would result in a reduction of desirable native habitats. Extreme fire behavior events could threaten small, localized populations of species, reduce important habitat features, or cause mortality of various individuals. In the absence of severe fire, the natural progression of vegetation could degrade some habitats over time.

Table 10. Coronado National Forest management indicator species and indicator categories

Indicator Species	Cavity Nesters	Riparian Species	Species needing Diversity	Species Needing Herbaceous Cover	Species Needing Dense Canopy	Game Species	Special Interest Species	T&E Species
Desert Bighorn Sheep						X		X
Pronghorn antelope				X		X		
Mt. Graham Red Squirrel								X
White-tailed deer			X	X		X		
Black bear		X	X			X		
Elegant trogon	X	X	X				X	X
Sulphur-bellied flycatcher	X	X	X				X	X
Gray hawk		X			X		X	X
Blue-throated hummingbird		X					X	X
Rose-throated becard		X					X	X
Thick-billed kingbird		X					X	X
Northern beardless tyrannulet		X			X		X	X
Bell's vireo		X			X			X
Buff-breasted flycatcher			X				X	X
Mearns' quail				X		X	X	
Merriam's turkey			X			X		
Five-striped sparrow							X	X
Peregrine falcon								X
Baird's sparrow				X				X
Gould's turkey								X
Primary and secondary cavity nesters	X							
Desert Massassauga				X				X
Twin-spotted rattlesnake								X
Arizona ridge-nosed rattlesnake								X
Huachuca (Sonora) tiger salamander		X						X
Tarahumara frog		X						X
Western barking frog		X						X
Arizona treefrog		X						X
Mexican stoneroller		X						X
Arizona (Apache) trout		X						X
Gila topminnow		X						X
Gila chub		X						X
Sonora chub		X						X
Spikedace		X						X

Alternative 2 - Proposed Action

Direct and Indirect Effects

Cavity Nesting Species

Habitat for cavity nesters (mature trees and snags) is widespread across the project area and is estimated to be increasing as a result of several large fires and insect infestations that have killed thousands of trees over the past decade (USDA Forest Service 2006). Primary and secondary cavity nesters may experience reductions in snag density and some direct effect from the proposed action (e.g., prescribed fire and vegetation treatments). Some individual animals may be injured or killed during the dropping of dead/dying trees (without cavities). However, the proposed project includes conservation measures to retain snags at the level of LRMP standards and for retention of all trees, live or dead, with cavities that are in use by wildlife. Horton and Mannan (1988) found the short-term impacts of broadcast understory fires on cavity-nesting birds to be minimal. Implementation of the proposed action would have minimal effect on occupied habitats for cavity nesters and would not contribute significantly to changes in Forestwide populations for the species.

Riparian Species

The proposed action includes excluding riparian habitats from treatment activities: EU 1 is excluded from proposed treatments; EU-13 Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12 (23 mi)^2 is excluded from proposed treatments; Riparian, aquatic, and wetland areas conservation measures will prevent effects to riparian habitat and indicator species. Based on this information, implementation of the proposed action would have no effect on occupied habitats for riparian indicator species and would not contribute significantly to changes in Forestwide populations for the species.

Species Needing Diversity

Out of all the species listed in this group, black bear and white-tailed deer are two species that are not already analyzed in other analysis sections.

Black Bear - The proposed treatments of prescribed fire and vegetation management will reduce cover and forage available to black bears in the short-term. Many mast-producing species (i.e., oaks) will resprout following treatment. Bear will benefit similarly to deer in terms of understory composition and structure, for fruit and herbage production. Manzanita will be left on many untreated acres, such as slopes greater than 20 percent, and will regenerate on treated sites. Across the project area, bear habitat is of sufficient quality and abundance to allow the species to continue to be well distributed across Federal lands. Historic habitats remain will occupied, although the population will fluctuate within occupied habitats based on the availability of forage.

White-tailed Deer - The proposed use of low- to moderate-severity prescribed fire and mechanical treatments to restore fire-adapted vegetation will reduce cover available to white-tailed deer in the short-term. This reduction in cover is not expected to be significant. Treatments will increase vegetative diversity in both plant species composition and structure. White-tailed deer will benefit from an increase in forage following prescribed fire and mechanical treatments. Across the project area, white-tailed deer habitat is of sufficient quality and abundance to allow the species to continue to be well distributed across Federal lands. Historic habitats remain will occupied, although the population will fluctuate within occupied habitats based on the availability of forage.

Based on the above information, implementation of the proposed action would have no effect on occupied habitats for Species Needing Diversity indicator species and would not contribute significantly to changes in Forest-wide populations for these species.

Species Needing Herbaceous Cover

Of the species in this group, two are not located in the project area and all but one, Mearn's quail, are analyzed in a previous section.

Tall grass is important as thermal cover for roosting birds such as Mearn's quail. In addition to grass cover, quail use is positively related to tree canopy cover greater than 20 percent. Prescribed fire will cause a short-term reduction in grass height in some areas; however, in the long-term, Mearn's quail will benefit from reduced woody vegetation and increased oak savanna habitat. The proposed project is not likely to cause a detectable change in Mearns' quail populations or a loss of occupied habitat.

Species Needing Dense Canopy

The species listed as Species Needing Dense Canopy (Table above) have been addressed previously either here in the MIS report or in the Biological Evaluation.

Special Interest Species

The species listed as Special Interest Species (Table 10 above) have been addressed previously either here, in the MIS report, or in the biological evaluation.

Cumulative Effects to All Special Status Species

Increasing human populations are occurring in Sierra Vista, Sonoita, Patagonia and other areas and in remote, sparsely populated areas. Habitat is typically lost or modified to meet the needs of increasing populations in all of these areas. In addition, ecological processes that maintain or stimulate development of habitat for special status species are often disrupted. Increasing human populations near the project area lands are of particular concern as species affected by the proposed action are greater near these lands and cumulative effects could undermine population centers important to species' recovery. These habitat changes are beyond the administrative jurisdiction of the Forest Service, Department of Defense - Fort Huachuca, and NPS Coronado National Memorial.

In addition to impacts associated with increasing human populations, human-caused wildfire, wildfire suppression, and wildfire risk reduction will also affect species. As the public becomes more informed on wildfire, fuel reduction and fire suppression strategies will stem the rising trend toward more frequent and more catastrophic wildfires experienced in the region, reducing the amount of habitat lost during these events. Risk reduction efforts on private lands that change the vegetative structure or components beyond the range of natural variability may remove or degrade habitat resulting in localized habitat loss. However, fuel reduction and other catastrophic risk reduction strategies can benefit special status species by preventing wildfire from severely altering habitat across large acreage beyond the localized treatment areas ultimately resulting in a long-term benefit to species and their habitats.

3.4 Soil and Water Resources

This section addresses issue number 3, which identified that implementing the proposed non-fire and prescribed fire vegetative treatments may have detrimental effects to soils, riparian areas, and water resources. To measure and compare these potential effects to riparian areas and water resources this analysis will analyze each alternative by the following:

- Potential for damage to riparian vegetation/stream channels
- Potential for decreased water quantity/quality
- Potential for increased runoff

To measure and compare the potential effects to soils, this analysis will analyze each alternative by:

- Potential for erosion hazard
- Potential for changes in woodland and range productivity

3.4.1 Regulatory Framework

Forest Service Manual (FSM) direction for riparian area management is "to protect, manage, and improve riparian areas while implementing land and resource management activities" (FSM 2526.02, 1994). Direction for managing riparian areas on the Coronado National Forest is found in the Forest Service Manual 2526 (USDA Forest Service 2000), and the LRMP (USDA Forest Service 1986).

Direction for managing soil and water resources is found in the National Park Service, U.S. Department of the Interior, 2006, Management Policies: The Guide to Managing the National Park System (DOI 2006). It includes:

> **Soil Resource Management (4.8.2.4)**
>
> The Service will actively seek to understand and preserve the soil resources of parks, and to prevent, to the extent possible, the unnatural erosion, physical removal, or contamination of the soil or its contamination of other resources.
>
> **Protection of Surface Waters and Groundwaters (4.6.1)**
>
> The Service will perpetuate surface waters and groundwaters as integral components of park aquatic and terrestrial ecosystems.

3.4.2 Desired Condition

The desired conditions in the project area are those that best achieve soil quality, water quality, water quantity, and air quality as expressed in national guidelines including the Clean Water Act (PL 92-500 as amended) and the Clean Air Act (84-159 as amended), as well as Forest Service, Department of Defense, and National Park Service land management plans and directives.

3.4.3 Affected Environment

3.4.3.1 Existing Condition

Geology and Landscape

The geology underlying the project area is complex. In general, the Huachuca and Whetstone mountains are granite, rhyolite, and andesite; and the valleys are alluvium. However, over 25 percent of the project area is a mix of volcanic and sedimentary rock including cave features (Figure 3). Consequently, the soils are complex as well. In general, the soils in the area are shallow to deep, gravelly loams, to extremely cobbly sandy loams with numerous rock outcrops. Elevations range from 4,000 feet above mean sea level at the east end of Fort Huachuca, to 9,466 feet at Miller Peak.

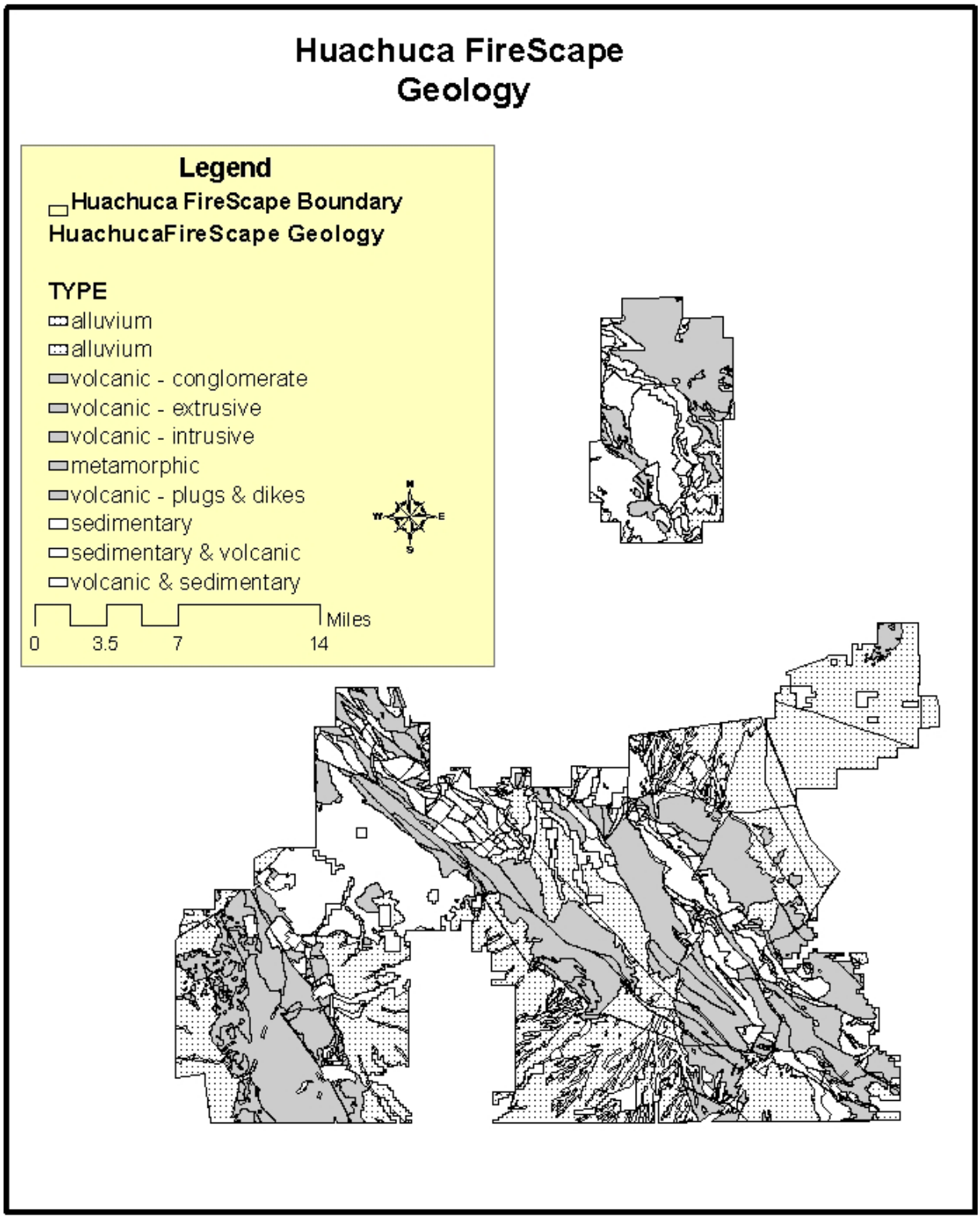


Figure 3. Geology of the Huachuca FireScape project area

The project area is mineralized, and mining has been done historically. Numerous private property in-holdings are present within the forest system lands as a result of historic mining patents.

Soils

A "general ecosystem survey" (GES) including soil information was completed by the Forest Service in 1991, and covers the entire Sierra Vista District (USDA Forest Service 1991). The USDA Natural Resources Conservation Service (formerly Soil Conservation Service) completed soil surveys for parts of the Sierra Vista Ranger District and all of Fort Huachuca in 2000 (USDA Forest Service 2000). The USDI completed a soil survey for the Coronado National Memorial in 2000 (USDI Geological Survey 2000).

Soil Properties

Soil properties discussed in this assessment include erosion hazard, hydrologic soil group, woodland potential, and range potential. A soils existing condition report for National Forest lands has been prepared, and is included as Appendix C in the soils specialist report (Lefevre 2008), located in the project record.

Erosion Hazard

Erosion hazard is defined as the potential water erosion loss compared to the tolerance for soil loss (USDA Forest Service 1991; USDI Geological Survey 2000). The tolerance level for soil loss is that amount, expressed in tons per acre per year, which can be lost without a permanent loss in the soil's potential to support the expected vegetation. Generally, erosion hazard is considered to be slight if the potential for loss is less than the tolerance level. Severe erosion hazard varies as the tolerance level varies: a soil with a tolerance level of 2.2 tons/acre/year is considered to have a severe erosion hazard if the potential for loss exceeds 9.0 tons/acre/year; whereas a soil with a higher tolerance level of 6.7 tons/acre/year is considered to have a severe erosion hazard if the potential for loss exceeds 17.6 tons/acre/year. This property is only the hazard for erosion. An area rated as having a moderate or severe erosion hazard is not necessarily eroding at that time.

Hydrologic Soil Group

There are four hydrologic soil groups in the project area as defined in the National Engineering Handbook (USDA Forest Service 2007)

A. (Low runoff potential). Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.

B. Soils having moderately low runoff rates when thoroughly wetted, and consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C. Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. These soils have a slow rate of water transmission.

D. Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential.

Woodland Potential

Woodland potential is an estimate of the capability of the site to grow trees traditionally thought of for firewood or other commercial use. Soil surveys referenced above (USDA Forest Service 1991; USDA Forest Service 2000; USDI Geological Survey 2001) each document this property a little differently. The Natural Resource Conservation Service identifies the site index, the Forest Service and U. S. Geologic Survey identify site index only for ponderosa pine or mixed conifer sites. The Forest Service reports fuelwood in cords/acre for woodland areas, and the U.S. Geologic Survey reports productivity class in cubic meters/hectare/per year. For this assessment, the following rating system is used:

- Good – Eight cords per acre or greater for National Forest lands, productivity class of one or greater for National Park Service lands, and site index of 45 or greater for Department of Defense lands.
- Moderate - Four cords to eight cords per acre for National Forest lands, productivity class of 0.5 for National Park Service lands, and site index between 0 and 45 for Department of Defense lands.
- Poor – Only rated on National Park Service Lands for productivity class of 0.25.
- None – No entry in the soil survey for woodland potential

Range Potential

All of the soil surveys reported a range potential in pounds per acre per year produced. These were grouped into four categories:

A. 200 – 500 pounds per acre per year

B. 500 – 1,000 pounds per acre per year

C. 1,000 – 2,000 pounds per acre per year

D. 2,000+ pounds per acre per year.

Riparian Areas and Stream Channels

The analysis of existing streams is based primarily on information gathered at established riparian area monitoring points. These points were assessed using the Riparian Area Survey and Evaluation System (RASES) data collection technique (USDA Forest Service 1989). Vegetation data and basic stream morphology data were collected at each of the monitoring points. Not all mapped reaches or delineations were field validated.

Riparian vegetation has been found in channels within, and downstream of the project area. Riparian vegetation and stream channel data for the project area within this analysis are from on-the-ground observations, aerial photo interpretation, corporate GIS database layers, and the from the management plans of the cooperating agencies. Riparian areas were valued based on forest plan standards because they were the most comprehensive. Each riparian area was compared to the following standards to determine a value of degradation:

- Vegetation standards: 3 riparian species present, each with 3 age classes; 60 percent or more of the woody stems are in riparian tree species; and riparian tree reproduction is present
- 80 percent of natural bank protection is present
- 60 percent of natural shade is present

Vigor must be rated “good” or “excellent” Numerous canyons or washes dissect the analysis area. Few of these streams have perennial surface water flow, even for short reaches. However, below the surface of the dry reaches, the water table may be shallow in spots or have subsurface flow. This subflow may be close enough to the surface to sustain riparian type vegetation.

There are over 100 named channels within the FireScape boundary. Twenty-six of these, occupying 95 miles (about 2,300 acres), have been identified as true riparian areas by either the Forest Service or the Arizona Game and Fish Department. Of these, 70 miles (about 1,700 acres) have riparian vegetation that meets the desired conditions set forth under current LRMP standards and guidelines.

Wild and Scenic Rivers

None of the streams within the project area on National Forest Lands are designated as Wild and Scenic Rivers or eligible for designation (USDA Forest Service 1993, U.S. Department of Defense 2001, USDI National Park Service 2004).

Water Quantity and Quality

The way that land is used may impact the water quality in a watershed. Uses on public lands are primarily cattle grazing, recreation, woodcutting, historic logging and mining, and wildlife habitat. Surface water quality and water quantity peak flow are affected by hydrologic function, which is the ability of soil to capture, hold, and release water. Hydrologic function is strongly influenced by soil condition. However, the effect of soil condition on water quality and quantity is generally based on a landscape scale, and usually not related to individual GES map units. For this reason, water quality and quantity are addressed at the landscape level in this assessment.

If soil conditions degrade, then the water quality of the watershed can degrade due to a compromised hydrologic function. Runoff is usually increased and the time that water sits on the land (water residence time) decreases. This decrease limits the ability of the soil to absorb and transmit water, resulting in a reduction of the capability to filter soluble solids and sediments, thereby impacting water quality.

Similarly, as soil conditions degrade, water quantity, in the form of runoff (water yield), increases due to a compromised hydrologic function. The result is generally an increase in peak flow discharges. In the Environmental Consequences section below, the analysis of increased water quantity will not be focused around water yield, but rather be attributed to increases of water quantity in the aquifer, subflow and soil. Therefore, an increase in water quantity will be a positive attribute, rather than a negative one.

The project analysis area is located within eleven USGS defined fifth-code watersheds (Table 11 and Figure 4). The entire project area is at the top of the watersheds. The fifth-code watersheds are large, totaling 1,656,683 acres, and the project area makes up about 23 percent of the total acres of these watersheds (Table 11).

Water quality is assessed by comparing existing conditions with desired conditions that are set by the States under the authority of the Clean Water Act. The Arizona Department of Environmental Quality (ADEQ) is the regulating authority for water quality in Arizona. The general classifications used for surface water quality by ADEQ are “attaining” and “impaired” for all uses specified, “inconclusive”, and “not assessed’. Presently, water quality has been assessed within or near the project area in 12 streams and 1 lake.

Table 11. Fifth-code watersheds and percentages that reside in the Huachuca FireScape project area

Fifth Code Watershed Number (HUC5)	HUC5 Name	Percent of Project Area	Acres in Huachuca FireScape Project Area	Percent of Entire Watershed in Project Area	Total Watershed Acres
1505020201	Las Nutrias Headwaters	7%	26,506	96%	27,701
1505020203	Montezuma Canyon-Upper San Pedro River	3%	9,995	27%	37,140
1505020204	Banning Creek-Upper San Pedro River	7%	25,623	16%	157,083
1505020205	Babocomari River	23%	88,619	44%	200,109
1505020206	Walnut Gulch-Upper San Pedro River	6%	23,941	15%	156,956
1505020207	Clifford Wash-Upper San Pedro River	5%	17,476	7%	257,494
1505020209	Ash Creek-Upper San Pedro River	2%	6,704	4%	175,154
1505030101	San Rafael Valley-Upper Santa Cruz River	20%	76,002	67%	113,770
1505030102	Sonoita Creek	15%	56,198	34%	166,049
1505030103	Potrero Creek-Upper Santa Cruz River	7%	28,137	28%	100,346
1505030201	Cienega Creek	6%	21,272	8%	264,880
	Total of all Watersheds		380,472	23%	1,656,683

According to 2006 ADEQ online data, (ADEQ 2006), the Santa Cruz River headwaters, Cienega Creek, Babocomari Creek, San Pedro River downstream from Charleston, and Redrock Creek were found to fully support all uses. Parker Canyon and Miller Canyon are classified as inconclusive because there have not been enough samples analyzed during the assessment period, or there are missing parameters. San Pedro River upstream from Charleston and Ramsey Canyon are classified as attaining some uses, and inconclusive for others. Alum Gulch, Cox Gulch, Harshaw Creek, Humboldt Canyon, and Three R Canyon all have been assessed and found to have exceedances in zinc, cadmium, and copper; and very low pH. All of these have had a total maximum daily load (TMDL) analysis completed and remediation work conducted at the sites of the abandoned mines found. Parker Canyon Lake is classified as impaired because of the fish advisory for mercury. A fullest of these streams, rivers, and water sources are located in the project file.

3.4.4 Environmental Consequences

3.4.4.1 Criteria Used for Analysis

The following management indicators will be used in this analysis:

- Potential for increased soil erosion
- Potential for increased runoff
- Potential for changes in woodland and range productivity
- Potential for damage to riparian vegetation/stream channels
- Potential for decreased water quantity/quality

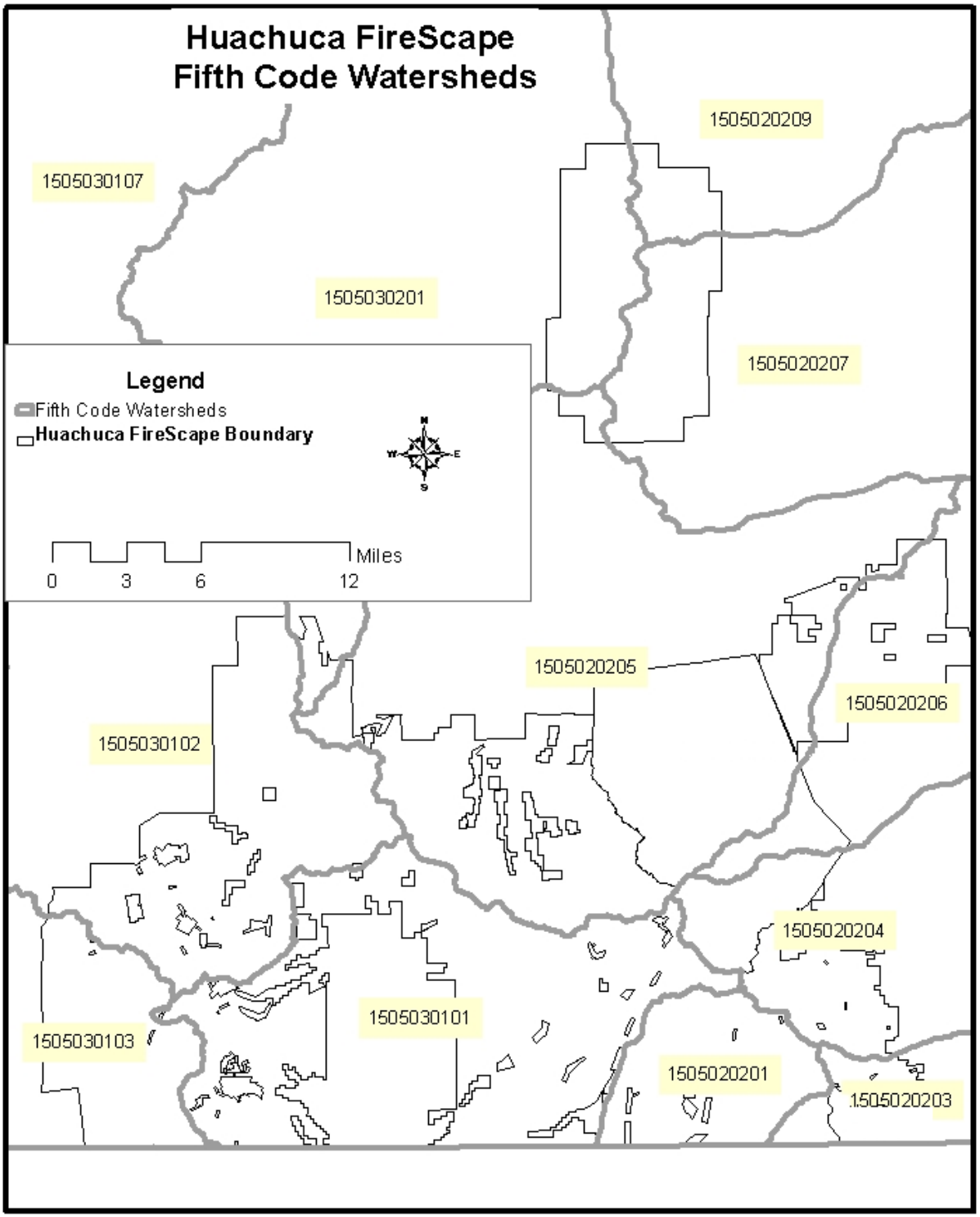


Figure 4. Fifth-code watersheds within the FireScape project area and vicinity

3.4.4.2 Alternative 1 – No Action

Direct Effects

If no action is taken, each agency would continue its management of fuel loading and fire independently of the others, rather than implement a collaborative management approach. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency's jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed. Because none of the proposed activities would occur with this alternative, there would be no direct effects to soils, riparian areas, stream channels, water quality or water quantity. Future fuels activities may occur that are not specified at this time and are categorized in the cumulative effects section.

Indirect Effects

Without proposed activities, the probability of major catastrophic fires occurring across the Huachuca FireScape area would continue to increase. If a large fire occurred, there would likely be indirect effects to soils, stream areas, and water quality and quantity.

Soils

While fire is happening, soil is heated, changing some characteristics. Catastrophic fires have detrimental effects on soil. Most organisms living in the soil die when soil temperature is raised to near 100 °C, at least temporarily reducing nutrient availability, and consequently, woodland and range production. Water repellency (hydrophobicity) is increased if soil containing organic matter or covered with organic matter is heated between 176 and 204 °C. This occurs as organic substances are vaporized, and then condensed, as they leach downward into cooler layers of mineral soil, generally within 5 cm of the surface. The result is at least temporary changes in the hydrologic soil group. Soil Erosion increases when organic matter protecting it is burned off, hydrophobicity increases, and structure changes. Soils with moderate or severe erosion hazard would lose productivity (DeBano et al. 1998).

Riparian Areas and Stream Channels

During large, hot fires, riparian vegetation is sometimes burned, often killing at least the tops of mature trees, moving the desired age distribution and shade characteristics away from Plan standards. As erosion in a watershed increases, bank protection is buried or removed due to scour, moving that characteristic away from Plan standards.

Catastrophic fire can cause flooding at a more frequent rate and larger volume than the conditions under which the current vegetation developed. Flood frequency and volume is affected by upland watershed conditions, which are currently good within the project area, but could be altered by catastrophic fire. Another effect that can occur is sedimentation of a channel following accelerated erosion in the uplands. Several recent wildfires and prescribed burns have been monitored for effects on channels in Bear Canyon and Scotia Canyon. See Table 12 below for examples of effects that can be expected from low to moderate severity fires.

Water Quantity and Quality

The effects of severe burning in the watershed can release nutrients and cause accelerated erosion. As erosion in watershed increases, water quality can be impaired. Severe burning can also increase peak flows for a period of three to five years. Total water yield is not expected to change in the ecological units found over most of this project.

Table 12. Monitoring results from two prescribed fires and one wildfire on effects to riparian areas and stream channels

Activity	Percent of Bear Canyon Watershed Burned at moderate or low severity	Percent of Scotia Canyon Watershed Burned at moderate and low severity	Observations
Lone Mountain Prescribed Burn 2005	40%	59%	No accelerated erosion in the channel, no accelerated sedimentation in the channel. Streamside management zone protected the channel.
Merrittt Wildfire	0%	31%	No accelerated erosion in the channel, no accelerated sedimentation in the channel. Some channel bank vegetation burned, some ash deposited.
Merrittt Prescribed Burn	0%	58%	No accelerated erosion in the channel, no accelerated sedimentation in the channel. Some channel bank vegetation burned, some ash deposited.

Cumulative Effects

Soil erosion, wood and forage production, riparian areas, stream channels, and water quality/quantity trends would continue to develop at current rates. Current management plans and project analyses, including range allotment management plans, wildlife habitat improvement projects, and fuels management projects in place document potential effects of past, present and reasonably foreseeable future projects to these resources. A review of these (Appendix, part E) found no significant effects were determined. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents beneficial effects on soil resources as fire is allowed to play a natural role. For Fort Huachuca, including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there would be beneficial effects to soil resources. None of these actions in themselves or in combination with effects of the no action alternative discussed above are considered to have a significant effect to soil erosion, wood and forage production, riparian areas, stream channels, or water quality/quantity.

3.4.4.3 Alternative 2 – Proposed Action

The effects to soils, riparian resources, and water resources would be limited by use of the design criteria and best management practices as listed in the Appendix, part C. The sections below describe how implementing the proposed action using the design criteria would affect erosion, water infiltration, woodland and range productivity, riparian vegetation, bank stability, vigor, water quantity, and water quality.

Direct and Indirect Effects

Soils

The approximate area proposed for treatment in each hazard level, expressed in acres and as a percentage is presented in Table 13.

No Treatment Area

At least 12 percent of the project area is proposed to receive no treatments as a result of this decision. Effects in these areas would be similar to those described in the No Action section above although the

risk of severe wildfire and its associated effects would be expected to diminish as fuels-related projects are implemented and break up the continuity of fuels in the surrounding landscape.

Thin by Hand/Handpile and Burn/Prescribed Burn

For 23 percent of the project area proposed for treatment by these practices, there would be no significant effects to erosion or site productivity, as best management practices such as 31.12, (2) d, e, and f (Appendix, part C), and design criteria such as SW 3 would be implemented to minimize impacts to soil. This would include limiting where off-road travel would be allowed, and ensuring that piles would be constructed to avoid intense fire, and burning would be done with a prescription that avoids intense fire in those areas with severe erosion hazard, or hydrologic units B and C. Thinning would be done according to design criteria (VF 3 and VF 4), insuring that woodlands and rangelands are left in a productive state.

Table 13. Acres and percent of erosion hazard by treatment (excluding wilderness areas)

Proposed Treatment	Moderate	Severe	Slight	Grand Total
No Treatment on Areas That Are Available for Treatment	27,453 (7%)	9,655 (2%)	16,444 (4%)	53,552 (13%)
Thin By Hand/Handpile And Burn/Prescribed Burn	73,714 (18%)	14,186 (3%)	6,493 (2%)	94,392 (23%)
Thin By Hand/Masticate/Handpile And Burn/Chip Or Remove/Prescribed Burn	125,329 (31%)	27,568 (7%)	107,720 (26%)	260,617 (64%)
Grand Total	226,495	51,409	130,658	408,562

Table 14. Acres and percent of woodland productivity potential areas by proposed treatment (excluding wilderness areas)

TREATMENT	Good	Moderate	None	Poor	Grand Total
No Treatment on Areas That Are Available for Treatment	11,665 (3%)	21,934 (5%)	19,890 (5%)	0 (0%)	53,489 (13%)
Thin By Hand/Handpile and Burn/Prescribed Burn	25,623 (6%)	62,093 (15%)	6,676 (2%)	0 (0%)	94,392 (23%)
Thin By Hand/ Masticate/Handpile and Burn/ Chip or Remove/Prescribed Burn	120,634 (30%)	44,495 (11%)	95,185 (23%)	303 (<1%)	260,617 (64%)
Total	157,922	128,576	121,761	303	408,562

Thin by Hand/Masticate/Handpile and Burn/Chip or Remove/Prescribed Burn

For the more than 64 percent of the project area proposed for treatment by these practices, there would be no significant effects to erosion, as best management practices such as 24.21 and 24.23 (Appendix, part C), and design criteria such as A 2 and RAW 9 would be implemented, restricting off road vehicle activity. Design criteria VF 3 and VF 4 would insure that prescribed burning and thinning would be conducted such that woodlands and rangelands are left in a productive state.

Riparian Areas and Stream Channels

No Treatment Area

Effects in these areas would be similar to those described in the No Action section above.

Thin by Hand/Handpile and Burn/Prescribed Burn

In areas proposed for treatment by these practices, there would be no significant effects to riparian vegetation, bank stability, or vigor as best management practices such as 24.16, 24.18, 24.27, and 31.12 (Appendix, part C), and design criteria such as A 2, RAW 7, and RAW 9, would be implemented to minimize effects to riparian resources. This would include limiting where off road travel would be allowed, and utilizing designated channel crossings to ensure that damage to cross-sections is insignificant. Design criteria RAW 1 and RAW 6 would insure that piles would be constructed outside riparian and streamside areas, and burning would be done with a prescription that avoids intense fire. Thinning would be done in a manner to insure that riparian areas are left with the desired vegetation characteristics meeting or moving toward Plan standards (RAW 3).

Thin by Hand/Masticate/Handpile and Burn/Chip or Remove/Prescribed Burn

In areas proposed for these treatments, there would be no significant effects to riparian areas, as best management practices and design criteria described above would be implemented. Burning would be done with a prescription that avoids intense fire, allowing hydrologic soil groups to remain unchanged.

Water Quantity and Quality

No Treatment Area

At least 12 percent of the project area is proposed to receive no treatments as a result of this decision. In these locations, there would be continued threat of large fire. The probability of major catastrophic fires occurring across the Huachuca FireScape area would continue to increase. The effects severe burning in the watershed can release nutrients and cause accelerated erosion. As erosion in watershed increases, water quality can be impaired. Severe burning can also increase peak flows for a period of three to five years. Total water yield is not expected to change in the ecological units found over most of this project.

Thin by Hand/Handpile and Burn/Prescribed Burn

In areas proposed for treatment by these practices, there would be no significant effects to water quantity and quality as best management practices (24.26, 24.23, 24.26, 24.27, 24.28, 24.3, 31.11, and 31.12 see attached Appendix, part C) and design criteria such as A 1, VF 4, SW 1, SW 2, SW 3, RAW 8, RAW 11, and RAW 12 would be implemented to protect water resources. There would be no indirect effects to water quantity or quality as best management practices (24.26, 24.23, 24.26, 24.27, 24.28, 24.3, 31.11, and 31.12 see attached Appendix, part C) and design criteria (A-1, VF-4, SW-1, SW-2, SW-3, RAW-8, RAW-11, and RAW-12 in Appendix, part C) would be implemented to determine where off road travel would be allowed, piles would be constructed to avoid intense fire, and burning would be done with a prescription that avoids intense fire. Thinning in the vegetation types within this project would not cause increases in total water yield.

Thin by Hand/Masticate/Handpile and Burn/Chip or Remove/Prescribed Burn

In areas proposed for treatment by these practices, there would be no significant effects to water quantity or quality as best management practices (24.16, 24.17, 24.18, 24.2, 24.21, 24.23, 24.24, 24.25, 24.26, 24.27, 24.28, 24.3, 31.11, and 31.12 (Appendix, part C), and the design criteria in the

Appendix, part C would be implemented. Thinning and mastication in the vegetation types within this project would not cause increases in total water yield. No change in hydrologic function at a watershed scale is expected from implementing the proposed action, though changes in hydrologic function are expected on some localized map units. There would be no indirect effects to water quantity or quality as best management practices (24.16, 24.17, 24.18, 24.2, 24.21, 24.23, 24.24, 24.25, 24.26, 24.27, 24.28, 24.3, 31.11, and 31.12 see attached Appendix, part C) and design criteria (A-1, A-2, A-3, VF-4, SW-1, SW-2, SW-3, RAW-8, RAW -11, and RAW-12 in Appendix, part C) would be implemented to determine where off road travel and mastication would be allowed, piles would be constructed to avoid intense fire, travelways would be designated for removal of products, and burning would be done with a prescription that avoids intense. Thinning and mastication in the vegetation types within this project would not cause increases in total water yield.

Cumulative Effects

Soils

No Treatment Area

In areas where no treatments are proposed, soil erosion, and wood and forage production would continue at current rates. Implementation of the proposed action is not expected to have measurable direct effects in these treatment areas and therefore no cumulative effects are anticipated.

Thin by Hand/Handpile and Burn/Prescribed Burn

Soil erosion would continue at current rates. Wood and forage production would continue at current rates. A review of past, present, and reasonable foreseeable actions do not indicate significant effects, and when these effects and those identified in this analysis are considered, baseline levels of erosion and productivity are expected to be within natural variability thresholds and therefore would not represent a significant cumulative effect.

Thin by Hand/Masticate/Handpile and Burn/Chip or/Prescribed Burn

Soil erosion would continue at current rates. Wood and forage production would continue at current rates. A review of past, present, and reasonable foreseeable actions do not indicate significant effects, and when these effects and those identified in this analysis are considered, baseline levels of erosion and productivity are expected to be within natural variability thresholds and therefore would not represent a significant cumulative effect.

Summary of Cumulative Effects of Proposed Action on Soil

Existing analysis and management plans including range allotment management plans, wildlife habitat improvement projects, and fuels management projects (see Appendix, part E) document potential effects of past, present and reasonably foreseeable future projects to soil. A review of these actions did not indicate significant effects. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents beneficial effects on soil resources as fire is allowed to play a natural role. For Fort Huachuca including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there will be beneficial effects to soil resources. None of these actions in themselves or in combination with effects of the proposed action alternative discussed above are considered to have a significant effect to soil erosion or wood and forage production.

Riparian Areas and Stream Channels

All Proposed Actions

Existing analysis and management plans including range allotment management plans, wildlife habitat improvement projects, and fuels management projects (see Appendix, part E) document potential effects of past, present and reasonably foreseeable future projects to soil. A review of these actions did not indicate significant effects. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents beneficial effects on riparian resources as fire is allowed to play a natural role. For Fort Huachuca including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there would be beneficial effects to resources.

Summary of Cumulative Effects of Proposed Action on Riparian Areas and Stream Channels

A review of past, present, and reasonable foreseeable actions do not indicate significant effects and when these effects and those identified in this analysis are considered in the context of this project, minor beneficial cumulative effects to riparian or stream channels may occur because of the lowered risk of severe wildfire on the landscape.

Water Quantity and Quality

No Treatment Area

Implementation of the proposed action is not expected to have measurable direct effects in these treatment areas and therefore no cumulative effects are anticipated. In watersheds that currently do not support water quality standards, “no treatment” plus future foreseeable projects, as defined in the specialist report (Lefevre 2008), would not add to the pollutants that are causing the impairment. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents beneficial effects on water resources as fire is allowed to play a natural role. For Fort Huachuca including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there would be beneficial effects to resources.

All Other Proposed Actions

Existing analysis and management plans including range allotment management plans, wildlife habitat improvement projects, and fuels management projects (see Appendix, part E) document potential effects of past, present and reasonably foreseeable future projects to water and water quality. A review of these actions did not indicate significant effects. In watersheds that currently do not support water quality standards, this alternative, plus future foreseeable projects not add to the pollutants that are causing the impairment. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents beneficial effects water resources as fire is allowed to play a natural role. For Fort Huachuca including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there would be beneficial effects to resources.

Consistency with Regulatory Direction and Guidance

This alternative moves the project analysis area towards the desired condition, addresses the purpose and need, and responds to the Forest Service, Department of Defense, and National Park Service land management plans and directives; and the Clean Water Act (PL 92-500 as amended) and the Clean Air Act (84-159 as amended).

The effects of this alternative follow the guidance outlined in Federal land management policies and fall within the participating agencies, land management direction discussed above. If agency policies

are followed pertaining to prescribed burning and other activities identified above, there should be no adverse impacts to public health and safety under this alternative.

3.5 Air Quality

This section addresses issue number 4, which identified that smoke from proposed prescribed burning may have detrimental effects to air quality.

3.5.1 Regulatory Direction

Air quality standards are defined by the agency management plans and are tiered to the Clean Air Act (CAA). For example, the Coronado National Memorial Fire Management Plan (p. 31) includes: "...the fire program will be in compliance with the Clean Air Act, as regulated by ADEQ. The objectives for smoke management and compliance with the Clean Air Act are similar to those for fire management: to encourage a natural process so long as it does not endanger public health and safety. The memorial will apply Best Management Practices when possible, and ignition will not occur if all prescriptions are not met. Smoke characteristics will be evaluated regularly by the memorial at the time of ignition. All ADEQ regulations will be followed. The park natural resource staff will work with the HAFP to identify vistas and smoke-sensitive areas (roads, developments, caves, mines) for which smoke management objectives will be created and to conduct outreach to visitors, neighbors, and employees to notify them when prescribed fires are planned. Notification and warning about smoke will be relayed to the public via signs, phone calls, media, and personal contact. Outreach activities will also provide information for public education on the values of both clean air and the natural process of fire and on the goal of the NPS to protect air resources while allowing the natural process of fire to the fullest extent possible."

The primary purpose of the Clean Air Act (CAA) is to protect humans against negative health or welfare effects from air pollution. The CAA defined National Ambient Air Quality Standards (NAAQS) as the amount of pollutant above which detrimental effects to public health or welfare may result. An area that is found to be in violation of a primary NAAQS is labeled a nonattainment area; an area once in nonattainment but recently meeting NAAQS, and with appropriate planning documents approved by EPA, is a maintenance area; all other areas are attainment areas or unclassified.

The CAA also requires the Prevention of Significant Deterioration (PSD). The goal of PSD is to prevent areas that are currently cleaner than is allowed by the NAAQS from being polluted up to the maximum level established by the NAAQS. From this, three air quality classes were established: Class I, Class II, and Class III. Class I areas are subject to the tightest restrictions on how much additional pollution can be added to the air. These areas include Wilderness Areas and National Memorial Parks over 5,000 acres, National Parks over 6,000 acres, and International Parks in existence as of August 7, 1977. No areas have been designated Class III. Therefore, all areas that are not designated Class I are Class II. The entire project area is in Class II.

In 1999, the U. S. Environmental Protection Agency (EPA) promulgated the Regional Haze Rule. The regional haze regulations call for States to establish goals for improving visibility in Class I areas to develop long-term strategies for reducing emissions of air pollutants that cause visibility impairment. Fire is one of the sources of regional haze covered by the new rules. Visibility rules require States to make "reasonable progress" toward the Clean Air Act goal of "prevention of any future, and the remedying of any existing, impairment of visibility". The regional haze regulations did not define visibility targets but instead gave States flexibility in determining reasonable progress

goals for Class I areas. States are required to conduct analyses to ensure that they consider the possibility of setting an ambitious reasonable progress goal, one that is aimed at reaching natural background conditions in 60 years. The rule requires States to establish goals for each affected Class I area to: (1) improve visibility on the haziest 20 percent of the days, and (2) ensure no degradation occurs on the clearest 20 percent of days over the period of each implementation plan.

Regional Air Quality Management Policies and Direction

The State of Arizona is a member of the Western Regional Air Partnership. Because regional haze is a multi-State issue, regional haze regulations encourage all stakeholders to work together and participate in regional cooperation and coordination efforts to eliminate barriers and boundaries to developing planning guidelines that address regional haze issues. The 2003 Arizona Regional Haze SIP represents the completion of work that began with the formation of the Grand Canyon Visibility Transport Commission (GCVTC) in 1991.

Agency Standards and Guidelines

The following agency standards and guidelines provide direction for each Federal agency regarding air quality.

The Coronado National Forest LRMP establishes the following standards and guidelines for air quality:

- Cooperate with Federal, State and local regulatory agencies to protect air quality as required by the Clean Air Act (LRMP 1986, p. 11)
- All management practices will be planned so that air quality will meet local, State and Federal standards (LRMP 1986, p. 45)

The Coronado National Memorial Natural and Cultural Resources Management Plan (USDI National Park Service 1998) calls for a coordinated interagency air quality-monitoring program. (p. 24). The Fire Management Plan contains comprehensive measures for minimizing impacts from smoke (USDI National Park Service 2005, page 31)."

The Fort Huachuca Integrated Wildland Fire Management Plan (U.S. Department of Defense 2006, p. 53) states "mitigation of smoke related impacts caused by prescribed fires will be addressed in the Prescribed Burn Plan format for Fort Huachuca and monitored in accordance with ADEQ regulations."

3.5.2 Affected Environment

The largest sources of air pollution in the Huachuca FireScape planning area are smoke from wildland and prescribed fires, and dust from unpaved roads. Under current State and Federal rules, wildland fires are considered natural events, so the smoke they produce is not considered a violation of air quality standards or visibility protection goals. Conversely, prescribed fires are considered active management so the smoke produced is considered as an impact on air quality and visibility standards.

The project area is in a Class II airshed. The Galiuro Wilderness and Chiricahua Wilderness, as well as the Chiricahua National Monument and Saguaro National Park are all Class I areas within 100 kilometers of the project area. There is one nonattainment area adjacent to the project area (the Nogales Particulate Matter (PM)-10 Nonattainment Area). There is a maintenance plan approved. Currently, the air quality in the project area is within agency standards and guidelines.

3.5.3 Environmental Consequences

3.5.3.1 Criteria Used for Analysis

Measurement indicators for analysis will consist of qualitative discussions on:

- The duration of smoke and particulate matter emissions
- Compliance with air quality regulations

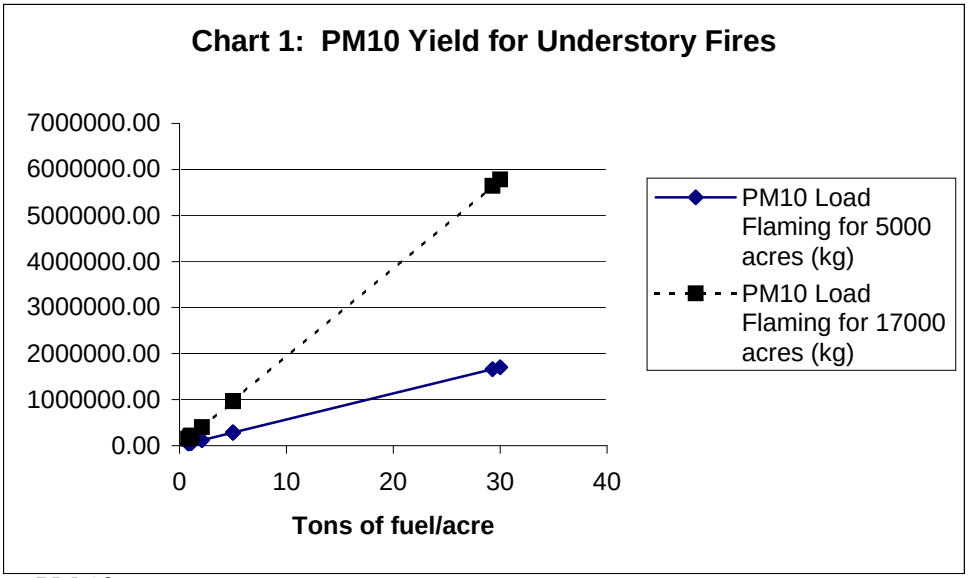
Smoke and Particulate Matter

Smoke is a very complex entity. Hundreds of compounds are produced during combustion, and the effects are seen as impaired visibility and felt as impaired health in many individuals. Of great concern is the suspension of particulate matter in the air. Particulate emissions vary greatly depending on fuel type and amount. The following charts (Figure 5) display how much variation there can be, and that reduced fuel levels in some types result in greatly reduced emissions.

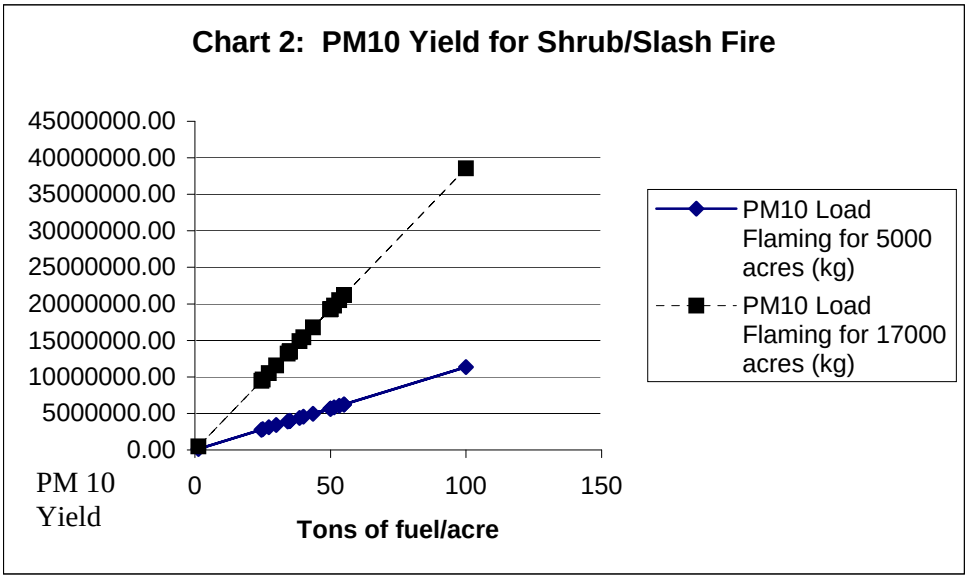
3.5.3.2 Alternative 1 – No Action

Direct and Indirect Effects

Because none of the proposed activities would occur with this alternative, there would be no direct effects to air quality. Individual agency land and resource management plans as well as fire management policy and procedures would continue to guide fire and fuel management of lands under each agency's jurisdiction. Potential impacts of future fuel and fire management projects would be evaluated on a case-by-case basis by each agency in accordance with its governing NEPA procedures as each project is proposed. Future fuels activities may occur that are not specified at this time and are categorized in the cumulative effects section. However, the probability of major catastrophic fires occurring across the Huachuca FireScape area may continue to increase. Indirect effects could occur if there were a large-scale wildfire. Severe burning would create large quantities of particulate matter (PM-10) impairing visibility and possibly causing health hazards. Emissions from wildfire may also occur over a period of a few days to several weeks as opposed to intermittent days over several years for a prescribed fire project.



PM 10 Yield



PM 10 Yield

Figure 5. Levels of particulate matter (PM10) generated by fires of 5,000 and 17,000 acres. Chart 1 shows levels of PM10 for understory fires and Chart 2 shows levels for shrub and slash fires.

Smoke from the Oversight fire in 2002. Large-scale wildfires can often emit smoke and particulate matter for weeks and months.

Cumulative Effects

Past, present and reasonable foreseeable activities and their effects on air quality are difficult to address in terms of cumulative effects. It is assumed past activities would have had some effect on the air quality of the area; however, those effects are gone and cannot be viewed cumulatively. If a wildfire occurred, there is a potential for the NAAQS to be exceeded depending on the size and duration of the wildfire. If a large wildfire were to occur, the Forest Service and the ADEQ would probably restrict all regulated burning. However, effects of smoke from a large wildfire could become cumulative with present and foreseeable activities or combined with unregulated pollutants in the area, such as dust from roads. Air quality effects of these large fires have not been documented in the planning area.

There are existing plans and analyses, including range allotment management plans, wildlife habitat improvement projects, and fuels management projects that document potential effects of past, present and reasonably foreseeable future projects to air quality. None was found to be significant. For the Miller Peak Wilderness, a wildland fire use plan is in place that documents effects to air quality as fire is allowed to play a natural role. For Fort Huachuca including the impact zone in the eastern portion, the Integrated Natural Resource Management Plan documents that there would be beneficial effects to air quality. None of these actions in themselves, or in combination with effects of the no action alternative discussed above are considered to have a significant effect to air quality.

3.5.3.3 Alternative 2 – Proposed Action

The effects to air resources would be limited by use of the design criteria and best management practices. The sections below describe how implementing the proposed action using the design criteria would affect air quality.

Direct and Indirect Effects

For the more than 270,000 acres (86 percent of the project area) proposed for potential treatment, there would be no significant effects to air quality, as best management practices (FSM 2580, R-3 Supplement 2500-2005-1, Chapter 2580.43-2 - Forest Supervisors Responsibility) and design criteria AQ-1 would be implemented to insure that:

- necessary air emission permits are obtained,
- prescribed burning is conducted in compliance with Federal, State, and local air regulatory statutes and guidelines, and
- prescribed burning activities are controlled to minimize visibility reduction and adverse smoke effects on Class I areas, public facilities, private lands, and other smoke-sensitive areas.

Prescribed burning to reduce fuels and maintain more natural ecological conditions can affect the air quality at the time of the burning; however, it should be noted that the proposed prescribed burning in areas to be treated would not all be conducted at once, and the effects of proposed activities are expected to be minimal, and of short duration. Prescribed burning would be conducted when weather conditions are predicted to produce good-to-excellent smoke dispersal. Pertinent smoke impact mitigation measures would be applied, as outlined in this document. As previously stated, the effect on air quality is expected to be short-term because once the smoke has dispersed, the emissions are diluted and transported from local airsheds. Careful application of mitigation as noted in the document should ensure compliance with NAAQS. Permits are issued by AQED only if conditions are favorable for burning.

Management activities proposed under this alternative would likely cause direct short-term impacts from dust. Specifically, these activities involve chipping, chewing and grinding of live and dead vegetation, loading and processing activities, and truck transportation of material. These activities are not anticipated to result in significant impacts to regional air quality because of the transitory nature of fugitive dust.

Although difficult to measure, an indirect beneficial effect from proposed treatments is a reduction in the emissions that would be released from wildfires in the area (Ottmar 2001, p. 159). If a high-intensity crown fire were to occur, the amount of live fuel that could burn would tend to release high amounts of particulate matter. By removing the small diameter surface fuels with controlled prescribed fire, the potential of a high intensity catastrophic fire developing within the stands would be reduced significantly.

Cumulative Effects

Proposed management activities under this alternative combined with past, present, and foreseeable activities would contribute to the emissions that effect air quality. These alternatives and their impacts on air quality are difficult to address in terms of cumulative effects. Large fires have occurred in and near the project over the past century; however, those effects on air quality are gone and cannot be viewed cumulatively. If a wildfire occurred, there is a potential for the NAAQS to be exceeded, depending on the size and duration of wildfire. Air quality effects of these large fires have not been documented in the planning area.

It is acknowledged that multiple prescribed burn activities, occurring at the same time, could cumulatively increase particulate levels. Generally, the effects of one burn activity have dissipated before another burn activity begins. Impacts to air quality would generally be confined to no more

than a few hours, or at most a few days. The cumulative effect of prescribed fire on air quality is rather short-lived, because once the burn is over and the smoke has dissipated, the effect is over.

The effects of the proposed action from smoke are not likely to have cumulative effects with other activities in the airshed given the oversight by the ADEQ that allows for good smoke dispersion. Daily regulation of amount of burning is managed to reduce impacts and negative effects of smoke. The number of days to accomplish prescribed burning in this project would compete with other burning in the airshed on any given day. The individual agencies would be responsible for establishing burn priorities on their lands and the ADEQ would be responsible for managing all the burning on a given day. In addition, the agencies would coordinate their prescribed burning activities with each other. If air quality is exceeding thresholds when proposed activities are scheduled to occur, implementing either one of these alternatives may result in some delays in burning as a result of this increased demand for “air space.

3.6 Cultural and Heritage Resources

This section addresses issue number 5, which identified tribal concerns that proposed activities could affect gathering of traditional plants. In addition, this section discloses compliance with State and Federal requirements for protecting archaeological and heritage resources in the project area.

3.6.1 Regulatory Framework

This analysis is in conformance with regulations of the National Historic Preservation Act (NHPA), 1966, as amended (P.L. 89-665, 80 Stat.915); the National Environmental Policy Act (1969), Archaeological Resources Protection Act of 1979 (ARPA), Native American Grave Protection and Repatriation Act (1990: P.L. 101-601), and American Indian Religious Freedom Act (1978: P.L. 95-341). Forest Service Manual 2360.5 provides agency direction for heritage program management.

Heritage Resource design criteria for the Huachuca FireScape Project follow the guidelines given in the “Programmatic Agreement”, formally known as the *First Amended Programmatic Agreement Among USDA Forest Service, Southwestern Region and Arizona State Historic Preservation Officer and New Mexico State Historic Preservation Officer and Advisory Council on Historic Preservation Regarding Wildland Urban Interface and Other Large-Scale Hazardous Fuels Reduction Projects* (2004). More general protocols directing the consultation procedures of the Forest Service in the Southwest Region are given in the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities Among New Mexico Historic Preservation Officer and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer and Oklahoma State Historic Preservation Officer and the Advisory Council on Historic Preservation and United States Department of Agriculture Forest Service Region 3 (2003).*

Although written for, and primarily applicable to, National Forest System lands, these stipulations will be considered for Coronado National Memorial and Fort Huachuca as well. Plans specific to the Coronado National Memorial are found in the *Coronado National Memorial General Management Plan* (2004), the *Coronado National Memorial Fire Management Plan* (2005) and the *Coronado National Memorial Natural and Cultural Resources Management Plan* (1998). Plans or protection measures developed in the future for either agency would apply. The design criteria also incorporate elements from the National Environmental Protection Act, and information provided by Ft. Huachuca heritage resource personnel. All proposed treatments would be reviewed by the appropriate land management agency heritage resource personnel. NHPA and its implementing regulations require Federal agencies to consider the effects of their undertakings on historic properties. Protection of

Historic and Cultural Properties, 36 CFR 800, outlines the set of procedures established by the NHPA that Federal agencies follow before implementing an action that may affect historic properties and traditional cultural properties. The term Historic Properties refers to cultural properties that have been listed or determined as eligible for the National Register of Historic Places (NRHP).

As the lead agency for this project, Tribal consultation, as directed by 36 CFR 800 and the Programmatic Agreement, was conducted by the Coronado National Forest. During scoping for the project, letters were sent by Forest Supervisor Jeanine Derby to the tribes the Forest regularly consults with. Written responses were received from the Hopi Tribe, Ak-Chin Indian Community, and Fort McDowell Yavapai Nation. The topic of FireScape planning and collecting by local tribal members was subsequently discussed informally in meetings and field trips with members of the Four Southern Tribes (Ak-Chin, Tohono O'odham, Gila River, and Salt River Pima-Maricopa) cultural working group on several occasions from 2006 to 2008.

3.6.2 Affected Environment

Existing Condition

Overviews of the cultural history of southern Arizona are given by Bronitsky and Merrittt (1986) and Whittlesey et al. (1994). The best information on post-contact history and land use is given by Hadley and Sheridan (1995) who prepared a Land Use History of the San Raphael Valley, Arizona, a study funded by the Forest Service Rocky Mountain Forest and Range Experiment Station. Bahre (1991) also gives a discussion of land-use history in the region (LeBlanc and Gillespie, 2004: San Rafael Valley Manzanita Project: Heritage Report 2004-05-067).

The Huachuca Mountains and nearby areas have been the scene of human occupation and use for over 10,000 years. Numerous archaeological and historic sites represent the physical record of this occupation. General overviews of the cultural history of southern Arizona are given by Bronitsky and Merrittt (1986) and Whittlesey et al. (1994). Only limited archaeological research and excavation has been made within the project area. Discussions of local Native American archaeology and culture history are given by Altshul and Jones (1990), Altshul et al. (1993), Vanderpot (1994, 1997), MacWilliams (2001), and LeBlanc and Gillespie (2004). Post-European contact history and land use are discussed by Hadley and Sheridan (1995), who prepared a Land Use History of the San Rafael Valley, Arizona, for the Forest Service, and by Bahre (1977; 1991).

Native American sites are most often artifact scatters including materials from flaked stone tool manufacture, ground stone artifacts, and ceramics. Large habitation sites are relatively uncommon and largely restricted to the lower elevations. Other site types include rock shelters, material quarries for stone tools, features such as roasting pits, hearths, rock cairns, and storage pits, and rock art on bedrock outcrops and boulders. Of these site types, rock art sites are the one category that has been recognized as fire sensitive. Pre-contact sites with flammable materials appear to be rare in the Huachuca Mountains area, in part because the majority of sites have been exposed to repeated low and medium frequency wildland fires.

Site types from the Euro-American use of the mountains include structures and features associated with ranching, mining, and Forest Service administration. In contrast to the situation with the known pre-contact sites, the assemblage of historic sites includes a relatively higher proportion of sites at risk from fire. The primary reason for this is the common presence of flammable wooden building materials and fire-sensitive artifacts. In contrast to the assemblage of pre-contact sites, many of the historic sites have existed only in the era of aggressive fire suppression, and accordingly contain flammable materials that would be destroyed by exposure to wildland fires.

3.6.3 Environmental Consequences

3.6.3.1 Alternative 1 - No Action

Direct and Indirect Effects

The no action alternative would not cause any direct environmental consequences to heritage resources or traditional cultural properties, as no activities likely to affect such resources or their attributes would occur. Indirect effects may occur under the no action alternative as there are known sites in the area that could be affected by wildfire. Future fuels activities may occur that are not specified at this time and are categorized in the cumulative effects section

Cumulative Effects

Past wildfires have affected heritage resources by consuming prehistoric and historic structures, features and fabrics. Heritage resources within the identified project area have features and fabric that could be lost from the continued effects of high-intensity wildfire.

3.6.3.2 Alternative 2 - Proposed Action

Direct and Indirect Effects

The use of the design criteria would be applied to all sites within the project area. For mechanical treatments, the agency Heritage Resource Manager (HRM) shall approve the use of tracked equipment to remove brush or woody material from within specifically identified areas under prescribed measures designed to prevent or minimize effects. In addition, tribes interested in gathering traditional materials prior to site-specific activities, would be notified in advance. As such, no direct effects are anticipated to heritage resources or tribal cultural properties.

Indirect effects of fuel reduction activities could be considered beneficial, as impacts from wildfires that may affect heritage resources would be reduced. No other indirect effects (e.g. erosion) are likely to occur to known heritage resources as a result of this project. There is the potential that sites (unanticipated discoveries) do exist that are currently obscured by vegetative cover. Unanticipated discoveries are to be mitigated using the terms of the design criteria.

Cumulative Effects

In the past, historic properties have been lost to wildfires. Properties could be adversely affected by high-intensity wildfire and by fire suppression efforts. Under the proposed action alternative, fewer sites would be lost from wildfire and/or suppression activities due to the removal of hazardous fuels. Known sites would receive protection from project activities, either through avoidance or from thinning activities within historic property boundaries. Therefore, there would likely be small, beneficial cumulative effects from the proposed project on heritage resources.

3.7 Scenic Quality

This section addresses issue number 6, which identified that proposed non-fire and prescribed fire vegetative treatments may alter landscape features, thereby affecting the scenic quality. On lands administered by the Coronado National Forest, these values are managed by meeting standard visual quality objectives (VQO) as defined by the LRMP. Impacts to the scenery resource are measured by determining whether implementation of an alternative moves the land towards achieving the visual quality objectives set forth by the LRMP. These standards do not apply to lands administered by the Department of Defense or the National Park Service. However, given that a majority of the lands in the project are National Forest System, it is assumed that the analyzing the project by the VQO standards as defined by the LRMP will meet the needs of this analysis issue.

3.7.1 Affected Environment

The Coronado National Forest LRMP establishes standards and guidelines for scenery management. Applicable guidelines for this project are found in Management Areas (MAs) 1, 3, 3a, 4, 7a, and 7b. Applicable VQOs for the project area, as assigned by the LRMP, are Retention, Partial Retention, Modification, and Maximum Modification. Definitions of these VQOs can be found in the Scenery Resource Report (Bonnett, 2008), located in the Huachuca FireScape Project record. For the desired future condition the LRMP specifies that the “VQO will be met” for MAs 1, 3, 3a, 7 (Prescription A and B) and "Visual quality objectives will be met or exceeded" for MA 4.

Scenic resources found within the project boundary include views from Highways 82, 83, 90, and 92, and Forest Roads 48, 49, 58, 61, 799, and 827. The primary travel routes scenery resources include Scenic Byway 82 (from Sonoita south to Forest Road 61), the portions of Highways 82 and 90 that provide views into the Whetstones, Highway 83 that extends into and through the forest and highway 92 and 98. In addition, the portions of forest road 48, 49, 58, 61, 799, and 827 that exist on forest lands provide views into the project area. Figure 6 shows the current typical visual landscape character of the area.

Figure 6. Views into the project area with the Huachuca Mountains in the background

To determine if an existing landscape or if a potential project will meet the defined VQOs, scenic landscapes are evaluated by determining variety class and visual quality, which evaluate features such as slope, vegetation, water features, and rock outcroppings. Existing visual condition and quality are determined through field reconnaissance and inspection of available GIS data of disturbances that can still be seen in the land from the scenery resources identified in this report. Throughout much of the project area, there are no visible disturbances within the foreground and middleground of scenic resources. Since there are no visual disturbances, the variety class elements have not diminished since LRMP designation, and both the variety class and visual quality are progressing toward meeting the VQO; therefore, the area is progressing toward its desired future condition. Complete delineation of these features, definitions of the projects area’s variety classes, and details of the existing conditions is located in Scenery Resource Report (Bonnett 2008).

3.7.2 Environmental Consequences

An analysis was conducted to determine the effects that each proposed alternative in the Huachuca FireScape Project would have on scenery resources in the project area for all alternatives. The current condition compared to the condition upon implementation of an alternative helps determine if the VQO is being met. If the project area is moving towards the VQO or is meeting the VQO then the

project area is meeting or going towards meeting its desired future condition. Existing variety class determines how the class assigned through the Forest Planning process differs from its current state. Together, visual quality and variety class help determine if the VQO is being met. The VQO being met has a direct positive correlation in determining if the land is going towards its desired future condition as defined by the LRMP.

3.7.2.1 Alternative 1 - No Action

Direct and Indirect Effects

Barring catastrophic disturbances such as fire there would be no direct effects to the landscape with this alternative, and therefore the visual quality objectives for the project area would continue to be met. There would be no change to the landscape features of slope, vegetation, and rock of the variety class. It is expected that diverse vegetation types and some variation in age classes would continue to occur through natural processes, causing the area to progress towards meeting the variety class, thereby moving the project area toward the desired future condition.

In addition, in the short term, indirect effects of potential catastrophic fire would cause negative changes in the landscape vegetation and likely cause the area to not meet its current VQO. Vegetation, slope, and rockforms could be affected negatively. The recovery rate would be slow to restore the typical vegetation of the EU for the desired period depending on the severity of the fire. This would allow for potentially negative effects to the scenery to continue for an extended (up to 40 years) time and the project area would move at a very slow pace towards the scenery's desired future condition.

In the event of a catastrophic fire, areas that currently have trees would continue to have a burned appearance during both the short and long term, while areas that currently have shrubs as the dominant vegetation would continue to have a burned appearance only during the short term. The overall appearance of the forest would have uniform form and black color of the burned trees, along with blackened ground and blackened woody material on the forest floor. The overall appearance value would decrease from its present condition and would continue to stay this way into the long term (more than five years) until the majority of the burned trees fall to the ground. The brush would be covered by new growth and the burned brush would fall to the ground. However, in both types of areas over the next 1 to 5 years, new shrub growth would add a positive layer of vegetation on the ground that would begin to enhance the landscape. The shrub growth would provide a sharp contrast, enhancing the visual effect of the horizontal dominant component where there are dying trees and positive elements of line, form, color, and texture. In areas where there are trees, it would be expected that in 40 years or so, burnt trees will have fallen, decreasing the dominant line of burnt black trees added to the area. By then new trees should be well on their way to begin the diversification of vegetation and to some extent add different age classes throughout the area. This should add line, form, color, and texture to the area that is generally positive to the viewer.

Cumulative Effects

Based on the potential direct and indirect effects, the area being analyzed for cumulative effects is the project boundary because the potential effects of catastrophic fire have the potential to affect scenery resources on a landscape level.

Part E of the appendix contains past, present and reasonable foreseeable projects that were considered in this analysis. Of this, specific acres of projects for this area that were considered in the effects are detailed in the Scenery Management Report (Bonnet 2008). These activities include a variety of treatments including prescribed fire, range allotments, miles of roads, miles of trails, acres of

developed campgrounds, acres of picnic sites and trailheads, acres of Sycamore Backcountry Recreation Area (ATV), riparian restoration activities, mechanical vegetation treatments, herbicide treatments, water improvements, fencing, mesquite removal, and construction of housing and facilities throughout the project area. A summary of these cumulative acres is contained in Table 15.

All of the past, present and future activities listed in the project record have happened or will happen over a time period that will allow the land to recover visually. There would be no predicted impacts to the vegetative portion of the variety class; therefore, there are no visual impacts to the project area VQOs. In addition, there are positive predicted vegetative effects which is continued growth of current trees and shrubs increasing line, form, color, and texture found in the area when the direct and indirect effect are considered along with the past, present, and reasonably foreseeable activities under Alternative 1 (No Action Alternative).

Table 15 shows the amount of acres that could be effected by the implementation of past, present and reasonably foreseeable projects. The number of occurrences of contributing features have been displayed in parentheses. Numbers in bold represent areas that would potentially impact more that 10,000 acres in an EU per VQO.

Table 15. Summary of cumulative acres by EU in each VQO

VQO	EU 1	EU 2	EU 3	EU 5	EU 6	EU 7	EU 8	EU 9	EU 10	EU 11	EU 12	EU 14	EU 15	Total Acres
P	0	0	0	28 (4)	0	1,305 (1)	0	0	6,166 (2)	1,243 (3)	**11,505** (4)	0	0	20,247
R	0	1 (1)	3,127 (15)	**12,288 (13)**	751 (3)	2,386 (11)	3,216 (13)	3,593 (17)	2,418 (12)	1,496 (6)	1,882 (8)	343 (2)	3,269 (4)	34,770
PR	0	2,550 (1)	**16,544 (17)**	**16,486 (28)**	14,085 (15)	5,888 (29)	5,826 (21)	6,955 (26)	8,250 (8)	3,249 (4)	3,310 (8)	3,661 (14)	**10,692 (8)**	97,496
M	1	1 (1)	8,785 (33)	**20,466 (43)**	3,494 (6)	**31,772 (20)**	6,406 (5)	**27,774 (16)**	334 (2)	449 (1)	394 (2)	510 (3)	9,356 (13)	109,741
MM	0	0	**12,207 (9)**	**49,1857**, 413 (24)	7,804 (5)	8,055 (15)	7,702 (8)	2,929 (4)	0	117 (1)	0	**10,506 (8)**	2,107 (1)	58,840

P = Preservation, R = Retention, PR = Partial Retention, M = Modification, MM = Maximum Modification

3.7.2.2 Alternative 2 – Proposed Action

The scenic resources that are being analyzed can be found at the beginning of this section. The proposed action includes specific design criteria that lessen the impact of the proposed activities on scenery resources. Those features are contained in the Appendix, part C. The proposed action also contains a site-specific LRMP amendment that allows for modification of some the VQOs in the project area.

Direct and Indirect Effects

Implementation of Alternative 2 would meet the visual quality objectives found in the project area for both fire and non-fire treatments. It is also predicted that there would be a long-term positive change to the landscape features, such as the vegetation variety class. The positive change means that the project area would trend towards meeting the VQOs of the area and therefore continue to trend towards meeting the desired future condition.

Any trees or shrubs that pose a safety hazard to the public would be removed for safety. Proposed lopping and scattering, and piling and burning slash would initially decrease scenery values close to

trails and some heavily used roads in the short term. The slash generated under this alternative may be a deterrent to some visitors using cross-country motorized travel. In the short term, reforestation of shrubs and trees would add positive line, form, color, and texture to the project area. It is also expected that diverse vegetation types and some variation in the age classes would be enhanced causing the area to progress towards meeting its desired future condition. There may be indirect effects to open vistas along trails, dispersed campsites, and the scenic byways when both the fire and non-fire treatments are implemented.

Additional scenery impacts would include damaged trees and other vegetation. Stumps would be visible along with slash and debris. The bare ground and temporary roads may add a visual contrast to existing terrain. There may be a loss of visual screening and some areas would be blackened due to the prescribed burning treatments. Most of these would be relatively short term and mitigated by design criteria. The visual amendment would allow the area to persist in this manner for two growing seasons giving the area opportunity to comply with the amended VQOs.

Benefits from this project on visual resources include a lower risk of large damaging wildfires and a healthier forest with greater diversity. Proposed treatments would result in a mosaic of forest conditions, with some patches of widely spaced larger trees and shrubs along with a grassier understory depending on treatment type. Some areas would have more open conditions, improving visual quality in scenery corridors for travelers.

Since catastrophic fire risk would be reduced in treated areas, there would be less likelihood of severe visual effects. If catastrophic fire occurred in untreated areas, the effects would be the same as those described in Alternative 1.

Cumulative Effects

Based on the potential direct and indirect effects, the area being analyzed for cumulative effects is the project boundary because the projects will occur over time throughout the project area landscape.

The appendix, part E contains past, present and reasonably foreseeable projects that were considered in this analysis. Of this, specific acres of projects for this area that were considered in the effects are detailed in the Scenery Management Report (Bonnet 2008). These activities include a variety of treatments including prescribe fire, range allotments, miles of roads, miles of trails, acres of developed campgrounds, acres of picnic sites and trailheads, acres of Sycamore Backcountry Recreation Area (ATV), riparian restoration activities, mechanical vegetation treatments, herbicide treatments, water improvements, fencing mesquite removal, and construction of housing and facilities throughout the project area. A summary of these cumulative acres is contained in Table 15 (above).

All of the proposed activities would happen over a time period that would allow the land to recover visually. There are no predicted impacts to the vegetative portion of the variety class; therefore, there would not be any visual impacts to the project area VQOs. In addition, in the long term there would be positive predicted vegetative effects that would increase line, form, color, and texture found in the area from both the fire and non-fire treatments.

Given these considerations, Alternative 1 (no action) would progress towards the VQO desired future condition at a slower rate than Alternative 2. The proposed project allows the various VQOs to be met in the long term (approximately after five years). However, in the short term (during implementation, up to two growing seasons for fire treated areas and up to five years for non-fire treatments), the various proposed management treatments may not meet visual quality standards and guidelines found in the LRMP but would meet those as proposed in the LRMP amendment. Specifically, treatments within primary travel routes (defined in the National Forest Landscape

Management Volume 2, pages 19 and 20), where applicable, are not likely to meet current VQO Retention and Partial Retention (but will meet standards within the proposed action amendment) because vegetation removal, associated slash, stumps, stacked logs, and skid roads, along with blackened vegetation and blackened tree trunks from fuel reduction treatments will be visible to the casual visitors in the short term.

Overall, the landscape would contain visual effects that would, in the short term, decrease the positive line, form, color, and texture in the project area. However, during the recovery period when the design criteria are implemented, these effects would be decreased and the area would progress towards meeting its VQO faster than if the design criteria were not applied. Implementing the design criteria for scenery would reduce potential adverse effects ensuring that the project would comply with LRMP standards. In order to accomplish meeting the VQO under Alternative 2, design criteria would have to be implemented in the foreground of all concern level 1 scenery resources on the maps contained in the Scenery Report (Bonnet 2008).

3.8 Social Considerations

This section addresses issue number 7; which identified that the proposed project could have impacts on local populations and minorities.

3.8.1 Regulatory Framework

Executive Order 12898 specifies that proposed Federal actions must be analyzed to determine whether they are expected to have disproportionately high and adverse human health or environmental effects on low income and minority communities.

3.8.2 Affected Environment

This discussion and analysis will focus on the impact area composed of Cochise, Pima and Santa Cruz counties, which surround the project area. While only a small portion of the project area is located in Pima County, communities connected to the area and interested in management within the project boundary are located in Pima County (Figure 7).

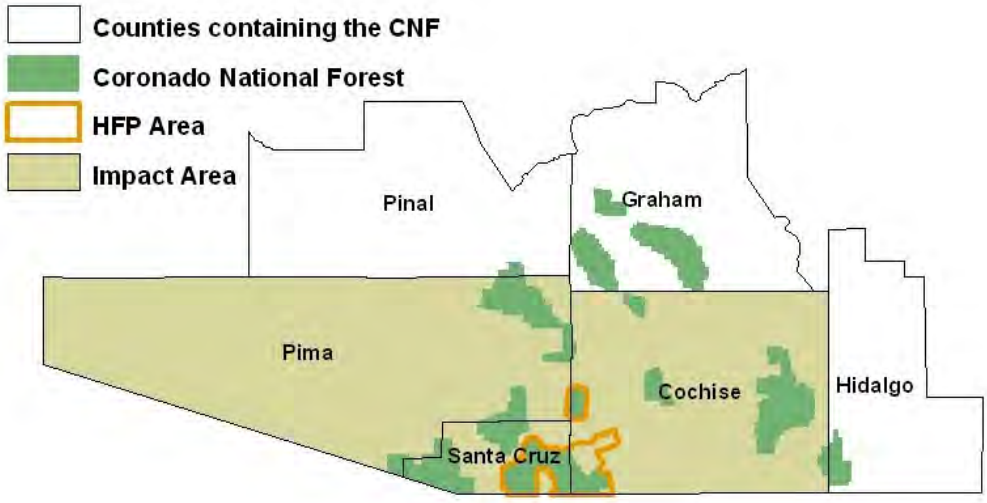


Figure 7. Huachuca FireScape Project (HFP) impact area within Cochise, Pima, and Santa Cruz counties

Certain defining features of every area influence and shape the nature of local social activity. Among these are the local history, population, the presence of or proximity to large cities or regional population centers, area racial and cultural characteristics, predominant land and water features, and unique area amenities. The Federal agencies in the project area operate as stewards of many of these area resources and opportunities, and thus play a principal role in the community. This discussion gives further insight on the character and extent of these community connections.

Historic Context

The project area and vicinity has a rich cultural history. Native Americans hunted, farmed and gathered edible and medicinal plants for thousands of years prior to the first European exploration in the late 16th century. Spanish explorers encountered different settlements of the Papagos and Sand Papagos peoples whom are the ancestors of the present day Tohono O'odham and Hia Ced O'odham, respectively. Over the next hundred years, Apache and other mobile hunter-gatherer groups began to inhabit the area as well (Pima County 2001).

Over the following century came Spanish settlement, missionaries, Spanish-Indian conflicts, and the Mexican-American war. With the Gadsden Purchase in 1854, the United States bought almost 30,000 square miles of northern Mexico making much of present day southern Arizona part of the U.S. territories. Soon after the Gadsden Purchase, both Confederate and Union interest in area mineral deposits brought the Civil War to southern Arizona. In 1863, the Arizona Territory was created from the New Mexico Territory, and continued Apache raids necessitated protection from the Federal government. Thus, a series of forts was constructed, including Fort Huachuca in 1877. After the surrender of Geronimo in 1886, the Apache threat was essentially extinguished, but Fort Huachuca was kept open because of its strategic border position.

By this time, ranches, mines, and farms became more commonplace and a larger part of the local economy (Pima County 2001). Farming in the area shifted from local subsistence to large-scale commercial production when the demand for cotton during the First World War encouraged large-scale cultivation. Citrus, Pecan and other vegetable crops were also grown as well. Grazing remained important economically and culturally. The popularity of the area as a tourist destination also began to increase. The area's arid climate was advertised for its health benefits and others came to escape winter cold in northern latitudes (Pima County 2001).

Area Population

Population growth in Cochise, Pima and Santa Cruz counties has been steady between 1970 and 2005 (Figure 8). Over this period population growth in these counties outpaced the nation increasing by 101, 160 and 198 percent in Cochise, Pima and Santa Cruz counties respectively. These increases amounted to annual increases of roughly 2.9, 4.6, and 5.7 percent respectively over the 35-year period. Increases in impact area counties were outpaced by Arizona which increased by 232 percent or roughly 6.6 percent annually. While growth in these impact area counties may have been slower than their state, they are still meaningful, considering they outpaced the nation while Arizona saw the second largest population increase as a share of its 1970 population in the nation.

Population projections for 2035 suggest Santa Cruz County will increase the most as a share of its total 2005 population (78 percent) while Pima County will increase the most in number (592,839). However, projections suggest not all impact area counties will see the growth Arizona as a whole will experience, growing by 86 percent and 5,096,570 persons over this period.

For the state of Arizona and Cochise County, the share of total population of all non-white races and Hispanics increased between 1990 and 2000, except for Native Americans in the state and Asians in

Cochise County, which both decreased by less than one percent (Table 16). The table below shows the shares of African American, Asian, those identifying with Some Other Race, and Hispanic were greater than the state in some impact area counties in the year 2000, indicating the possible presence of environmental justice populations as defined by Executive Order 12898 (see below for further discussion).

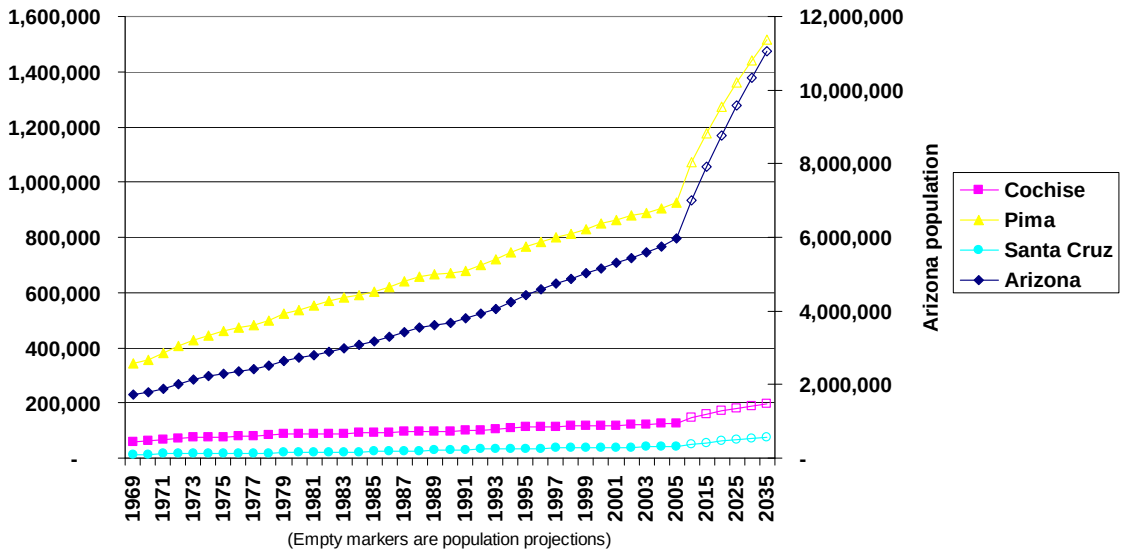


Figure 8. Population change and projections for Arizona and counties in the impact area (Source: U.S. Department of Commerce 2005; Arizona Department of Economic Security 2006)

Table 16. Racial and Hispanic composition of 2000 population and the change since 1990

	White	Black or African American	American Indian & Alaska Native	Asian, Native Hawaiian & Other Pacific Islander	Some Other Race	Hispanic
Arizona	**75.5%**	**3.1%**	**5.0%**	**1.9%**	**11.6%**	**25.3%**
% change from 1990	-5.5%	0.1%	-0.6%	0.5%	2.7%	6.7%
net change	905,929	48,811	51,290	44,842	268,006	614,989
Cochise	**76.7%**	**4.5%**	**1.1%**	**1.9%**	**15.8%**	**30.7%**
% change from 1990	13.2%	4.8%	70.9%	-0.2%	89.8%	27.3%
net change	10,545	243	560	(4)	8,787	7,755
Pima	**75.1%**	**3.0%**	**3.2%**	**2.2%**	**16.5%**	**29.3%**
% change from 1990	20.7%	23.1%	33.7%	53.0%	56.8%	51.6%
net change	108,411	4,799	6,848	6,337	50,471	84,316
Santa Cruz	**76.0%**	**0.4%**	**0.7%**	**0.6%**	**22.4%**	**80.8%**
% change from 1990	31.6%	49.5%	292.2%	42.7%	19.3%	33.5%
net change	7,009	48	187	70	1,391	7,784

Note: Since Hispanics can be of any race, the totals in the table do not add to 100 percent. (Source: Census 2000)

Economic Well-Being and Poverty

Total personal income (TPI) and per capita personal income (PCPI) are useful measures of economic well-being. From 1970 to 2005, annual TPI in the impact area increased by $22.7 billion to $30.9 billion, and annual PCPI increased from $18,998 to $28,298 (all measures adjusted for inflation to 2005 dollars). This translates to a TPI increase of 36 percent (roughly 1 percent annually) and a PCPI increase of 49 percent (roughly 1.4 percent annually) over this time period. In 2005, average PCPI in the impact area was $28,298, which was lower than the state ($30,019) and the nation ($34,471) which can partly be explained by differences in cost of living in metropolitan verses the somewhat non-metropolitan impact area. Differences in non-metropolitan and combined metropolitan/non-metropolitan PCPI levels for the state and the nation explain the lower levels seen in the economic impact area (non-metropolitan for the state was $22,183 and for the nation was $26,115 in 2005; which are lower than the metropolitan/non-metropolitan combined levels shown above) (U.S. Department of Commerce 2005).

From 1992 to 1998, average annual unemployment rates in the three county impact area fell along with national and state levels but increased to 5.2 in 1996. Unemployment after 1998 followed state and national trends thereafter, increasing till 2002 and then decreasing to 4.2 percent in 2006. Cochise and Santa Cruz counties are at their lowest levels of unemployment since 1990 (4.5 and 7.7 percent respectively) but remain above state levels of 4.1 percent. These counties maintained higher unemployment levels than both the state and the nation between 1990 and 2001. Santa Cruz County's unemployment level remained above both the state and the nation through 2006, with as much as 25.9 percent in 1996. In contrast, Pima County has maintained a level of unemployment under both the state and the national level between 1990 and 2006, with a low of 2.9 in 1998 (U.S. Department of Labor 2006). New jobs created in an area are filled from two principal sources; local unemployment and in-migration. High levels of unemployment in the immediate HFP area within Santa Cruz County may provide a source of local labor.

3.8.3 Environmental Consequences

Effects Common to all Alternatives

A social assessment performed by the Coronado National Forest indicates recreation uses are important to communities in the area. Under both the no action and proposed action alternatives, recreation areas or user experiences would not endure significant effects according to the Recreation Report located in the administrative record.

Under all the alternatives, tribal interests and traditional and cultural uses have been considered. Existing uses will be accommodated with the absence of treatment under the no action alternative and the proposed action has incorporated design criteria, which indicate tribes will be notified of activities that may affect traditional practices. These efforts will likely foster cooperative management of resources of mutual interest to tribes and the Forest Service, the Departmetn of Defense, and National Park Service, hopefully strengthening tribal interest and involvement.

Environmental Justice Compliance (Executive Order 12898) - While minority and low-income populations may exist in the area, none of the alternatives are expected to have disproportionately high and adverse human health or environmental effects on these communities. Impacts to local communities are expected to be negligible, and there is no reason to suspect that any impacts will disproportionately affect minority and low income populations. The actions associated with the project could potentially support employment and income in the area, which could benefit area minority and low-income populations, but are not likely to impact their quality of life or social values.

Alternative 1 – No Action

Under this alternative, current fuel conditions and the threat of high-intensity and high-severity wildfire are expected to continue. Although individual projects may occur form all of the Federal agencies, the scope and coordinated effect of those actions is undefined. Under the no action alternative, these untreated fuels would produce unmanageable fire behavior; creating conditions for greater threat to life, property, and human health than the proposed action alternative. With increased threat of large-scale wildfire, area communities could experience greater threats to air quality and human health than under the proposed action.

The lack of fuel treatments might also result in greater risk than the proposed action alternative to wildlife habitat and area natural resources, valued in the area by those interested in the management of wildlife and those interested in the management of natural resources.

Alternative 2 – Proposed Action

This alternative is predicted to result in fuel conditions that produce manageable fire behavior, and moves vegetation and fuel conditions toward their historic conditions. Thus, greater protection of property, human health, and firefighter safety can be expected. Some transitory effects from temporary nuisance smoke could occur as a result of lower intensity fire from fire treatments; however, they are less than the long-term human health effects, threat to firefighter safety and threat to property that could result with possible large scale wildfire. Thus, under the proposed action there would be less risk than the no action alternative to life, property, and human health, valued in the area by those interested in fire control and prevention. It must also be noted that while the proposed action would have no effect on illegal uses in the area, the occurrence of wildfire as a result of those uses would be reduced under the proposed action.

Cumulative Effects

Jobs and income supported by activities under the proposed action will coincide with employment and income contributions from other projects occurring in the impact area. While estimates of employment and income impacts from these projects are not available, they would accrue alongside potential employment and income impacts from the proposed action. Periods of high unemployment in Cochise and Santa Cruz counties noted above suggest the local labor force may benefit from the possible jobs and income supported by the proposed action.

3.9 Recreation

This section addresses issue number 8, which focuses on effects of proposed activities on visitors' recreational experiences and the recreation opportunity spectrum designations on National Forest lands.

3.9.1 Affected Environment

3.9.1.1 Regulatory Framework

Authorities to manage recreation on national forests come from the general laws related to National Forest management and the Coronado National Forest Land and Resource Management Plan (USDA Forest Service 1986, as amended).

The management of Coronado National Memorial is guided by the 1916 Organic Act that created the National Park Service (NPS), the General Authorities Act of 1970, the 1978 National Parks and Recreation Act (PL 95-625) and other applicable Federal laws and regulations. Actions also are

guided by the Coronado National Memorial General Management Plan (USDI National Park Service 2004).

Direction for management of Department of Defense Lands for outdoor recreation on Ft. Huachuca is found in Federal Land Policy and Management Act 1979, Public Law 96-561 Fish and Wildlife Conservation and Natural Resource Management Programs on Military Reservation: Amends Public Law 86-797 (Sikes Act), Executive Order 11989 Off-Road Vehicles on Public Lands, DOD Directive 6050.2, Use of Off-Road Vehicles on DOD Lands, DOD Directive 7400.4 and AR 200-3 Natural Resources, Land, Forest, and Wildlife Management (U.S. Department of Defense 2001).

Coronado National Forest, Sierra Vista Ranger District

The Coronado National Forest attracts approximately 2.2 million visitors annually. The top five recreation activities on the Coronado National Forest according to the National Visitor Use Monitoring results are viewing natural features, hiking/walking, viewing wildlife, relaxing, and driving for pleasure (USDA Forest Service 2003). The Sierra Vista Ranger District is approximately 310,000 acres and includes the Huachuca, Patagonia and Whetstone mountains as well as the Canelo Hills. The elevations range from approximately 3,000 feet at the lowest point to almost 9,466 feet at Miller Peak, the highest and southern-most peak in the southwestern United States. Miller Peak lies at the center of the Miller Peak Wilderness.

Recreation Opportunity Spectrum (ROS)

The recreation opportunity spectrum is a planning and management tool for recreation management. Recreation opportunities are arranged along a spectrum and describe the relationship between activities and settings that produce the recreation experience. Characteristics of an area are defined in terms of their physical, social and management settings (USDA Forest Service 1982).

The Sierra Vista Ranger District has designations of Roaded Natural (RN), Roaded Modified (RM), Semi-Primitive Motorized (SPM), Semi-Primitive Non-Motorized (SPNM) and Primitive (P). The majority of the district is classified as SPM. Roaded Natural and Roaded Modified classifications follow the main Forest Service roads and State Road 83. The Miller Peak Wilderness is classified as Primitive and the Whetstone Mountains are classified as SPNM and SPM.

Types of Recreation Use

Developed recreation sites are concentrated near Parker Canyon Lake and Carr Canyon. Parker Canyon Lake is the largest and most popular lake on the Coronado National Forest. It receives heavy use by boaters, fishermen, campers and picnickers. Carr House provides a visitor information center for the Carr Canyon area.

Dispersed use includes camping, hiking, bird watching, driving for pleasure and other activities not associated with a developed recreation facility. The majority of dispersed use occurs along the forest development road system and any open roads.

Birding is a popular activity in Carr Canyon, Miller Peak Wilderness and The Nature Conservancy's Ramsey Canyon Preserve. The Ramsey Canyon Preserve provides access to National Forest lands and Miller Peak Wilderness via the Hamburg Trail #122.

Recreational off-highway vehicle (OHV) riding is gaining popularity across the district. Driving for pleasure using passenger vehicles to view scenery and wildlife are popular activities for the recreating public. These motorized activities occur along all open roads but are mostly concentrated along the main arterial routes.

Non-motorized use occurs on system trails, non-system trails, open roads, and roads that are closed to motorized vehicles throughout the project area. System trails on the Sierra Vista Ranger District are primarily associated with access to Miller Peak Wilderness and several canyons.

The Whetstone Mountains are remote, steep and rocky and receive light use due to limited access via primitive roads. The Guindani Trail #398 is a 4-mile loop located on the east flank of the Whetstone Mountains and originates in the Kartchner Caverns State Park.

The Arizona Trail is a non-motorized trail connecting deserts, mountains, forests, wilderness, canyons and communities. It traverses the district, passing through the Miller Peak Wilderness and continuing into the Coronado National Memorial to the USA-Mexico border.

Many non-system trails exist in the area. They range from game trails to trails developed by recreationists. The Forest Service does not maintain non-system trails, nor does it regularly maintain an inventory of these trails. Hikers, horseback riders and mountain bikers are the primary non-motorized users of system trails, non-system trails and closed roads.

Fort Huachuca

Fort Huachuca Military Installation is approximately 81,000 acres in size. The primary mission of the Fort is military activity; however, public access to the reserve is allowed for outdoor recreational purposes. Fort Huachuca has an “open post” policy and access is gained through staffed gated access points. Outdoor recreational opportunities in Fort Huachuca include hunting, fishing, camping, picnicking, OHV use, birding, caving, hiking, and biking (U.S. Department of Defense 2001).

Types of Recreation Use

Developed recreation facilities that are available for outdoor recreation on the army installation include several picnic areas, an RV park, and two cabins rented by the boy scouts and girl scouts. These facilities are available with a permit and fee from the fort.

Hunting and fishing are popular activities in Fort Huachuca. Hunting is open to active and retired military personnel, civilian employees, their families and guests. Fishing is allowed for the general public. Fort Huachuca manages seven ponds for warm water fisheries and seasonally stocked trout.

Areas around Garden Canyon and Huachuca Canyon Picnic site receive a high degree of dispersed recreation including hiking, birding, and caving. Birders account for approximately 5,000 visitors per year. Peak season for birding is April-May and July-September (U.S. Department of Defense 2001).

Caving is also a popular activity on Fort Huachuca. There are 10 known caves on fort property and 2 caves, Pyeatt and Indecision, receive approximately 95 percent of the use. Some caves are closed from April 15-October 31 annually to protect bat roosting habitat.

There are approximately 20.25 miles of established trails on Fort Huachuca used for hiking, mountain biking and access for photography, birding and wildlife watching. Most trails can be hiked in a day and vary in length from 0.5 – 3 miles. The trails are not regularly maintained.

All privately owned vehicles are restricted to the use of existing roads and firebreaks. No off-road use is allowed. Off-road vehicles (ORVs) are allowed on roads and firebreaks if they are operated by licensed and insured drivers. This policy is in place for public safety due to military operations and training.

Coronado National Memorial

Coronado National Memorial commemorates and interprets the significance of Francisco Vásquez de Coronado's expedition. The Memorial is approximately 4,750 acres in size and is bordered by Mexico, Miller Peak Wilderness, and the Coronado National Forest (USDI National Park Service 2004). Visitation to the Memorial averages approximately 90,000 visitors annually. The busiest months are typically February, March and April. Overnight use is not allowed at the Memorial.

Types of Recreation Use

Recreation opportunities available at the Memorial include a visitor center, picnic area, scenic drives, Coronado Cave, and four trails. The visitor center provides information, an interpretive trail and parking for approximately 20 cars. Coronado Cave is approximately 600 feet long and is accessible by a 0.75-mile trail originating from the visitor center parking lot. Other trails in the Memorial include Joe's Canyon trail (3.1 miles), Yaqui Ridge Trail (1 mile), Crest Trail (2 miles) and the Arizona Trail where it originates at the US-Mexico border. Off-road vehicle (ORV) use is not permitted in the Memorial.

3.9.2 Environmental Consequences

This analysis will assess effects to visitors' recreational experiences, and whether the proposed activities affect ROS designations on National Forest lands within the project area.

3.9.2.1 Alternative 1 – No Action

Direct, Indirect and Cumulative Effects

Under this alternative, there would not be any direct effects because activities as defined in the proposed action would not occur. Undefined future activities will occur and are discussed under cumulative effects. Indirect effects to visitor recreation experiences could occur if a large-scale wildfire were to happen. Immediate, short-term effects would include restrictions and closure of the area to the general public, smoke emissions into the air and blackened scenery or burned recreational facilities (see the Air Quality and Scenic Quality sections). Over time, these effects would diminish as areas are rehabilitated or vegetation grows back. Unless another large fire was to occur close in time or space, there would be little to no cumulative effects with this alternative.

3.9.2.2 Alternative 2 – Proposed Action

Direct and Indirect Effects

As activities are proposed, fire and fuels managers would review treatment parameters and ensure design criteria related to recreation are implemented to protect the recreation resource and ensure public safety. Treatments proposed are consistent with projects already occurring in the project area. Effects to recreationists and the recreational experiences from these types of projects are short term and limited in scope. Implementation of the recreation design criteria would ensure that proposed activities would not have any significant effects on recreation areas or user experiences.

The proposed treatments would be consistent with ROS designations on National Forest ownerships. The assigned ROS class would not change as a result of the proposed activities.

Recreationists may find their favorite campground or destination closed or partially closed due to treatment activities. Visitors that have traveled a long distance and were not aware that the area would be closed may be frustrated that their plans have to be changed. This effect would be short-term, lasting while treatment activities are taking place. It is unlikely that all facilities in an area

would have treatment activities taking place at the same time. Users would have alternative options available for recreation activities on nearby areas of public lands.

Visitors may not understand the need for fuel reduction activities and may be surprised that trees have been removed near recreation sites. This may provide an opportunity to educate visitors on fire safety and fuel reduction practices.

Non-fire treatments such as chipping, lop and scatter, mastication, pruning and thinning by hand would produce localized disturbances to visitors. These could include noise, dust and machinery exhaust. These effects are temporary and short term in nature. Fire treatments would produce smoke and haze that may be uncomfortable to visitors. These effects would also be short term. The general effects to the recreation resource and recreationists related to treatment methods are described below:

Ground-based machines – Vegetation would be removed from the site by ground-based machines such as skidders or forwarders. Machines would cause soils disturbance and possibly damage remaining vegetation. Dust, noise, and exhaust would be present during ground-based machine operations. If machines are accessing units through the developed site or trail, it may be necessary to close the site to public use for safety purposes. If operations are outside the developed site or trail corridor and visitors can safely use the area during machine operations, then closure may not be necessary.

Chipping material on site and mastication – Chipping and mastication are very noisy and create dust, which may disturb visitors.

Lop and Scatter - Felled trees and shrubs would be limbed, lopped, and bucked using chainsaws so that slash would lie close to the ground, then the slash would be spread more or less evenly over the ground. Limbs and cut shrubs may make areas difficult to walk through until prescribed burning has been completed.

Pruning Trees - Pruning may allow deeper views into the forest along roads and trails. The sense of privacy and screening could be altered if pruning is done near recreation facilities.

Thin by Hand - This method would have the least impact to the surrounding vegetation. Sites or trails may not have to be closed for public safety. Disturbance to visitors such as noise, dust and exhaust from equipment would be minimal.

Prescribed Fire – Closure of an area would be necessary for public safety during and immediately after the burning operation. Smoke and haze would be evident during the prescribed burns and would dissipate when burning operations were complete. Dust and ash would be evident in the treatment area until new vegetation has grown back. These effects are temporary and short term, through one growing season.

Handpile and Burn - Burning materials would create smoke and haze that may be uncomfortable to visitors. Residual charred material is sometimes left after burning is complete and charred soil can remain visible for the long term if not treated. Visual design criteria address burned piles and residual materials.

Fire Control Line - Thinned vegetation along fire control lines may create deeper views into the forest. This may change the recreation experience that visitors desire. Visitors may begin to use the fire control lines for access after prescribed activities. This type of use may be undesirable to managers.

Cumulative Effects

The cumulative effects discussion considers past, present and reasonably foreseeable actions that occur within the analysis area. A detailed list of the cumulative actions considered in this analysis is included in Appendix, part E.

The short-term effects related to treatment activities include dust, noise, smoke, slash, burned piles and possible temporary closures to recreation sites and trails. These effects would last during the implementation of the treatments. The long-term effects include changes in vegetation surrounding the various recreation sites, allowing deeper views into the forest. Treatments in the shrub type may create more open views of the surrounding area. Some recreationists may not like the changed vegetation condition due to treatment and choose to recreate elsewhere. Others may not notice changes in vegetation or are new visitors to the area and have no reference point to gauge changes.

Combined with past, present and reasonably foreseeable activities, direct and indirect effects of project activities would be insignificant, therefore, there would be little to no cumulative effects on the recreation resource.

3.10 Fire, Fuels and Vegetation

This section evaluates the effectiveness of how well the proposed project changes fire behavior, intensity and severity, and vegetation composition, density and structure (see Effectiveness of Accomplishing the Purpose and Need on p. 10) across the three Federal jurisdictions included in this proposal.

3.10.1 Regulatory Direction

The regulatory direction that guides fire, fuels and vegetation management activities is described generally on page 4 of Chapter 1, and in more detail in the Appendix, part B.

3.10.2 Affected Environment

As stated in Chapter 1, the existing condition of the ecological units in the Huachuca FireScape project area has changed over the past 100 or more years. These changes are evident in the amount of fuels that have built up over time, the change in the frequency of natural fires (fire interval), and the intensity of wildland fires.

The HAFP Plan (2005) discusses the historical mean fire intervals for the Huachuca Mountains, and indicates that they ranged from 3 to 26 years (MFI 8 years), which is similar to that reported for other sky island mountain ranges (Swetnam and Baisan 1996). In contrast to low- to moderate-intensity, pre-settlement fires, several large crown fires have occurred within the last 35 years in the Huachuca Mountains. These include fires in 1977, 1983 and 2002. The potential for fires in this mountain range is high due to lightning and human-caused sources. The Huachuca Mountains are a major conduit for illegal immigrant traffic entering the United States from the Mexican border. Several recent fires were attributed to immigrant camps. Large fires greater than 100 acres between 1985 and 2008 were recently mapped, and are examples of the magnitude and pattern of fires regularly occurring within the project analysis area (see Appendix, part F).

Vegetation Condition

The existing condition of vegetation in the ecological units is described in detail in the HAFP Plan (2005), and will only be summarized in this document. Part A of the appendix displays, for each ecological unit (EU), summarized statements of existing, historic, and desired conditions, especially as they relate to fire regime condition classes and desired vegetative conditions. The existing conditions relative to historic conditions can be summarized as follows:

Example of shrubs invading semi-desert grasslands due to lack of frequent fire

EU-2, 3. Shrubs have invaded the semi-desert grasslands, which were historically maintained by natural fire at regular intervals, decreasing the area covered by semi-desert grassland.

EU-3. Oak trees have invaded the grasslands, which were historically maintained by natural fire at regular intervals, decreasing the area covered by semi-desert grassland

EU-5, 6, 7, 8. Tree density has increased in areas historically oak savanna resulting in an expansion of oak woodland and a loss of the savanna/woodland mosaic.

Example of savanna-woodland mosaic. Under the historical natural fire regime, tree canopy cover is less than 10 percent in savanna areas and 10-30 percent in woodland areas with thin soils or substrate discontinuities. (McPherson 1997). Canopy cover currently exceeds 30 percent in many areas due to lack of fire.

EU-9. Tree density has increased in areas historically oak/juniper savanna resulting in an expansion of oak/juniper woodland and a loss of the savanna/woodland mosaic, chaparral shrubland has increased in coverage and become uniform in successional stage, and grassland coverage has decreased.

EU-10, 11, 12. Small tree density in oak-pine woodlands and mixed-conifer forests has increased and fire-intolerant trees have especially increased as a proportion of the understory tree stocking.

EU-14. Tree density has increased in oak savanna

resulting in an expansion of oak woodland, mesquite has increased in coverage, and grassland has decreased in coverage.

EU-15. Tree density has increased in oak savanna resulting in an expansion of oak woodland, chaparral shrubs have increased in coverage and become uniform in successional stage, and grassland has decreased in coverage.

The Wildland-Urban Interface (WUI)

The wildland-urban interface is the zone where human developments meet or intermingle with undeveloped wildlands. Fires have been negatively affecting people, their property, and natural resources in this interface since the 1800s. In past decades, dealing with fire in the wildland-urban interface has been a national priority but one not easily addressed (HAFP 2005). Observations within the analysis area show that the buildup of flammable vegetation, including woody perennial vegetation (trees, shrubs), forbs, and annual weeds, is a concern in many areas. The eastern slope of the Huachuca Mountains is a classic wildland-urban interface situation, where structures and utilities are intermixed with fire-prone, naturally vegetated areas (HAFP 2005). These conditions make fire management and fuels reduction in this area a priority.

Fire Behavior

Flame length has significance for suppression strategies and tactics, and is a good visual indicator of fireline intensity at the head of the fire (DeBano et al. 1998). It is also a measure of fire suppression difficulty. Table 17 displays measures of fireline intensity and flame length as they relate to suppression difficulty. Fire modeling was used to evaluate potential fireline intensity (flame length) and fire type for the project analysis area. See Methodology section, p. 89.

Figure 9 and Figure 10 show acres of potential flame lengths under typical high fire danger (90th percentile) weather conditions. Figure 9 shows that in its existing condition, approximately 322,480 acres (80 percent) of the project analysis area would have greater than 4 foot flame lengths (see also Figure 20, Appendix, part F). Figure 10 shows the proportion of individual ecological units by flame length classes. Figure 11 shows that about 188,200 acres (46 percent of the area) are susceptible to passive and active crown fire (see also Figure 22, Appendix, part F). Figure 12, which displays the proportion of individual ecological units by fire type, shows that those ecological units dominated by forest and woodlands could support a combination of passive and active crown fire, whereas those ecological units dominated by shrubland and savanna would likely experience surface and passive crown fire. Part F of the appendix displays maps of the existing fireline intensity and fire type.

Table 17. Fireline intensity interpretations

Intensity	Flame Length (Feet)	BTUs/Sec/Foot	Interpretations
Low	<4	<100	Direct attack at head and flanks with hand crews, handlines should stop spread of fire
Low–Moderate	4.1–8	100–500	Employment of engines, dozers, and aircraft needed for direct attack, too intense for persons with hand tools
Moderate	8.1–11	500–1,000	Control problems, torching, crowning, spotting; control efforts at the head are likely ineffective
High	>11.1	>1,000	Control problems, torching, crowning, spotting; control efforts at the head are ineffective

Based on Rothermel (1983)

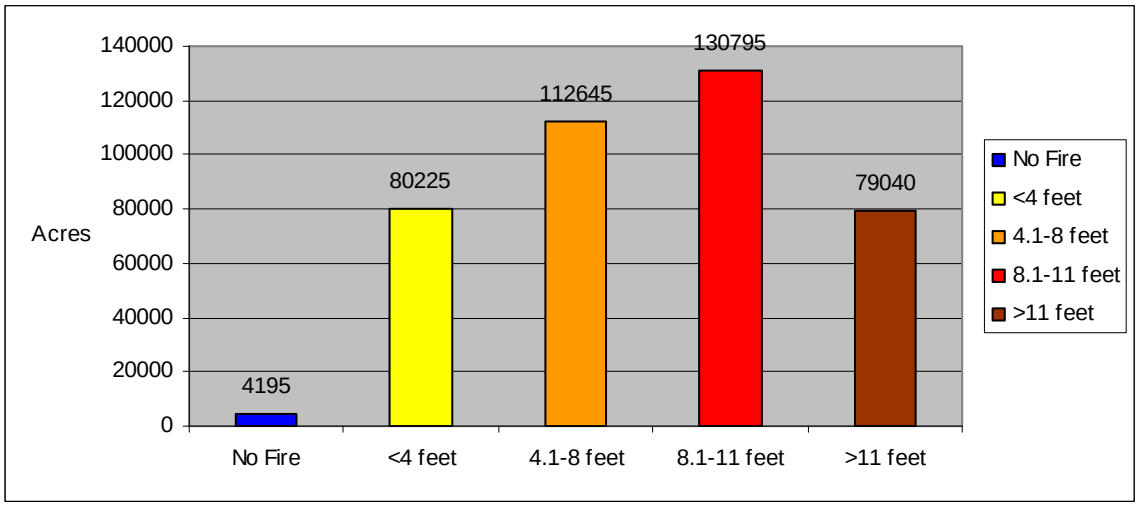


Figure 9. Modeling results showing the amount of acres that would burn at a particular flame length given the existing conditions of the vegetation and fuels within the project area

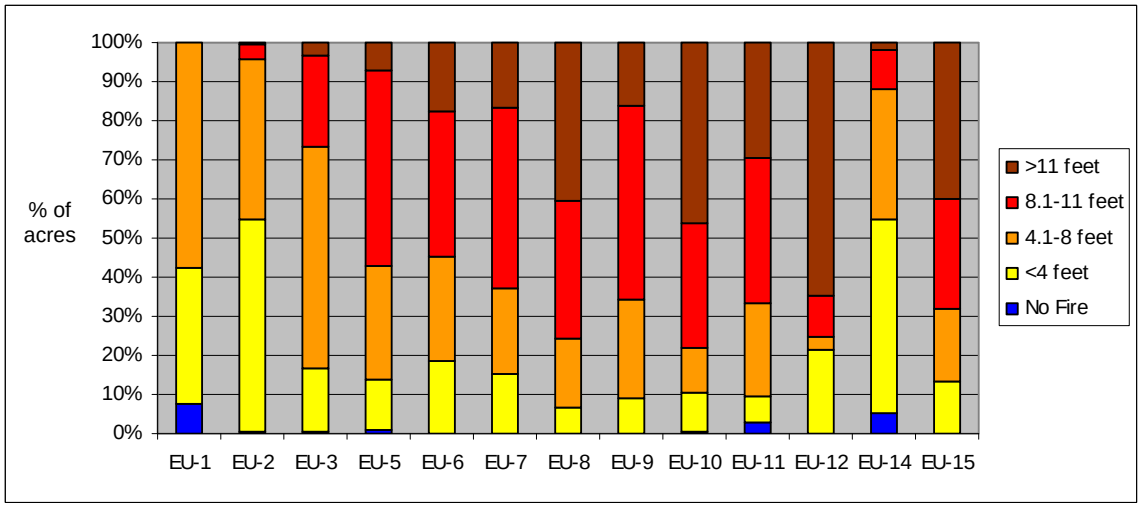


Figure 10. Modeled proportions of flame length ranges that could occur in each ecological unit given the existing conditions of the vegetation and fuels within the project area

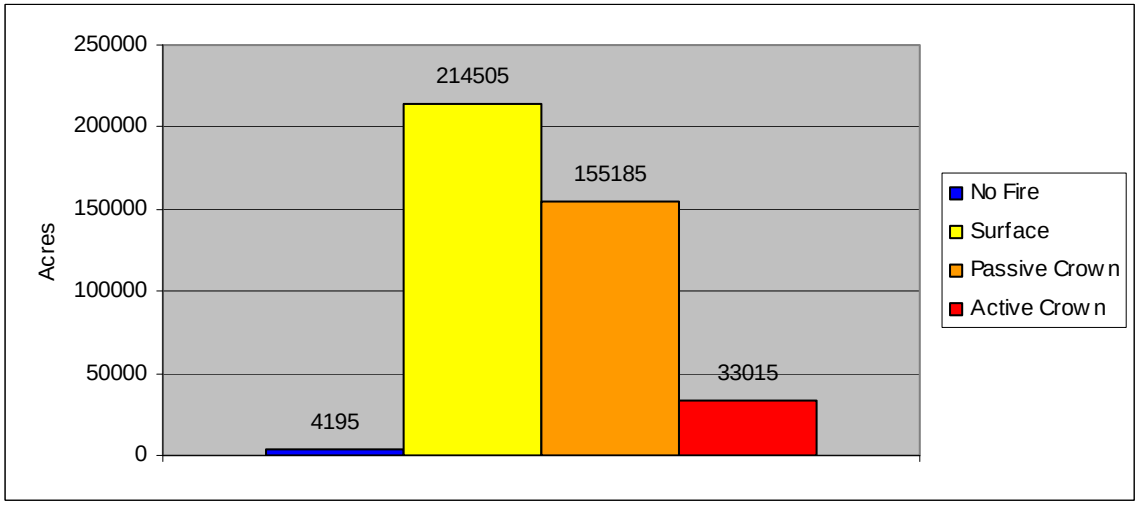


Figure 11. Modeled results showing acres of each fire type that could occur in the project area given existing vegetation and fuel conditions

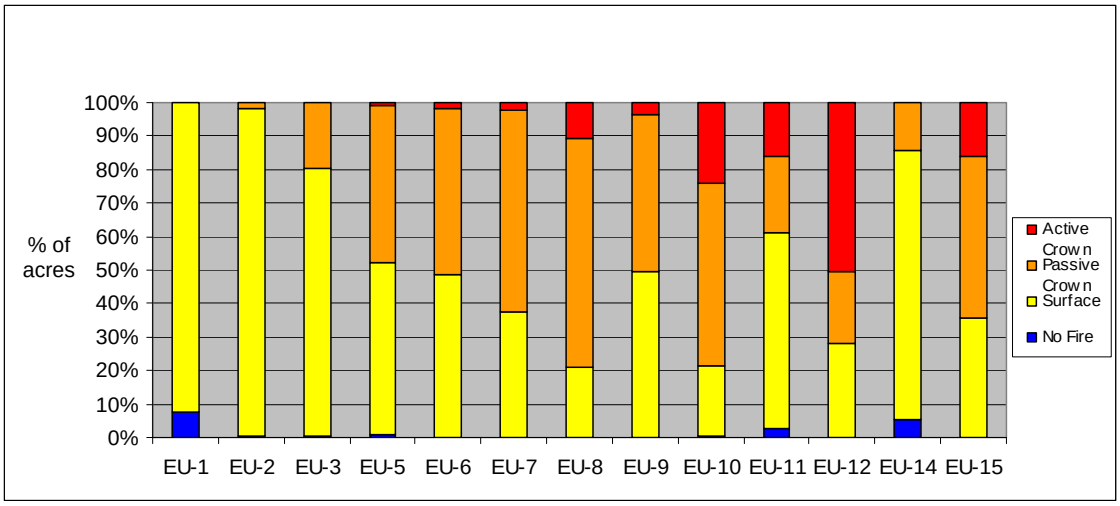


Figure 12. Modeled proportions of fire types that could occur in each ecological unit given the existing conditions of the vegetation and fuels within the project area

3.10.3 Environmental Consequences

3.10.3.1 Criteria Used for Analysis

The following measurement criteria were used to determine effects of proposed activities on the environment, and the effectiveness of the alternatives in accomplishing the purpose and need for the project.

- **Effects on fireline intensity expressed as flame length in feet associated with fire hazard** - Flame lengths generally less than 4 feet are desired, allowing for safe, direct attack by hand crews. Flame lengths greater than 4 feet generally require equipment such as dozers and aircraft to be employed; beyond 8 feet, torching, crowning and spotting can occur. [2]
- **Effects on fire type expressed as surface, passive torching or crown fire** - Low severity surface fire is desired in order to allow for safe fire suppression action.
- **Effects on fire regime condition class (FRCC) -** This is a qualitative assessment discussing how FRCC is trending (See text box, next page).

Surface Fire: Fire that burns loose debris on the surface, which include dead branches, leaves, and low vegetation. Burns only in the surface fuelbed.

Passive Crown Fire: consuming single or small groups of trees or bushes.

Active Crown Fire: The surface fire ignites crowns and the fire spread is able to propagate through the canopy.

- **Effects of proposed treatments on vegetation composition, density and structure in each ecological unit -** This is a qualitative assessment on the predicted vegetation that would occur in each ecological unit.

Methodology

Models and assumptions used in the analysis are discussed in detail in Appendix A of the Fire and Fuels specialist report in the project file (Hall and Amell 2008). Fire models are tools to help depict relative change in fire behavior and growth across the landscape. Although there are limitations to

[2] Rothermel, Richard C. 1983 59

FRCC - Fire Regime Condition Classes*

Condition classes are a way of categorizing the degree to which key ecosystem components such as species composition, structural stage, and stocking level have changed in an area due to changing fire regimes. One or more activities such as fire exclusion, insects and disease, and past management activities can cause a change in fire regimes). There are three condition classes:

Condition Class 1: Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within their historical range.

Condition Class 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 landscape patterns. Vegetation attributes have been moderately altered from their historic range.

Condition Class 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. This leads to dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

* FRCC concepts and definitions are published in Hardy and others (2001), Hann and Bunnell (2001), and Schmidt et al. (2002).

fire behavior modeling, the model outputs provide useful information for planning, assessing, and prioritizing fuel treatments (Stratton 2004 and Stratton 2006). Interpretation, professional judgment, and local knowledge of fire behavior were used to evaluate the outputs from the models.

The FlamMap Fire Behavior Model was used to conduct spatial analysis of wildland fire hazard over the project analysis area. FlamMap generates a fire behavior footprint of the landscape for a given set of weather and fuel moisture data inputs. Fire behavior fuel models used in the model are discussed in Scott and Bergen (2005).

Data used in the model came from the Landscape Fire and Resource Management Planning Tools Prototype Project, or LANDFIRE Prototype Project, which was a sub-regional, proof-of-concept effort designed to develop methods and applications for providing the high-resolution data (30-m pixel) needed to support wildland fire management and to implement the National Fire Plan and Healthy Forests Restoration Act. It is available from the internet at http://www.landfire.gov/index.php.

The Forest Vegetative Simulator/Fire Fuels Extension (FVS/FFE) Model was used to predict vegetation and fuels changes. FVS consists of a number of integrated models including those for predicting large-tree height and diameter increment, small-tree height and diameter increment, tree mortality, crown change, tree regeneration establishment, shrub development, shrub and tree vertical canopy distribution, and fire effects. FVS uses stand exam data containing measurements for tree attributes such as diameter-at-breast-height, diameter-at-root-crown, tree height, percent crown, and tree species as well as site attributes to model tree growth and mortality. FVS enables users to model changes to stand attributes such as stocking levels due to management activities such as tree thinning and prescribed fires. Fire effects are modeled in FVS through the Fire and Fuels Extension (FFE), which simulates fuel dynamics and potential fire behavior over time in the context of stand development and management (Reinhardt and Crookston 2003).

3.10.3.2 Alternative 1 - No Action

Direct and Indirect Effects

Vegetation

Except in small treatment areas, the effects of no action on vegetation in each ecological unit would be a continuation of the same condition and trends that have resulted in the existing condition described above. Overall, it is expected that shrublands and woodlands would continue to expand to some degree, resulting in further loss of grasslands; however, it is suspected that the trend would be slower than in the past. This is because most of the conversion that would take place has already occurred. It is also expected that woodland and conifer forest stocking would increase to some degree; however, it is suspected that this trend has also slowed due to current heavy tree stocking, which prohibits the establishment of additional trees.

Fire Behavior and Fuels

The effects of no action on fire behavior and fuels are considered the same as described under the existing condition. This means that approximately 322,480 acres (79 percent) of the project analysis area would have greater than 4-foot flame lengths, and about 188,200 acres (46 percent) of the area is susceptible to passive and active crown fire under high fire danger conditions (Figures 3 and 5).

Surface, ladder, and crown fuels would continue to accumulate in the absence of fire or treatment. With no change to forest structure and fuels, fire behavior under normal summer conditions would continue to be severe, threatening resources within the project area. Fires that escape initial attack (usually those burning under severe conditions) are likely to become large and damaging crown fires. Direct suppression tactics would not be effective in areas where flame lengths exceed 4 feet and where passive and active crown fire are likely to occur.

Surface Fuels – Ground accumulation of vegetation and fallen debris.

Ladder Fuels – Flammable branches, twigs, or vegetation attached along the trunks of trees that tend to carry fire from the ground into the treetops.

Crown Fuels – Vegetation in the canopy of trees that is especially flammable when trees are dense or have dead and dying components.

In the absence of any kind of human-caused or natural disturbance, indirect effects would occur from the natural progression of forest growth and change. The result would be increased surface fuels that affect flame length, increased ladder fuels that affect torching of trees, and increased crown density that causes crown fire (Peterson et al. 2005, Graham et al. 2004). Fire risk in the project analysis area would likely increase and contribute to severe wildfires that could destroy important resources and habitat.

The no action alternative would not be consistent with agency direction. It would not contribute to the desired condition, address the purpose and need of this project, achieve the objectives of each agency's management plans, or respond to the National Fire Plan goals of reducing hazardous fuels. The ability of firefighters to safely and effectively suppress wildland fire would be hindered as fire behavior characteristics intensify.

Fire Regime and Condition Class - No progress would be made toward initiating the restoration of ecological processes, including the historic frequent low-to-mixed-severity fire regimes. Fire regime condition classes would continue as discussed under the existing condition, or would continue to progress toward fire regime condition class 3.

3.10.3.3 Alternative 2 - Proposed Action

In this alternative, the Forest Service, Park Service, and Fort Huachuca propose a series of fire and non-fire treatments that are designed to achieve or push the ecological units toward the desired condition. In general, the treatments would reduce surface fuels, ladder fuels, and the density of trees and shrubs. The most appropriate fuel treatment strategy is often thinning (removing ladder fuels and decreasing crown density), followed by prescribed fire, piling and burning fuels, and mechanical treatments (Peterson et al. 2005, Graham et al. 2004). The proposed action includes treatments of prescribed burning, hand thinning of trees and shrubs, hand piling and burning of cut material, chipping of cut material, removal of cut or chipped material, and mechanical mastication of trees and shrubs. Proposed treatments are described in detail in Chapter 2 of this EA. Table 1 on page 14 displays proposed treatments by ecological unit for the project analysis area.

Direct and Indirect Effects

Vegetation

Each proposed treatment would have somewhat different effects on the vegetation:

Thin by Hand – As a result of this treatment, the density of shrubs and trees would be reduced. Depending upon the ecological unit and site-specific thinning objectives, thinning by hand would leave a variety of tree and shrub spacing regimes and species combinations.

Masticate – In areas being masticated, individual trees and small closely spaced groups of trees would be retained, but uniformly and closely spaced trees would not be retained due to equipment limitations. In areas of masticated shrubs, a mosaic of untreated patches of varying size and configuration would be created, but again, closely spaced individual plants would not be retained due to equipment limitations.

Pruning – Pruning trees would have little impact on the growth, vigor, and health of the pruned trees due to the limits placed upon how much of an individual tree's branches can be removed. The amount of area in which trees would be pruned would be a very small portion of the landscape.

Lop and Scatter – Lopping and scattering cut material would reduce fuel concentrations and distribute fuel loads over a greater area. This would decrease the severity of burning of plants where concentrations of woody debris exist, and slightly increase the severity of burning of plants over a larger area. This treatment may also be applied as a preparation measure for prescribed burning to lower the risk of crown scorch.

Chipping – Chipping of cut material would have little impact to vegetation except for impacts due to movement of machinery if the chipped material is removed from the site. If the chipped material is distributed back onto the site, chip concentrations may cover vegetation, decreasing growth and vigor of the covered vegetation. When burned, the increased fuel load in the chip concentrations would 1) increase mortality of the covered vegetation, 2) create small patches of bare mineral soil which would provide seed beds for the establishment of plants, and 3) heat-scarify seeds banked within the soil profile, increasing the establishment of those seed-banked species.

Removal - Removal of cut trees and shrubs would have little impact to remaining vegetation except for disturbance due to equipment running over and dragging cut material over vegetation covering the ground.

General effects to vegetation in the ecological units from the treatments would be:

- **EU-2, 3**. In these ecological units, there would be a decrease in overall shrubland coverage and an increase in overall grassland coverage as treatments begin reversing the trend of shrubs invading into semi-desert grassland. The ecological units would become more of a mosaic, consisting of grassland patches, dense untreated shrub patches, and thinned shrub patches. These changes would take place on up to 30 percent of EU-2 and up to 81 percent of EU-3 (Table 6), leaving the majority of the area in EU-2 and 19 percent or more of EU-3 to continue with the same conditions and on the same development trend as described in the existing condition section.
- **EU-3.** In this EU, trees that have invaded into former frequent-fire-maintained grasslands would be partially or wholly killed by cutting, masticating or burning, which would increase grassland coverage and begin reversing the trend of oak tree invasions into historic semi-desert grassland. These changes would take place on up to 81 percent of EU-3 as mentioned above, leaving about 19 percent or more area to continue as described in the existing condition section with the trend toward oak invading semi-desert grasslands.

Table 18. Total acres and percent of ecological unit (EU) available for treatment

Ecological Unit	Total Acres and Percent of EU Available for Treatment
EU-1 Low gradient riparian systems	0
EU-2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	5,000 (30%)
EU-3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow, sycamore dominated riparian systems.	40,000 (81%)
EU-5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	45,000 (79%)
EU-6 Oak savanna and open woodlands on granite hills	10,000 (38%)
EU-7 Oak savanna and woodland, volcanic hills and low mountains	40,000 (81%)
EU-8 Oak savanna and woodland granite mountains	10,000 (43%)
EU-9 Grass-chaparral and oak savanna on limestone dominated hills and low mountains	20,000 (48%)
EU-10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	10,000 (49%)
EU-11 Pine-oak woodland on granitic hills and low mountains	15,000 (85%)
EU-12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite dominated mountains	15,000 (51%)
EU-13 Sensitive higher gradient streams (line segments) nested within EUs 5, 10, 11 and 12	0
EU-14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	40,000 (78%)
EU-15 Grass-chaparral, grassland and oak woodland, limestone dominated mountains	20,000 (79%)
Total	270,000 (66%)

- **EU-5, 6, 7, 8.** In these EUs, oak tree density would be less in treated areas due to cutting, masticating, or prescribed burn mortality. Smaller and younger trees would generally be killed or cut and large and old trees retained. This would result in an increase of the proportion of the EUs in very open oak savanna, a decrease in the proportion of the area in denser oak woodland, and the creation of a mosaic of savanna and woodland oak stands with

a high degree of stocking-level diversity between the stands. Treatments would involve up to 79 percent of EU-5 (Table 18), 38 percent of EU-6, 81 percent of EU-7, and 43 percent of EU-8. The remaining portions of these EUs would continue as described in the existing condition with the same trends toward increased tree density as described in the existing condition section.

- **EU-9.** In this ecological unit, treatments would increase grassland coverage, create patches of early chaparral successional stage, and decrease tree density in areas. Up to 48 percent of the ecological unit would be treated. This would increase the proportion of the ecological unit in oak/juniper savanna and decrease the proportion of the ecological unit in oak/juniper woodland. The ecological unit would become more of a mosaic composed of varying sized patches of grassland, late-successional chaparral shrubland, early successional chaparral shrubland, very open oak/juniper savanna, and oak/juniper woodland. About 52 percent or more (Table 18) of the ecological unit would continue as described under the existing condition, with the trend of increasing tree density, aging of chaparral shrubland, and decreases in grassland coverage as discussed in the existing condition section.
- **EU-10, 11, 12.** In these ecological units, treatments would decrease the density of small-diameter trees of all species. But more importantly, it would decrease the proportion of the understory vegetation in less fire-tolerant tree species such as oaks, Douglas-fir, and white fir, and increase the proportion of the remaining understory in more fire-tolerant pines. The stands would be more open and “park-like” and the natural distribution of the older trees would be more evident. With more open tree canopies, understory vegetation would increase in coverage, especially in areas where ground cover of heavy tree duff and litter has been reduced by prescribed burning. These treatments would involve up to 49 percent of EU-10 (Table 18), 85 percent of EU-11, and 51 percent of EU-12. The remaining untreated area would continue as described under the existing condition, with the trends toward increased density and increases in fire-intolerant tree species continuing as described above in the existing condition section.
- **EU-14.** In this ecological unit, oak density would be reduced in treated areas, mesquite coverage reduced, and grassland coverage increased. The ecological unit would become more of a mosaic composed of patches of oak savanna, oak woodland, mesquite shrubs and trees, and grassland. Treatments would involve up to 78 percent (Table 18) of the ecological unit with about 22 percent or more of the ecological unit continuing as described above in the existing condition section.
- **EU-15.** In this ecological unit, oak woodland density would be reduced in treated areas, oak woodland coverage would be reduced slightly, chaparral coverage would be reduced, patches of a younger chaparral age class would be created, and grassland coverage would increase. The ecological unit would become more of a patchy mosaic of oak woodland, oak savanna, old age chaparral shrubs, young chaparral shrubs, and grassland. These treatments would involve up to 79 percent (Table 18) of the ecological unit with the remaining 21 percent or more of the ecological unit continuing as described in the existing condition section.

Fire Behavior

Direct and indirect effects of the proposed treatments on flame lengths and fire types were modeled for proposed activities. In the fire behavior modeling, it was assumed that with the exception of wilderness and non-Federal lands, treatments would be applied to all areas within the project analysis area. Outputs from the modeling show predicted changes in flame lengths and fire types over the entire analysis area, except for those areas excluded (see Figure 21 and Figure 23, Appendix, part F). Figure 13 shows a comparison of modeled flame lengths between the no action and proposed action

alternatives. Carrying out proposed treatments would result in a substantial overall reduction in predicted flame lengths within the project analysis area.

Figure 14 and Figure 15 display predicted flame lengths as a percentage of each ecological unit for no action (Alternative 1) and the proposed action (Alternative 2).

Figure 14 shows that proposed treatments would reduce flame lengths in every ecological unit. This reduction would only occur in those portions of the ecological units proposed for treatment (Table 1). The remaining untreated portion of the ecological units would experience flame lengths as discussed under the Existing Condition, and No Action sections above.

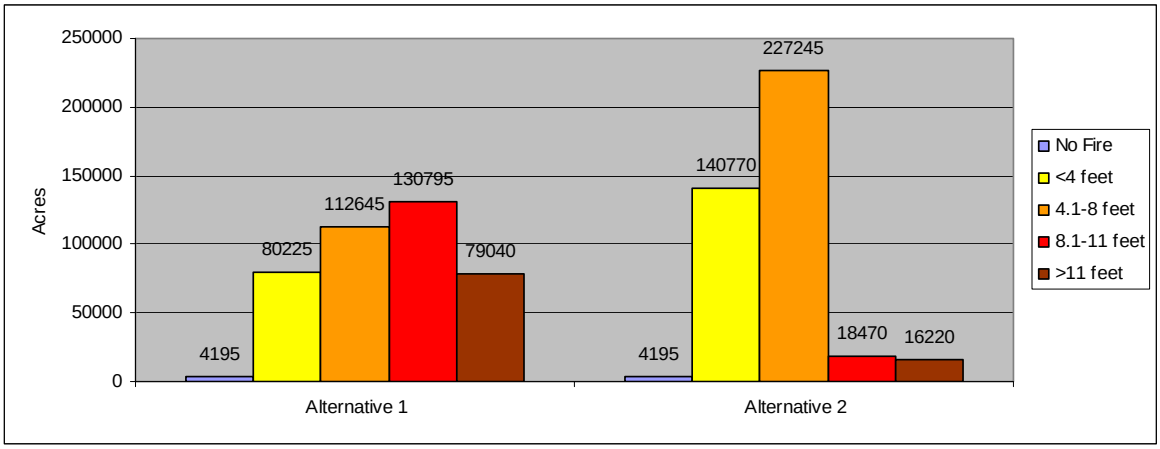


Figure 13. Comparison of each alternative's predicted effect on flame lengths

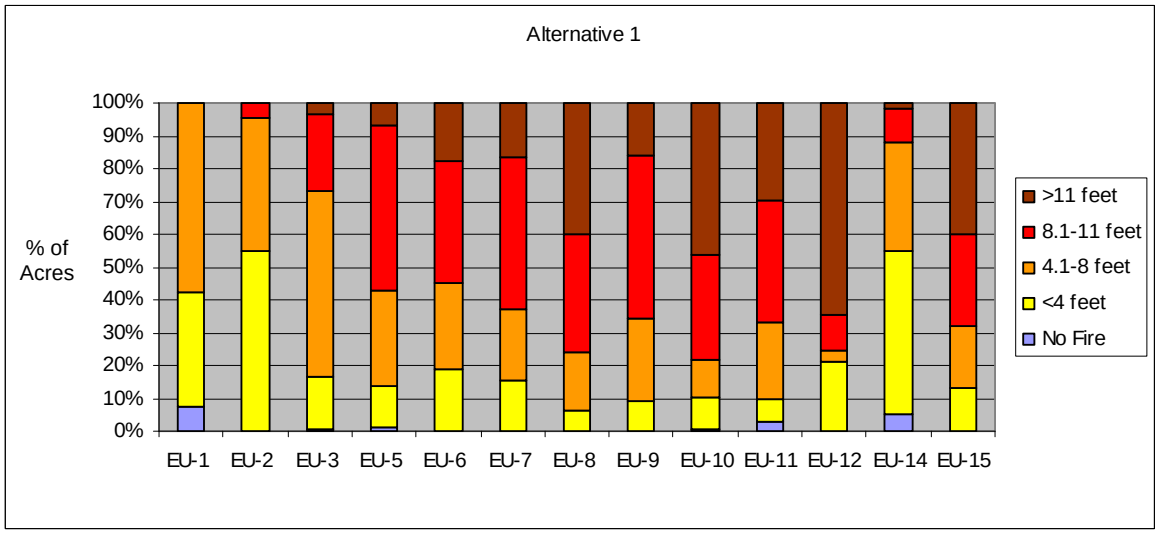


Figure 14. Modeled proportions of flame length ranges by ecological unit for Alternative 1

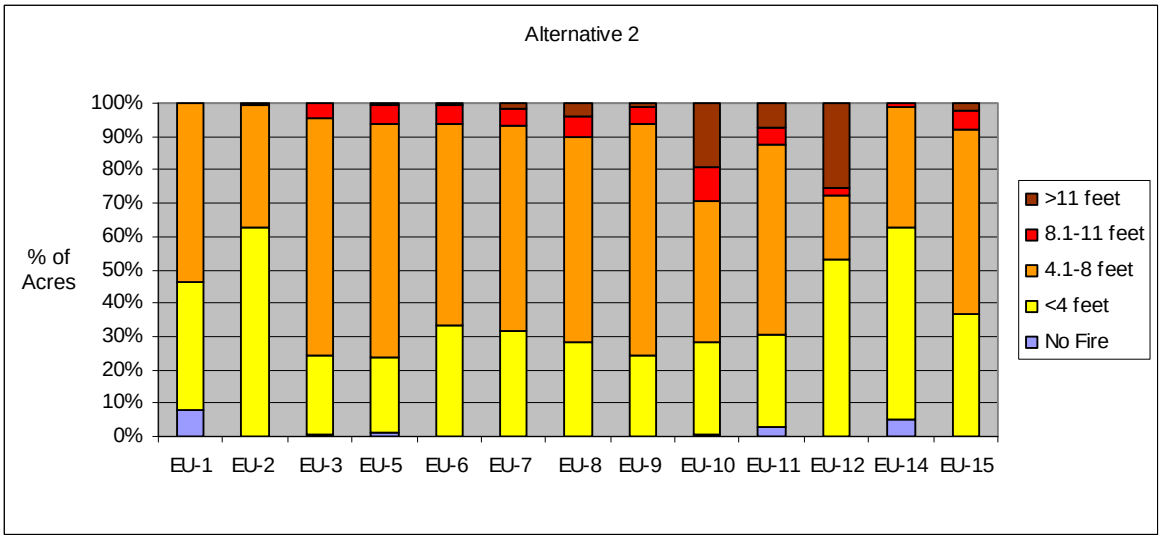


Figure 15. Modeled proportions of flame length ranges by ecological unit for Alternative 2

Figure 16 shows a comparison between alternatives in fire type over the project analysis area except for excluded areas as discussed above. Figure 16 shows a moderate reduction in crown fire activity (active to passive) or (passive to surface) due to the treatments; however, the acres proposed for treatment would be less than what is displayed. Figure 17and Figure 18 compare the proportion of fire type in each ecological unit for each alternative. Based on fire modeling, all ecological units show a reduction in active crown fire and less potential for severe stand-replacing wildfire. The most notable changes are in EUs 8, 10, 11, 12, and 15. As stated above, these reductions would only occur in those portions of the ecological units proposed for treatment in Table 1 with the remaining untreated portions of the ecological units as discussed under the Existing Condition.

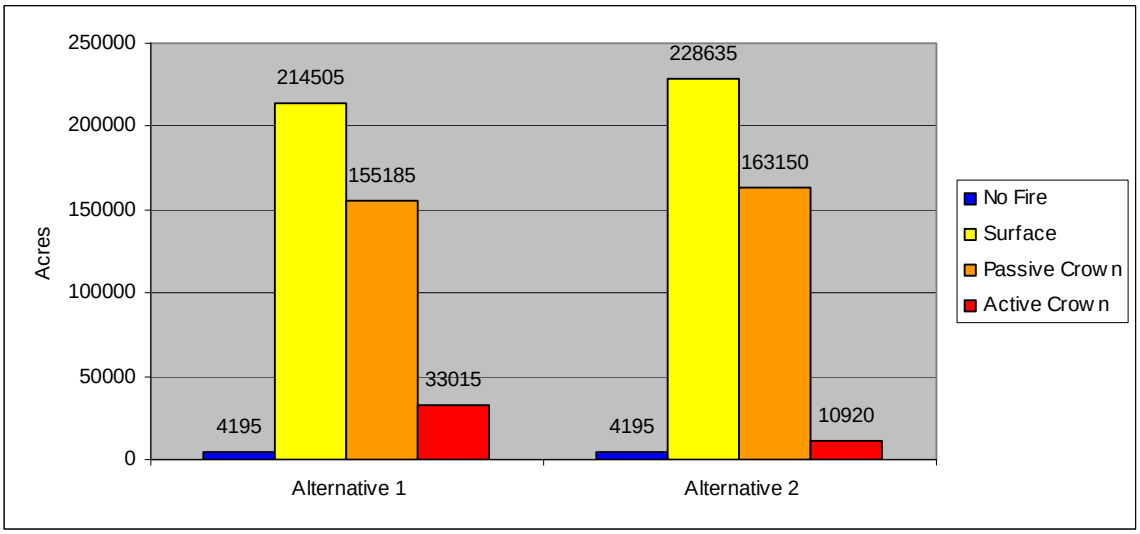


Figure 16. Comparison of each alternative's predicted effect on fire type

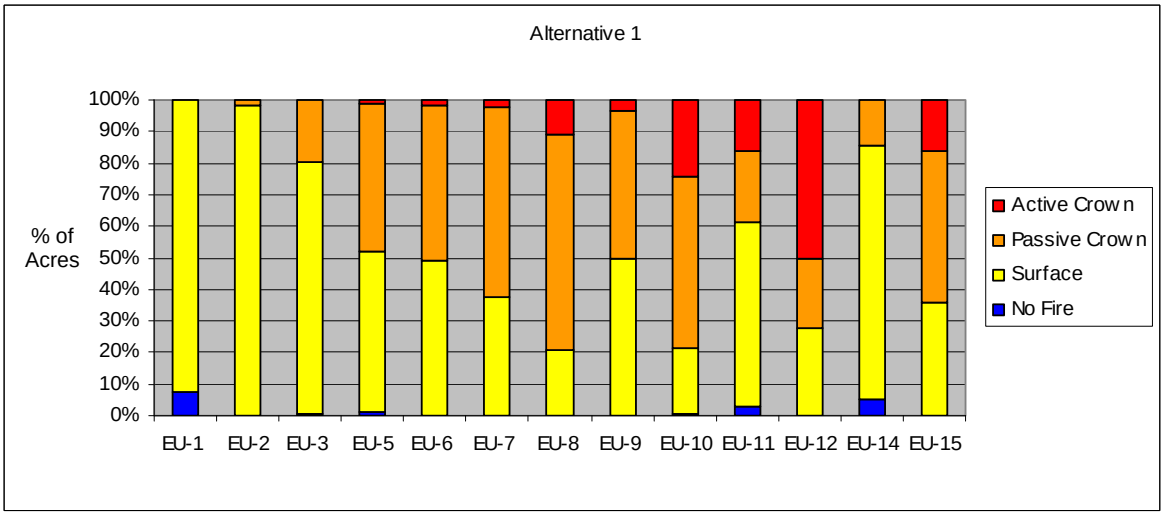


Figure 17. Modeled proportions of fire types by ecological unit for Alternative 1

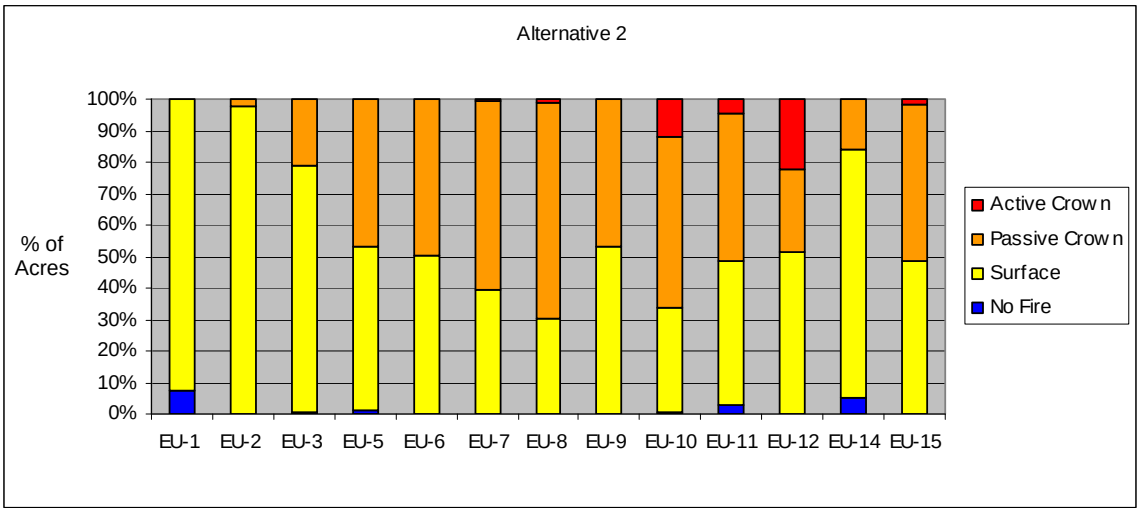


Figure 18. Modeled proportions of fire types by ecological unit for Alternative 2

Thinning dense, small-diameter understory trees and vegetation would reduce ladder fuels and help keep fires in the surface fuels, reducing the potential for crown fire. Fire suppression would continue to occur; however, the proposed action would reduce flame lengths and consequently fireline intensity, allowing suppression personnel to safely use more direct suppression tactics (Rothermel 1983). Proposed treatment areas would be dispersed throughout the project analysis area, helping to break up fuel continuity and reducing the likelihood of wildfires gaining momentum over the landscape.

Fire Regime and Condition Class

Proposed treatments would begin to restore ecological processes, including the frequent low-to-mixed-severity fire regimes that historically occurred. In the portions of the ecological units where treatments are proposed (Table 1), the fire regime condition class would move toward the desired condition discussed above (and in the Appendix, part A), especially in those areas currently considered to be in fire regime condition class 3. Those portions of the ecological units not being

treated would continue to be outside their historical range, and would continue to progress toward fire regime condition class 3.

Cumulative Effects

The cumulative effects analysis area was determined to be the area within the project analysis boundary, because it is of sufficient size to manage vegetation, fire behavior, and effects on a landscape level. For grassland, shrubland, oak savanna, and woodland ecological units, activities (including wildfires) within the last 20 years were considered. This approach was based on the assumption that vegetation in these ecological units impacted by activities more than 20 years ago, but having had no impacts since, would be as described under the existing condition. In addition, for pine-oak and mixed-conifer ecological units, all recorded wildfires were included; this is because the impacts of wildfires to those ecological units were considered to last more than 20 years.

Past, present, and foreseeable activities that have occurred, are occurring, and will occur in the project analysis area include use and maintenance of: roads, trails, developed campgrounds, picnic areas, interpretive sites, administrative facilities, the Sycamore Backcountry Recreation Area, livestock range allotment use, range water improvements, range fencing, herbicide application, mining, rural and urban development, prescribed burning, fuelwood cutting, manual fuel treatments (thinning and burning), mechanical fuels treatments (mastication), and wildfires. Of these, the activities considered relevant to the cumulative effects analysis include prescribed burning, mastication, range allotment use, hand thinning of shrubs and trees, pile burning, herbicide application, and wildfires. Although the impacts of the other activities to vegetation, fuels, and fire behavior may be substantial in very small, localized areas, their area of impact is very small in relation to the large size of the analysis area.

With the exception of range allotments, the proportions of each ecological unit impacted by past and ongoing activities are displayed in Effects on Vegetation

There are two levels of cumulative effects that can be discussed: 1) the cumulative effect of all activities and the proposed action impacting vegetation on the proportion of each EU where treatments would occur, and 2) the cumulative effect of more than one activity impacting vegetation in an area over time. Table 19 displays a range of area that could be impacted by past, present, and foreseeable activities, including the proposed action. For example, activities not including the proposed action will have impacted about 16 percent of EU 3, and the proposed action would impact 81 percent of the ecological unit. If the area in the 16 percent of the ecological unit is impacted by the proposed action, then 81 percent of the ecological unit would cumulatively be impacted. If the area does not overlap, then up to 99 percent of the ecological unit could be cumulatively impacted. In EU 3, from 1 to 19 percent of the ecological unit would not be cumulatively impacted and would continue as described above for the existing condition and no action alternative. In the proportion of the ecological unit only impacted by the proposed action, the effect would be as described above for the direct and indirect effects.

Table 19. The table also includes the percentage of each ecological unit that would be impacted by Alternative 2, and a percent range of each ecological unit that could be cumulatively impacted. In establishing the lower bounds of the percentile range of area affected, it was assumed that the effects of other actions and the proposed action overlap, and that the upper bounds of the percentile range represent the area affected if other actions and the proposed action do not overlap.

Effects on Vegetation

There are two levels of cumulative effects that can be discussed: 1) the cumulative effect of all activities and the proposed action impacting vegetation on the proportion of each EU where treatments would occur, and 2) the cumulative effect of more than one activity impacting vegetation in an area over time. Table 19 displays a range of area that could be impacted by past, present, and foreseeable activities, including the proposed action. For example, activities not including the proposed action will have impacted about 16 percent of EU 3, and the proposed action would impact 81 percent of the ecological unit. If the area in the 16 percent of the ecological unit is impacted by the proposed action, then 81 percent of the ecological unit would cumulatively be impacted. If the area does not overlap, then up to 99 percent of the ecological unit could be cumulatively impacted. In EU 3, from 1 to 19 percent of the ecological unit would not be cumulatively impacted and would continue as described above for the existing condition and no action alternative. In the proportion of the ecological unit only impacted by the proposed action, the effect would be as described above for the direct and indirect effects.

Table 19. Percent of EUs affected by past, present and foreseeable actions, Alternative 2; and the percent range cumulatively affected

EU	Prescribed Burning	Wildfires	Mechanical and Hand Removal	Total	Alternative 2	Range of EU Cumulatively Effected (Percent)
1	70.2	0	0	70.2	0	70
2	15.5	0.2	0	15.7	30	30-46
3	5.2	13.8	0.2	19.2	81	81-99
5	12.6	10.1	7.2	29.9	79	79-100
6	0	4.8	0	4.8	38	38-43
7	4.5	12.6	0	17.1	81	81-97
8	0	6.6	0	6.6	43	43-50
9	0	31.9	0.5	32.4	48	48-80
10	10.6	55.6	0	66.2	49	66-100
11	9.6	3.9	3.4	16.9	85	85-100
12	2.5	13.9	0	16.4	51	51-67
13	0	0	0	0	0	
14	26.9	6.5	6.2	39.6	78	78-100
15	0	0	0	0	79	79

In EU 3, up to about 16 percent of the ecological unit could be impacted by more than one activity, including the proposed action. On the area receiving more than one activity, there would be a cumulative effect of the multiple activities. The cumulative effects of the multiple activities would be to further reduce shrub coverage and oak encroachment into the semi-desert grasslands, and push vegetation toward the desired condition of dominance by native grass communities.

The previous discussion generally applies to all ecological units. Proportions of the ecological units outside of the ranges displayed above would not be impacted and would continue to be as described above for the existing condition. Proportions of the ecological units only impacted by the proposed action would be as described above under direct and indirect effects. Proportions of the ecological units impacted by more than one activity would be further pushed toward the desired condition. Historic trends toward shrub and oak expansion into grasslands, oak savanna conversion to oak woodland, conifer stocking increases, and increases in fire-intolerant species discussed above would be reversed to a greater degree than that occurring as a result of one activity.

Portions or all of 12 ecological units on National Forest lands are within grazing allotments (Table 20). The cumulative impact of livestock use of range allotments and the proposed action would be somewhat different than that of other activities. The other activities discussed above would generally reduce shrub and tree coverage and increase coverage of understory herbaceous vegetation. Livestock use in range allotments would tend to reduce understory herbaceous vegetation and enhance the establishment of shrubs and trees. However, the impacts of managed grazing are considered generally to be minor, except in localized areas where livestock congregate (Lorenz, 2008).

Table 20. Percent of EUs in grazing allotments

EU Number	Percent of EU	EU Number	Percent of EU
2	15	9	93
3	80	10	99
5	95	11	33
6	100	12	58
7	92	14	28
8	100	15	100

Effects on Fire Behavior and Fire Regime Condition Class

Past, present and foreseeable activities displayed in at beginning of Chapter 3 and wildfires displayed in the Appendix, part E, combined with this alternative, would reduce surface, ladder and crown fuels over most of the project analysis area. Cumulatively, these activities result in reductions in flame length (fireline intensity) and severe crown fire to a greater degree than described above under the proposed action, due to the amount of area involved. Because some areas may be impacted by more than one activity, there would be greater reductions in fireline intensity and severe crown fire in those areas. All of the activities discussed would cumulatively break up fuel continuity on the landscape, allowing wildfires to be suppressed more readily resulting in reduced fire size. This would result in greater community protection and firefighter safety, as well as reduced suppression costs and resource damage from future wildland fires.

The cumulative effects of all activities would be such that on most of the analysis area, the fire regime condition class would move toward the desired condition, and on areas where more than one activity would occur, a greater movement toward the desired condition of fire regime condition class 1 would result. These combined activities would greatly facilitate restoring and sustaining ecological processes in fire-dependent ecosystems, and move vegetation and fuel conditions toward their historic fire regimes (fire regime condition class 1). They would set the stage for managing naturally occurring fires in fire-dependent ecosystems.

Summary

This alternative involves prescribed burning, which always carries some degree of risk for a fire escape resulting from unforeseen factors, such as adverse changes in weather. However, all prescribed burning requires that a burn plan be developed to minimize the risk of fire escape. There could be

temporary road, campground, and hiking trail closures as a result of implementation of proposed activities.

This alternative would push the current condition of vegetation on a large portion (up to 66 percent, Table 1) of the project area toward the desired condition, and reverse the undesirable trends discussed in the HAFP Plan (HAFP 2005) and this document. On treated portions of the ecological units, as discussed above, the treatments would help reverse shrubland and woodland expansion into semi-desert grassland, resulting in an expansion of semi-desert grasslands. Also, on treated portions of ecological units, the trend toward increased woodland and conifer forest stocking, especially of small-diameter trees and the more fire-intolerant tree species would be reversed over a large portion of the project area. The forests and woodlands would be more open and park-like, and more resistant to stand-replacing insect and fire events, as well as drought episodes. On the remaining untreated areas, the existing condition and the trends discussed above would continue.

This alternative would result in fuel conditions that produce more manageable fire behavior, and moves vegetation and fuel conditions toward their historic conditions. Treatments would result in reduced fireline intensity and crown fire activity over a large portion of the analysis area and would move the area toward the desired condition of fire regime condition class 1. Treatments would result in reduced suppression costs, resource damage, and threats to the public, including the wildland-urban interface resulting in improved firefighter safety. Proposed activities would also make the area more suited for future prescribed fire applications; therefore, progress would be made toward initiating the restoration of ecological processes. Those proportions of the ecological units not being treated would continue to be outside their historical range, and would continue to progress toward fire regime condition class 3.

Consultation and Coordination

The Forest Service consulted the following individuals, Federal, State and local agencies, tribes and other entities during the development of this environmental assessment:

Federal and State Officials and Agencies

- U.S. Department of the Interior, National Park Service, Coronado National Memorial
- U.S. Department of Defense, Fort Huachuca Army Installation
- U.S. Department of the Interior, Fish and Wildlife Service
- U.S. Department of the Interior, Bureau of Land Management
- Arizona Game and Fish Department
- Arizona State Historic Preservation Office
- Arizona Department of Environmental Quality
- Army Corps of Engineers
- U.S. Department of Homeland Security
- San Rafael Ranch State Park, Arizona State Parks
- Arizona State Land Department
- San Pedro Riparian National Conservation Area, Bureau of Land Management

Tribes

- Ak-chin Indian Community
- Fort McDowell Yavapai Nation
- Hopi Tribe

Others

- Non-Federal Huachuca Area Fire Partners
  - Appleton-Whittell Research Ranch, National Audubon Society
  - Babocomari Ranch
  - San Rafael Ranch
  - Southeastern Arizona Preserves, The Nature Conservancy

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References

Abbott, L. 1997. The ecological role of fire in semidesert grassland ecosystems of southeastern Arizona. Final Draft, Upper San Pedro Ecosystem Program, The Nature Conservancy, Contract No. USPE050197.

Altschul, .H., and B.A. Jones. 1990. Settlement Trends in the Middle San Pedro: A Cultural Resources Sample Survey of the Fort Huachuca Military Reservation. Technical Series No. 19. Statistical Research, Inc., Tucson.

Altschul, J.H., M.G. Cottrell, C.W. Meighan, and R.H. Towner (compilers). 1993. *The Garden Canyon Project: Studies at Two Rockshelters, Fort Huachuca, Southeastern Arizona*. Technical Series No. 39. Statistical Research, Inc., Tucson.

Bahre, C.J. 1977. Land-Use History of the Research Ranch, Elgin, Arizona. Journal of the Arizona Academy of Science 12 (Supp.2): 1-32.

Bahre, C.J. 1991. A legacy of change: Historic human impact on vegetation of the Arizona borderlands. University of Arizona Press, Tucson.

Baisan, Christopher H. and Thomas W. Swetnam. 1990. Fire history on a desert mountain range: Rincon Mountain Wilderness, Arizona, U.S.A. Can. J. For. Res. 20:1559-1569.

Barrows, Jack S. 1978. Lightning fires in southwestern forests. Final report: Cooperative Agreement 16-156 CA. Unpublished report on file with: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory, Missoula, MT. 154 pp.

Bonnett, C. 2008. Scenery Resource Report for the Huachuca FireScape Project. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

Bronitsky, G., and J.D. Merrittt. 1986. The Archeology of Southeast Arizona: A Class I Cultural Resource Inventory. USDI Bureau of Land Management, Arizona, Cultural Resource Series No. 2. Phoenix.

Caveney, S. 2008. Recreation Report for the Huachuca FireScape Project. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

Danzer S.R., C.H. Baisan, and T.W. Swetnam. 1996. The influence of fire and land-use history on stand dynamics in the Huachuca Mountains of southeastern Arizona. *In:* Ffolliott, P. F., L. F. DeBano, M. B. Baker, Jr., G. J. Gottfried, G. Solis-Garza, C. B. Edminster, D. G. Neary, L. S. Allen, and R. H. Hamre, technical coordinators. Proceedings: effects of fire on Madrean Province ecosystems. United States Department of Agriculture, Forest Service General Technical Paper RM-289. Pp 265 -270.

Debano, L.F., D.G. Neary, and P. F. Folliott. 1998. Fire’s effects on ecosystems. John Wiley & Sons, Inc., 605 Third Avenue, New York, NY 10158-0012. p 331

Eichman, H. 2008. Huachuca FireScape Project Social Report. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

Geiger, Erika Lynn. 2006. The role of fire and a nonnative grass as disturbances in semi-desert grasslands of Southeastern Arizona. Unpublished PhD Dissertation, University of Arizona, Tucson, AZ. 131 pages.

Graham, Russell T.; McCaffrey, Sarah; Jain, Theresa B. (tech. eds.) 2004. Science basis for changing forest structure to modify wildfire behavior and severity. Gen. Tech. Rep. RMRS-GTR-120. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 43 p.

Grissino-Mayer, H.D., C. H. Baisan, and T. W. Swetnam. 1995. Fire history in the Pinaleño Mountains of southeastern Arizona: effects of human-related disturbances. Pages 399-407. In Debano, L. F., G. J. Gottfried, R. H. Hamre, C. B. Edminister, P. F. Ffolliott, A. Ortega-Rubio, tech. coords., Biodiversity and Management of the Madrean Archipeligo: The Sky Islands of Southwestern United States and Northwestern New Mexico, September 19-23, 1994, Tucson, Arizona, USDA Forest Service General Technical Report RM-GTR-264.

HAFP (Huachuca Area Fire Partners) 2005. Fire Management Plan. Available from The Nature Conservancy, Southeastern Arizona Preserves, Ramsey Canyon Preserve, Hereford, AZ.

Hall R., and L. Amell. 2008. Fuels and Silviculture Report for the Huachuca FireScape Project. Unpublished specialist report available from the project record.

Horton, Scott P. and R. William Mannan. 1988. Effects of Prescribed Fire on Snags and Cavity-Nesting Birds in Southeastern Arizona Pine Forests. Wildlife Society Bulletin, Vol. 16, No. 1, pp. 37-44

LeBlanc, C., and W. Gillespie. 2004. San Rafael Valley Manzanita Project: Background research and survey strategy. Coronado National Forest, Cultural Resources Report 2004-05-067. Report on file at Coronado National Forest Office, Tucson, AZ.

Lefevre, R. 2008. Huachuca FireScape Project Soils, Water, and Air Specialist Report. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

Lorenz, T. 2008. Huachuca FireScape Project Range Report. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

MacWilliams, A.C. 2001. The San Raphael de la Zanja Land Grant River Corridor Survey. Volume I & II. Unpublished Report Submitted by Arizona State Museum to Arizona State Parks.

McLaughlin, S.P. (1995). An overview of the flora of the sky islands, southeastern Arizona: diversity, affinities, and insularity. In DeBano, L.F., Ffolliott, P.F. and Hamre, R.H. (eds), Biodiversity and management of the Madrean Archipelago: the sky islands of southwestern United States and northwestern Mexico. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, Colorado.

McPherson, G.R. 1992. Ecology of oak woodlands in Arizona. In: P.F. Ffolliott, G.J. Gottfried, D.A. Bennett, C. Hernandez, V. Manuel, A. Ortega-Rubio, and R.H. Hamre, tech. cords. Ecology and management of oak and associated woodlands: perspectives in the southwestern United States and northern Mexico. 1992, April 27 – 30. Sierra Vista, AZ, GTR-RM-218. Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station. 24-33 pp.

Miller, J.D., S.R. Danzer, J.M. Watts, S. Stone, and S.R. Yool. 2003. Cluster analysis of structural stage classes to map wildland fuels in a Madrean ecosystem. Journal of Environmental Management, 68: 239-252.

Morino, K., C. Baisan, and T. Swetnam. 1999. Fire Regime Assessment for Coronado National Memorial, Arizona. Prepared for the National Park Service, Coronado National Memorial by the Laboratory of Tree Ring Research at the University of Arizona.

Nykamp, R. 2008. Heritage Report for the Huachuca FireScape Project. Unpublished report available from the project record, located at the Coronado National Forest, Tucson, AZ.

Ottmar, R.D. 2001. Smoke source characteristics. In: Hardy, C.C., R.D. Ottmar, J.L. Peterson, J.E. Core, P. Seamon, eds/comps. Smoke management guide for prescribed and wildland fire 2001 edition. National Wildfire Coordination Group; PMS 420-2, NFES 1279. December 2001. Chapter 5, pp 89-106. Available online at http://www.nwcg.gov/pms/pubs/SMG/SMG-72.pdf.

Peterson, David L.; Johnson, Morris C.; Agee, James K.; Jain, Theresa B.; McKenzie, Donald; Reinhardt, Elizabeth D. 2005. Forest structure and fire hazard in dry forests of the Western United States. Gen. Tech. Rep. PNW-GTR-628. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 30 p.

Pima County. 2001. Historic Summary of Pima County fact sheets. Available at http://www.pima.gov/areainfo/PDF/HistoricSum.pdf

Rothermel, Richard C. 1983. How to predict the spread and intensity of forest and range fires, Gen Tech Rep. INT-143, USDA, FS, Intermountain Range and Experiment Station, Ogden, UT, 161 p.

Schroeder, M.J. and C.C. Buck. 1970. Fire weather: a guide for application of meteorological information to forest fire control operations. Agriculture handbook No. 360. USDA Forest Service. Washington, D.C. 229 pp.

Scott, Joe H. and Robert E. Bergen. 2005. Standard fire behavior fuel models: A comprehensive set for use with Rothermel's surface fire spread model. USDA Rocky Mountain Research Station RMRS-GTR-153.

Swetnam, Thomas W.; Baisan, Christopher H., 1996. Fire histories on montane forests in the Madrean Borderlands. . In: P.F. Ffolliott; L.F. DeBano; M.B. Baker; G.J. Gottfried; G. Solis-Garza; cords. Effects of fire on Maderan Province Ecosystems. Gen Tech. Rep. RM-GTR-289. Fort Collins, CO: U.S. Department of Agriculture, Forest Service Rocky Mountain Forest and Range Experiment Station.

U.S. Census Bureau. 2000. Census 2000 Summary File. http://www.census.gov/census2000/states/

USDA and USDI (United States Department of Agriculture and United States Department of Interior). 2001. "Federal Wildland Fire Management: Policy and Program Review: Final Report." Washington, D.C.

USDA and USDI. 2000. National Fire Plan: Managing the Impact of Wildfires on the Communities and the Environment. Washington, D.C.

USDA and USDI. 2001. The Federal Wildland Fire Management Policy and Program Review. Available at http://www.forestsandrangelands.gov/

USDA and USDI. 2002. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment: 10-Year Comprehensive Strategy Implementation Plan. Available at http://www.forestsandrangelands.gov/

USDA Forest Service. 1982. ROS Users Guide. United States Department of Agriculture.

USDA Forest Service. 1986. Coronado National Forest Land and Resource Management Plan. Southwestern Region, Albuquerque, NM.

USDA Forest Service. 1999. Protecting People and Sustaining Resources in Fire-Adapted Ecosystems: A Cohesive Strategy. Washington, D.C.

USDA Forest Service. 2003. National Visitor Use Monitoring report, Coronado National Forest. Tucson, AZ.

USDA Forest Service. 2006. Coronado National Forest Management Indicator Species Population Status and Trends 1986-2006. United States Department of Agriculture Forest Service – Southwestern Region, Coronado National Forest

USDA Forest Service. 2007. Regional Forester Sensitive Species List. Southwestern Region (R3). Albuquerque, NM.

USDA Forest Service 2008. Coronado National Forest Fire Management Plan.

U.S. Department of Commerce. 2005. Regional Economic Information System, Bureau of Economic Analysis, U.S. Department of Commerce. Washington, D.C.

U.S. Department of Defense. 2001. Integrated Natural Resource Management Plan and Environment Assessment. U.S. Army Intelligence Center and Fort Huachuca. Sierra Vista, AZ.

USDI (United States Department of the Interior) Fish and Wildlife Service. 1995. Recovery plan for the Mexican spotted owl. Albuquerque, New Mexico. l72pp.

USDI Fish and Wildlife Service. 2007. Biological Opinion for ongoing and future military operations at Fort Huachuca. June 14, 2007. Available from Fort Huachuca Army Intelligence Center, Sierra Vista, AZ.

USDI National Park Service. 1998. Coronado National Memorial Natural and Cultural Resources Management Plan. Coronado National Memorial. Hereford, AZ

USDI National Park Service. 2004. Coronado National Memorial General Management Plan. Coronado National Memorial. Hereford, AZ

USDI National Park Service. 2005. Coronado National Memorial Fire Management Plan. Coronado National Memorial. Hereford, AZ

U.S. Department of Labor. 2006. Bureau of Labor Statistics.

U.S. General Accounting Office. 1999. Western National Forests: A Cohesive Strategy is Needed to Address Catastrophic Wildfire Threats. GAO/RCED-99-65. Washington, D.C.

U.S. General Accounting Office. 2001. The National Fire Plan: Federal Agencies Are Not Organized to Effectively and Efficiently Implement the Plan. Washington, D.C.

Vanderpot, R. 1994. An Archaeological Survey of 1850 Acres on the Lone Mountain Ranch Land Exchange in the San Rafael Valley, Arizona. Technical Report No. 93-20. Statistical Research, Inc, Tucson.

Vanderpot, R. 1997. From Foraging to Farming: Prehistoric Settlement and Subsistence Dynamics of the San Pedro Valley. In, Prehistory of the Borderlands: Recent Research in the Archaeology of Northern Mexico and the Southern Southwest. Edited by J. Carpenter and G. Sanchez, pp. 33-45. Archaeological Series 186. Arizona State Museum, University of Arizona, Tucson.

Whittlesey, S.M., R.S. Ciolek-Torello, and M.A. Sterner. 1994.Southern Arizona, the Last 12,000 Years: A Cultural-Historical Overview for the Western Army National Guard Aviation Training Site. Statistical Research, Technical Series No. 48. Tucson.

Appendix

A - Ecological Units and Desired Conditions

B – Agency Standards and Guidelines

C - Design Criteria and Best Management Practices

D – Huachuca FireScape Monitoring Plan

E – Actions Relevant to Cumulative Effects

F – Fire and Fuels Analysis Maps

A - Ecological Units and Desired Conditions

Table 21. Current and desired conditions of fire regime condition classes for each ecosystem unit in the project area, and desired vegetative condition

Ecological Unit	Current Fire Regime Condition Class	Fire Regime[1] and Desired Fire Regime Condition Class[2]	Desired Vegetative Condition
EU-1 Low gradient riparian system	**Depending on reach, class 1** (within "historical range") **or 2** (moderate departure due to invasive species & soil/channel degradation)	**Historic Fire Regime I** **Desired condition class is class 1, or class 2** trending toward class 1, depending on reach.	The EU is dominated by herbaceous native wetland species (cienegas) interspersed with reaches supporting gallery cottonwood-willow forest in what can be considered a healthy and properly functioning riparian system. Fremont Cottonwood, Gooding's willow, and sacaton are associated with low terraces and floodplains. Stream banks and aquatic habitats support spike rush, sedges, cattails, and bulrush. The better-drained upper terraces and valley side slopes are characterized by grasslands dominated by blue grama, vine-mesquite, side-oats grama, plains lovegrass and three-awns.
EU-2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	**Class 3 for San Pedro River** dissected terraces (high departure due to extensive soil loss and shrub increase at expense of grasses; also prevalence of non-native species in some areas); **Class 1 or 2 in other units** (Class 2 due to non-native species mainly in the saline terrace component)	**Historic Fire Regime V** (due to inherently high bare soil and lack of grasses and other fine fuels this unit was generally not fire dependent; However, the dissected terraces adjacent to the San Pedro River are the exception. They supported grasslands historically, and generally reflected Historic Fire Regime ll, but were impacted by river down cutting and management impacts). Desired condition class 1 or class 2 trending toward class 1; Desired condition class 3 on San Pedro River dissected terraces	This EU consists mostly of desert scrub. Common species include creosote bush, whitethorn acacia and four-wing saltbush. This EU includes a discontinuous areas of mesquite grassland mostly associated with the dissected terraces adjacent to the San Pedro River. It either has inherent soil and vegetation characteristics, or as in the case of the San Pedro River dissected terraces is so severely eroded, that restoration is either unnecessary or would prove ineffective In much of this EU.

Ecological Unit	Current Fire Regime Condition Class	Fire Regime[1] and Desired Fire Regime Condition Class[2]	Desired Vegetative Condition
EU-3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore dominated riparian systems.	**Generally class 1 with some smaller areas of class 2 or 3** (mostly in the Sonoita area based on the extent of invasive species and shrub/tree encroachment). **Depending on riparian reach, class 1 or 2** (due to localized soil/channel degradation and non-native species).	**Historic Fire Regime II** (included riparian is Historic Fire Regime 1) **Desired condition class 1** (included riparian is desired condition class 1, or class 2 trending toward class 1, depending on reach).	This EU is dominated by native grass communities maintained by a frequent fire regime. The dominant grass species include blue grama, sideoats grama, cane beardgrass, hairy grama, plains lovegrass and little bluestem; scattered Emory oak and junipers occur at higher elevations and in moister microsites, such as draws. Non-native grasses are not present or occur only at low levels. The lower terraces of riparian systems are dominated by sycamore and walnut and are bordered by oak savanna side-slopes in what can be considered a healthy and properly functioning riparian system.
EU-5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	**Mostly class 3** (high departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species); class 1 or class 2 moving toward class 1 in areas of large fires (Merit and Ryan Fires)	**Historic Fire Regime I** **Desired condition class 1**	This EU is dominated by oak savanna with a canopy cover of 5 to 12% (average 25- to 45-foot spacing) interspersed with oak/juniper woodland areas 12 to 30% canopy cover (average 15- to 25-foot spacing) generally confined to low areas and on steep north-facing slopes associated with drainages. Major tree species present are Emory oak, Mexican blue oak, one-seed juniper, and alligator juniper. Point-leaf manzanita is also present but as a minor component. Understories are dominated by grass/herbaceous cover with minor components of cactus and succulents, including agave, prickly pear, pincushion cactus, sotol, beargrass, and yucca. Grasses include gramas, plains lovegrass and cane beardgrass.
EU-6 Oak savanna and open woodlands on granite hills	**Class 3** (high departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species)	**Historic Fire Regime I** **Desired condition class 1**	This EU is dominated by oak savanna with a canopy cover of less than 10% (greater than 30-foot spacing) composed mostly of oaks, interspersed with oak/juniper woodland areas with tree canopy cover of 10 to 30% (average 15- to 30-foot spacing) in low areas and on steep north facing slopes associated with drainages. Major vegetation species are as described above for EU-5. Mesquite may be present at lower elevations of this unit that are transitional to EU 14.

Ecological Unit	Current Fire Regime Condition Class	Fire Regime[1] and Desired Fire Regime Condition Class[2]	Desired Vegetative Condition
EU-7 Oak savanna and woodland, volcanic hills and low mountains	**Class 3** (high departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species)	**Historic Fire Regime I** **Desired condition class 1**	This EU is dominated by oak woodland dominated by oak species with 10-30% canopy cover (average 15- to 30-foot spacing) and oak savanna on drier aspects with continuous fine fuels (less than 10% canopy cover, greater than 30-foot spacing). The oak woodland varies in canopy cover due to fuel discontinuities caused by rock outcrops, thin soils, and variation in primary production. Major vegetation species are as described above for EU-5.
EU-8 Oak savanna and woodland granite mountains	**Mostly class 3** (high departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species)	**Historic Fire Regime I** **Desired condition class 1**	This EU is dominated by Arizona white oak, Mexican pinyon, madrone, alligator juniper, netleaf oak, and silverleaf oak. Tree canopy cover is generally 12 to 30% (average 15- to 25-foot spacing). Common shrubs associated with the oak woodland include pointleaf manzanita, Wright's silktassel, and evergreen sumac. More xeric sites are dominated by a savanna and possibly chaparral. The EU is generally a mosaic of canopy covers due to variations in aspect and site quality, as well as the presence of large rock outcrops and escarpments.
EU-9 Grass - chaparral and oak savanna on limestone dominated hills and low mountains	**Class 2** (moderate departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species) – trend is buffered by extremely limey soils and extensive bare ground	**Historic Fire Regime II** **Desired condition class 1**	This EU is a mosaic of chaparral patches with varying canopy cover (5 to 25%), reflecting different post-fire successional stages and composed primarily of fire-tolerant and resprouting species. Chaparral species include mountain mahogany, Stansbury cliffrose, oaks (shrub form or large trees), Mearns sumac, and pointleaf manzanita. Areas with deeper soils and higher fine fuel loads support an Emory oak and juniper savanna with 5 to 12% canopy cover (average 25- to 45-foot spacing). Grasses, including gramas, needlegrass and threeawns are prevalent.
EU-10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	**Class 3** (high departure due to greater tree and shrub densities, increasing prevalence of fire intolerant species, and displacement of understory vegetation by litter and woody debris)	**Historic Fire Regime I** **Desired condition class 1**	This EU is dominated by oak-pine woodland with canopy cover 12 to 40% (average 15- to 25-foot spacing) and with a grass/herbaceous understory. The overstory is composed primarily of fire tolerant species including resprouting species. Species present includes Chihuahua pine, Apache pine, Mexican pinyon pine, Arizona white oak, silverleaf oak and net-leaf oak, with Arizona pine and alligator juniper and Douglas-fir present on the moister sites.

Ecological Unit	Current Fire Regime Condition Class	Fire Regime[1] and Desired Fire Regime Condition Class[2]	Desired Vegetative Condition
EU-11 Pine-oak woodland on granitic hills and low mountains	**Class 3** (high departure due to greater tree and shrub densities, increasing prevalence of fire intolerant species, and replacement of understory vegetation by litter and woody debris)	**Historic Fire Regime I** **Desired condition class 1**	Desired conditions for this EU are similar to those described for EU-10 except that vegetation coverage is more uniform due to deeper soils, fewer rock outcrops, and less aspect variation. Pines are also more prevalent in the overstory. Tree densities are maintained at sometimes artificially low levels in the wildland urban interface, particularly near structures, along major roads, and in association with strategic fuel breaks.
EU-12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite dominated mountains	**Class 3** (high departure due to greater tree and shrub densities, increasing prevalence of fire intolerant species, and replacement of understory vegetation by litter and woody debris)	**Historic Fire Regime I** **Desired condition class 1**	This EU is a mosaic of pine and mixed-conifer forest with canopy cover 10 to 40% (average 20- to 35-foot spacing) with a grass/herbaceous understory. The overstory is composed primarily of fire tolerant species, including resprouting species. Major species in the pine communities are Arizona pine, Douglas-fir, southwestern white pine, silverleaf oak, and Gambel oak. The more mesic north-facing slopes in the uppermost elevations are dominated by white fir, Douglas-fir, and aspen with varying amounts of pine. Common shrub species include oak species, New Mexican locust, Wilcox's barberry, Fendler ceanothus, and mountain snowberry; common grasses include Muhlenbergia and pine dropseed.
EU-13 Sensitive higher gradient streams (line segments).	Largely dictated by the existing conditions of landscape units (EUs 5,10,11 and/or 12) within which they occur	**Historic Fire Regime I** **Desired condition class 1**	EU-13 is dominated by streamside vegetation reflective of "historic" conditions. EU provides critical habitat and areas of refuge for threatened and endangered species. Restoration of desired conditions for the units within which these stream segments are embedded contributes to the sustainability of these critical habitats.
EU-14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	**Class 3** (high departure due to greater tree and shrub densities and prevalence of non-native grass and forb species in many areas)	**Historic Fire Regime II** (these units were grasslands historically with no or little mesquite). **Desired condition class 1**	The EU is dominated by grasslands with very sparse mesquite shrubs and trees, confined mostly to microsites protected from fire. Oak savanna and open woodlands occur in the upper elevations on cooler moister microsites and in areas transitional to higher elevations. Woodland and savannah canopy cover is similar to that found in EU-6. The grass/herbaceous cover in most areas are currently dominated by non-natives, especially Lehmann lovegrass, which may limit restoration opportunities. Native grasses dominate many areas adjacent to the east slopes of the Huachuca Mountains.

Ecological Unit	Current Fire Regime Condition Class	Fire Regime[1] and Desired Fire Regime Condition Class[2]	Desired Vegetative Condition
EU-15 Grass-chaparral, grassland and oak woodland, limestone dominated mountains	**Class 2** (moderate departure due to greater tree and shrub densities and increasing prevalence of fire-intolerant species) – trend is buffered by extremely limey soils, extensive bare ground and presence of rock outcrops and escarpments	**Historic Fire Regime I** (oak woodland) and II (grass – chaparral and grassland). **Desired condition class 1**.	The EU is a mosaic of grass-chaparral, grassland and oak woodland. Vegetation types are strongly dictated by site characteristics related to elevation, slope, and aspect. Oak woodland canopy cover and species composition is similar to that discussed above for lower elevation oak woodlands and are dominated by Emory oak, Mexican blue oak, one-seed juniper, border pinyon, and alligator juniper. Grass-chaparral occurs as a mosaic of age classes with the younger age classes dominated by grass/herbaceous cover. Chaparral species include mountain mahogany, Stansbury cliffrose, oaks (shrub form or large trees), Mearns sumac, and pointleaf manzanita. Grasses include gramas, needlegrass and threeawns. .

1 Fire Regime I = 0 to 35-year frequency and low- (surface fires most common) to mixed-severity (less than 75 percent of the dominant overstory vegetation replaced)
Fire Regime II = 0 to 35-year frequency and high (stand-replacement) severity (greater than 75 percent of the dominant overstory vegetation replaced)
Fire Regime V = 200+ year frequency and high (stand replacement) severity

2 Condition Class 1: Fire regimes are within an historical range and the risk of losing key ecosystem components is low. Vegetation attributes (species composition and structure) are intact and functioning within their historical range.
Condition Class 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 landscape patterns. Vegetation attributes have been moderately altered from their historic range.
Condition Class 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. This results in dramatic changes to one or more of the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes have been significantly altered from their historical range.

B – Agency Standards and Guidelines

This section provides specific guidance from each Federal agency supporting the purpose and need for the FireScape Project.

Coronado National Forest Land Resource Management Plan (LRMP 1986; pp. 9-11, 45)

- Reduce the costs, resource damage, and threats to public and firefighter safety from future wildland fires.
- Manage naturally occurring fires to restore and sustain ecological processes in fire-dependent ecosystems.
- Create and maintain fuel conditions for low risk of extreme fire behavior and high-intensity wildland fires.
- Through integrated pest management, manage resources to prevent a buildup of insects and diseases.
- Cooperate with state and local law enforcement agencies in the protection of visitors, their property and National Forest lands and facilities.
- Cooperate with other Federal, State and local regulatory agencies to protect air quality as required by the Clean Air Act.
- Provide for ecosystem diversity by at least maintaining viable populations of all native and desirable nonnative wildlife, fish, and plant species through improved habitat management.
- Improve the habitat of and the protection for local populations of threatened and endangered species to meet the goals of the Endangered Species Act of 1973.
- Restore rangeland to at least a moderately high ecological condition (70 to 75 percent of potential production, fair range condition) with stable soil and a static or upward trend.
- Continue a program that enhances other resource values, and that effectively utilizes the wood fiber produced. Carry out silvicultural practices to improve stand health when such practices are consistent with other resource objectives.
- Provide a favorable water flow in quantity and quality for off-Forest users by improving or maintaining all watersheds to a satisfactory or higher level.

Coronado National Forest LRMP Amendment 11

In 2005, the LRMP was amended to incorporate the policies of the 2001 Federal Wildland Fire Management Policy and Review (USDI and USDA 2001). The LRMP, as amended, calls for an appropriate management response to wildland fires. This includes an appropriate suppression response and the ability to allow natural ignitions to play, as nearly as possible, their natural ecological role Forestwide (LRMP p. 45).

Forestwide Fire, Fuel, and Air Quality Management Standard and Guidelines

- Firefighter and public safety shall be the first priority in all fire management activities.
- All human-caused fires shall be suppressed using appropriate suppression response strategies.
- Wildland fire suppression responses shall minimize costs of suppression, resource impacts, and risks to life and property.
- The appropriate management response for each natural ignition will vary across the Forest but will include the full spectrum of options, from aggressive initial attack to management to achieve resource objectives.

- For all management areas, management of lightning-caused fires should be considered to restore fire's natural role in maintaining a healthy, diverse, and resilient ecosystem resistant to natural disturbances.
- Plan management practices to meet local, State and Federal air quality standards.

USDI National Park Service (Coronado National Memorial)

Coronado National Memorial General Management Plan (2004, p. 15)

- Fire management programs in the Memorial will be designed to meet resource management objectives prescribed for various areas of the memorial and to ensure that firefighter and public safety are not compromised.
- Conduct an active fire management program in the Memorial as directed by 1998 Natural and Cultural Resources Management Plan.

Coronado National Memorial Fire Management Plan (2005, pp. 12-14)

- Give primary consideration to firefighter, employee, public safety, and national cost containment objectives.
- Manage fire to minimize threats of unacceptable effects of fire to sensitive cultural and natural resources and properties within and outside the Memorial.
- Implement a program in the future to use prescribed burning and hazard fuel reduction to restore natural fuel loadings.

Department of Interior Director's Order #12 and Handbook (Conservation Planning, Environmental Impact Analysis and Decision Making) (2001)

NPS Reference Manual 18 – Wildland Fire Management (2008)

NPS Management Policies (2006)

U.S. Department of Defense (Fort Huachuca Army Installation)

Fort Huachuca Integrated Resource Management Plan (2001, pp. 162-164)

- Protect life (firefighter and public) as the first priority. Property, military training, and natural resources and historic properties (including endangered species protection) are second priority.
- Allow fires with burnable vegetation to occur at a reasonable return interval, except where occupied by human settlement.
- Include the following goals for prescribed burn planning:
  - Reduce fuel loads in military training areas to reduce the possibility of catastrophic fires
  - Maintain or improve wildlife habitat, including improving pronghorn antelope range away from firing ranges to reduce antelope foraging in burns near firing ranges
  - Reduce the risk of catastrophic fires in habitats used by Federally-listed threatened, endangered, and candidate species
  - Reestablish the natural frequency/intensity of fires that would sustain flora and fauna biodiversity of Fort Huachuca
  - Reduce the potential for fire to spread into the installation's urban interface areas

- Minimize the threat of fire to the installation's historical buildings and archeological sites

Fort Huachuca Integrated Wildland Fire Management Plan (2006, p. 5)

- Manage fire to benefit natural resources
  - Allow fire to be a dynamic ecosystem process.
  - Use fire to improve and sustain habitat of Federally listed and other sensitive species.
  - Minimize adverse effects of fire and suppression activities on natural resources.

C – Design Criteria and Best Management Practices

Specific design criteria were developed to eliminate or reduce adverse effects of the actions on sensitive resources. These design criteria are part of the proposed action and are intended to achieve fuels objectives in concert with resource objectives. Managers will consult an implementation guide, which will include a checklist of potential resource concerns and associated design criteria, prior to carrying out site-specific actions. Resource concerns identified as being relevant to each proposed treatment area, combined with individual agency management objectives, will determine which design criteria to apply at each site. While this may result in some variation in application of the design criteria, the overall effects of all actions must remain within maximum effects predicted in the environmental assessment.

In addition to these design criteria, best management practices (BMPs; see p. 137) from the Soil and Water Conservation Handbook (2509.22) would be followed to ensure protection of soil and water resources.

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
Design Criteria Applicable to Protecting All Resources				
A-1	**A prescribed burn plan** would be developed according to agency standards and approved prior to initiating any burning operation.	X	X	X
A-2	**Off-road vehicle activity** during fire activities would be kept to a minimum. Vehicles would be parked as close to roads as possible, and vehicles would use wide spots in roads or disturbed areas to turn around. If off-road travel is necessary, local fire-fighting units should go off-road first because of their prior knowledge of the area.	X	X	X
A-3	**No permanent or temporary road construction would be allowed.** Any skid trails and ORV trails resulting from proposed activities would be obliterated and restored.	X	X	X
A-4	**Areas of significant human activity during prescribed fire operations**, such as fire crew camps and equipment staging areas, would not be located on or adjacent to sensitive sites such as habitat of protected species or archaeological sites. Such activities should also be kept to the minimum area possible and should be located in previously disturbed sites whenever possible.	X	X	X
Vegetation and Fuels[3]				
VF-1	Where necessary, in thinning units proposed for prescribed burning, activity slash would be pulled out from around leave trees to minimize damage (EUs 1, 3, 5-12, 14, 15).	X	X	X

[3] These design criteria are applicable to the ecological units (EUs) specified after each description.

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
VF-2	Hazard Trees – If tree thinning operations take place around campgrounds, roadways, utility lines, structures, facilities or other improvements, the hazard potential of all dead or dying trees would be assessed and those trees considered hazardous would be removed (EUs 1, 5-12, 14, 15).	X		
VF-3	Tree thinning activities in forest types for which there are defined old-growth standards would meet thinning diameter limits, stocking levels, and coarse woody debris standards appropriate for the forest type to retain old-growth attributes (EUs 1, 5-12, 14, 15).	X		
VF-4	For burns designed to reduce encroachment of woody species into grassy areas, plans and prescriptions would also address maintenance of native, perennial grasses and reducing the spread of invasive exotics (EU 3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15)	X	X	X
Air Quality				
AQ-1	Fire managers would cooperate with other Federal, State and local regulatory agencies to protect air quality as required by the Clean Air Act and State and local regulations.	X	X	X
Soil and Water				
SW-1	Waterbars would be constructed in firelines, especially on steep hillsides.	X	X	X
SW-2	Sufficient groundcover would be retained to prevent erosion of the burned site.	X	X	X
SW-3	Intense prescribed fire would be avoided on sensitive soils, to prevent water repellency, nutrient leaching, and erosion.	X	X	X
Riparian, Aquatic, and Wetland Areas				
RAW-1	Prescribed fire control actions in riparian areas should apply minimum impact suppression tactics to minimize damage to stands of native vegetation and soils from prescribed fire or wildfire use operations.	X	X	X
RAW-2	To the extent possible, large, downed woody materials and snags that are not a hazard to firefighters would be retained. Large logs (12 inches diameter and greater and 8 feet or more long) should not be cut into sections.	X		X
RAW -3	Retain all age classes of riparian species (defined in FSM 2526, Riparian Watershed Management) and madrone.	X		
RAW -4	Fire management (e.g., control lines) and rehabilitation in riparian corridors would be coordinated with a Resource Advisor.	X	X	X
RAW -5	Site-specific implementation plans (e.g., Coronado National Forest Fire Management Plan, Ft. Huachuca Integrated Fire Management Plan) that include management areas with Federally listed aquatic or riparian-obligate species would specify fire management objectives and prescribed burning guidance, taking into account the special concerns related to these species.	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
RAW -6	In riparian areas, natural barriers, openings in riparian vegetation, or topographic features would be used where possible as the easiest, safest method to manage prescribed fire.	X	X	X
RAW -7	Crossings for motorized vehicles across a perennial stream would not be permitted, unless an established road already exists or where dry, intermittent sections occur. Avoid use of heavy mechanical equipment in: • wet riparian drainages or • on wet upland soils if rutting greater than 3 inches is occurring	X	X	X
RAW -8	The use of fire retardants or chemical foams in riparian habitats or within 300 feet of aquatic habitats would be avoided; particularly sites occupied by Federally listed species. On National Forest lands, operational guidelines would be applied as stated in the Interagency Standards for Fire and Fire Aviation Operations 2005 (or updates), "Environmental Guidelines for Delivery of Retardant or Foam Near Waterways," Chapter 8 (pp. 8-13 through 8-15) (USDA Forest Service 2005).	X	X	X
RAW -9	Placement of prescribed fire support sites (e.g., camps, staging areas and, refueling sites) would be outside riparian areas or river/stream corridors.	X	X	X
RAW -10	Water from sources supporting Federally listed species will not be used for fire abatement. Unused water from prescribed fire activities would not be dumped in sites occupied by Federally listed aquatic species to avoid introducing non-native species, diseases, or parasites.	X	X	X
RAW -11	If water is drafted from a stock tank or other body of water for prescribed fire activities, it shall not be refilled with water from another tank, lake, or other water source that may support non-native fishes, bullfrogs, crayfish, or salamanders. Only water drawn from a municipal water supply or well water shall be used to refill stock tanks- Use of containment systems for portable pumps to avoid fuel spills in riparian or aquatic systems would be required.	X		X
RAW -12	For priority fire/fuels management areas (e.g., wildland-urban interface areas) with Federally listed species or designated critical habitat downstream, biologists and other resource specialists, as appropriate, in coordination with U.S. Fish and Wildlife Service and Arizona Game and Fish Department, would determine: a) The number of acres and the number of projects or phases of projects to occur within one watershed per year. b) An appropriately sized buffer adjacent to perennial streams and ponds (e.g., lowest discernable bench above the stream but outside the high-water mark) in order to minimize soil and ash from entering the aquatic system.	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
Caves and Mines				
CM-1	Design criteria for caves and mines will be determined on a site-by-site basis. Efforts will be made to preserve vegetation around cave entrances. Fuel reduction buffer areas may be desirable to protect such vegetation.	X	X	X
CM-2	Aerial or ground application of retardant or foam should be restricted within 300 feet of caves and abandoned mines, and water used instead, in accordance with the Interagency Standards for Fire and Aviation Operations.	X	X	X
Wildlife, Fish, and Plant Habitats				
	General Protections Measures: • Resource advisors would be consulted regarding all treatment and prescribed burning activities. They would also be responsible for coordination with the agencies on Federally listed and other sensitive species. They would monitor fire and vegetation management activities to ensure the protective measures are implemented.	X	X	X
	• Resource advisors should coordinate site-specific burn and implementation plans with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to identify site-specific measures to protect Federally listed and sensitive species, and species of concern.	X	X	X
WFP-2	• Implementation activities in habitats of threatened, endangered, sensitive species, and/or species of concern will include oversight or coordination with wildlife staff. Coordination may include training of crews in: the identification of sensitive species; avoidance of impacts to sensitive species (e.g., identification and avoidance of wildlife use/habitat elements, such as nests, cavities, and woodpecker foraging holes); notification of the appropriate agencies (i.e., AGFD or USFWS) if a sensitive, threatened, or endangered species is encountered; and that individuals must not be picked up or removed without a permit.	X	X	X
WFP-3	• Prescriptions (particularly timing and intensity of burn) for projects within or adjacent to suitable habitat for Federally listed and sensitive plant populations shall be designed to maintain or improve the existing population or habitat.	X	X	X
WFP-4	• Project wide manageable areas would be delineated to avoid impacts to sensitive areas. This is a large perimeter around a smaller prescribed burn unit within which fire is allowed to spread before control action must be taken. It is not actively ignited during the prescribed burn, and it allows for setting up the trigger points that will drive management actions based on resource values	X		X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
WFP-5	• Maintain 3 or more cavity bearing live trees and 3 or more snags or decadent trees per acre	X		
WFP-6	• Retention areas will emphasize hiding, escape, bedding and thermal cover around feeding and watering areas, in drainages, and along roads.	X		
WFP-7	• Minimize mechanical disturbance of soils to reduce the impact of habitat manipulation on small mammal and reptile communities	X	X	X
WFP-8	• Nesting birds and sensitive plants: consult with local biologist for species and site-specific guidance when developing burn/implementation plans, especially for fire treatments outside the normal natural fire season.	X	X	X
WFP-9	• Within a calendar year consider the spatial scale of treatments relative to distribution of individual species of concern (e.g., the proportion of habitat treated) in the planning area when implementing project(s).	X	X	X
WFP-10	• The spatial distribution and contiguous size of planned burn/treatment areas would be considered in order to reduce the effects of peak flow change on stream channels.	X	X	X
WFP-11	• When constructing slash piles, avoid agave and any known sensitive plant populations	X	X	X
WFP-12	**Jaguar Habitat:** Implement the conservation measures for fire management activities in riparian and aquatic habitats to eliminate adverse effects to jaguars that may occur in dense riparian habitats.	X	X	X
WFP-13	**Huachuca Water Umbel Habitat:** • Known locations and potential habitat for plant populations would be mapped to facilitate planning for prescribed fires and vegetation treatments, to ensure protection of these populations.	X	X	
	• Delineate buffer areas around plant populations prior to prescribed fire and vegetation treatment activities. Coordinate with USFWS during prescribed burning and vegetation treatments to ensure protection of plant populations.	X	X	

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
	• During prescribed fire in habitat occupied by Federally listed plant species, no staging of equipment or personnel would be permitted within 328 feet (100 meters) of identified individuals or populations (Huachuca Area Fire Partners Fire Management Plan (page 81)). Off-road vehicles would also not be allowed within the 328-foot buffer area, unless necessary for firefighter or public safety or the protection of property, improvements, or other resources.	X	X	
WFP-14	**Pima Pineapple Cactus Habitat:** • Surveys shall be conducted for Pima pineapple cactus in the proposed action area where suitable habitat exists. • Where individual plants or groups of plants are vulnerable to damage from fire and radiant heat clear vegetation from the area between 2 and 3 meters around the plant or group of plants leaving the area within 2 meters intact (to avoid disturbance of microhabitat/microclimate). • Remove woody fuels within the vegetation “leave patch” if it is determined that woody fuels contribute to risk of damage from fire/radiant heat • in suitable habitat for Pima pineapple cactus no broadcast burning will be conducted where Lehmann lovegrass is the primary grass component	X		
WFP-15	**Bat Habitat – all species:** Caves and abandoned mines will be surveyed prior to project implementation to determine occupancy. Fire and other vegetation management activities would not be located within 0.5 mile of-occupied caves and abandoned mines	X	X	X
WFP-16	**Lesser Long-nosed Bat Habitat:** • Low-moderate severity prescribed fire would be planned to minimize adverse effects to lesser long-nosed bat forage plants and roosts.	X	X	X
	• All crew bosses (prescribed fire and vegetation treatments) would be instructed in the identification of agave and the importance of their protection for bats. Resource advisors, qualified biologists designated to coordinate lesser long-nosed bat concerns, will be present or available during prescribed fire and vegetation treatments.	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
	• In agave stands, personnel would avoid driving off road and over plants, piling slash on top of plants, and burning on or near plants. Staging areas for fire crews or helicopters would be located in previously disturbed sites, if possible. Creating public access to known roosts during fire operations would be avoided.	X	X	X
WFP-17	**Mexican Spotted Owl Habitat:** • Prescribed fire (preferably low to moderate-intensity) would be used to maintain and enhance MSO habitat inside and outside of the Protected Activity Centers by varying the management prescriptions to: a) reproduce natural disturbance patterns; b) maintain native vegetation in the landscape, including early seral species; c) allow natural gap processes to occur, thus producing horizontal variation in stand structure; d) promote the growth of additional large oaks and pines by thinning out understory vegetation through the use of moderate-intensity burning and by pretreating large trees (ringing, foam, limbing). e) reduce fuels to promote future low to moderate-intensity fire in PACs and adjacent areas.	X	X	X
	• Survey PACs for occupancy and determine location of nest tree/delineate core area prior to implementing treatments within the PAC: - Within occupied PAC implement prescribed fire and mechanical treatments outside breeding season: March 1 – August 31	X	X	X
	Protected Activity Centers (Mexican Spotted Owl Recovery Plan, 1995) Treat fuel accumulations to abate fire risk. • Select up to 10% of the PACs within each Recovery Unit that exhibit high fire risk conditions. Nest sites must be known within these PACs. Ideally, a paired sample of PACs should be selected to serve as control areas.	X	X	X
	• Within each selected PAC, designate 40 ha (100 acres) centered around the nest site. This nest area should include habitat that resembles the structural and floristic characteristics of the nest site. These 40 ha (100 acres) will be deferred from the treatments described below.	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
WFP-17	• Within the remaining 203 ha (500 acres), combinations of thinning trees <22.4 cm (9 inches) dbh, treatment of fuels, and prescribed fire can be used no reduce fire hazard and no improve habitat conditions for owl prey. Habitat components that should be retained or enhanced include large logs (>30 cm [12 inches] midpoint diameter), grasses and forbs, and shrubs. These habitat components are strong correlates of the presence of many key prey species of the owl. Emphasis of the spatial configuration of treatments should be to mimic natural mosaic patterns.	X	X	X
	• Treatments can occur only during the non-breeding season (1 September- 28 February) to minimize any potential deleterious effects on the owl during the breeding season.	X	X	X
	• Following treatments to 10% of the PACs, effects on the owl, prey species, and their habitats should be assessed. If such effects are nonnegative, an additional sample of PACs may be treated. If negative effects are detected, these effects must be carefully evaluated. If they can be ameliorated by modifying treatments, those modifications should occur prior to treatment of additional PACs. If not, no additional treatments should be permitted.	X	X	X
	• Within the remaining PACs, light burning of ground fuels may be allowed within the 500 acres surrounding the 100-acre PAC centers (as stated above), following careful review by biologists and fuels management specialists on a case-specific basis. Burns should be designed and implemented to meet the objectives noted above. Burns should be done only during the non-breeding season (1 September-28 February).	X	X	X
	• Resource advisors would be consulted when making decisions about prescribed fire activities. Advisors would be notified if MSO are discovered during fire operations.	X	X	X
	• Prescribed fire and mechanical thinning treatments would be conducted to minimize effects on reproduction; actions with known potential for negative effects to MSO and MSO habitat (protected and reserve) would be avoided.	X	X	X
	• Mexican spotted owl Recovery Plan (U. S. Fish and Wildlife Service 1995) pine-oak forest habitat structure guidelines would be followed in setting project objectives. These guidelines stress maintaining large trees (greater than 18 inches dbh), snags, and downed logs (greater than 16 inches in diameter).	X	X	X
	• Staging areas and other "activity centers" would be located more than a mile from designated PAC boundaries during the breeding season (March 1 – August 31).	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
WFP-18	**Chiricahua Leopard Frog Habitat:** • Implement the conservation measures for fire management activities in riparian and aquatic habitats as described in the riparian, aquatic and wetland protection measures above. • For fire management sites with habitat for the Chiricahua leopard frog, unsurveyed sites would be considered occupied unless surveyed prior to project implementation. • No water would be drafted for fire (prescribed fire) control activities from bodies of water known to be occupied by the Chiricahua leopard frog.	X	X	X
WFP-19	**Sonora Tiger Salamander:** • High intensity fire shall be avoided near occupied stock tanks and within the drainage feeding the tanks.	X		X
	• Post treatment monitoring of occupied stock tanks shall occur to determine the need for sediment filters to avoid ash loading into the tank.	X		
	• Areas of significant human activity during prescribed fire activities, such as fire crew camps, landing strips, and equipment staging areas, shall not be located on or adjacent to salamander breeding sites and should be located at least 1,650 feet away from such sites unless absolutely necessary for fire control.	X	X	X
	• A resource advisor would be present or available during all prescribed fire in salamander habitat areas. Resource advisors would be qualified - to address Sonora tiger salamander concerns, serve as an advisor to the fire boss, and coordinate with USFWS.	X	X	X
	• No water would be drafted for fire (prescribed fire) control activities from bodies of water known to be occupied by the Sonora tiger salamander.	X	X	X
WFP-20	**Gila Topminnow:** • Prescribed burns would be conducted such that no more than one-half of the watershed of each Gila topminnow natural or reintroduction site is burned in a two-year period (excluding buffers to the streams and/or spring habitats) and repeat treatments occur at greater than two-year intervals.	X		
	• When considering which creek crossings to use for fire management activities, crossings that are known to be occupied by Gila topminnow would be avoided when possible.	X		

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
	• Fire managers would develop burn plans in cooperation with the U.S. Fish and Wildlife Service and Arizona Game and Fish Department to identify site-specific measures, such as prescribed fires in grassland vegetation types to improve watershed conditions, to protect populations of Gila topminnow from other resource program impacts.	X		
	• As described in RAW-8, the use of fire retardant would be avoided near streams and other water bodies.	X		
WFP-21	**Gila Chub Habitat:** • When considering which creek crossings to use for fire management activities, crossings that are known to be occupied by Gila chub would be avoided when possible.	X		
WFP-22	**Barking Frog Habitat:** • Fireline construction and other ground-disturbing activities would be avoided within 300 feet of the limestone hills and other areas known to provide habitat for barking frogs.		X	X
WFP-23	**Peregrine Falcon Habitat:** • Restrict human activity associated with vegetation management and prescribed fire fire operations within 1 mile of an active peregrine falcon nesting cliff between February 1 and August 31. The human disturbance buffer can be modified by the Resource Advisor based on nesting activity and local topography.	X	X	X
	• Maintain noise buffers around project areas between February 1 and August 31 (e.g., equipment operation shall not cause increase in noise levels at raptor nests and roost sites above 55 dB.)	X	X	X
WFP-24	**Northern (Apache) Goshawk:** • Human activity should be limited in goshawk nesting areas and Post Fledging Areas (PFA) during the breeding season, March 1 through September 30.	X	X	X
	• Within nesting areas and PFA, maintain existing canopy cover levels. Within adjacent woodlands outside PFA, manage for uneven-age stand conditions to sustain a mosaic of vegetation densities (overstory and understory), age classes, and species composition well distributed across the landscape. Provide for reserve trees, snags, down woody debris.	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
	• Low-intensity ground fires may be used in a PFA at any time but avoid burning the entire PFA in a single year. Prescribed fire within nesting areas should be planned to move with prevailing winds away from the nest tree to minimize smoke and risk of crown fire developing and driving the adults off or consuming the nest tree.	X	X	X
	• Maintain noise buffers around project areas during the raptor-nesting season (e.g., equipment operation shall not cause increase in noise levels at raptor nests and roost sites above 55 dB.)	X	X	X
WFP-25	**Yellow-billed cuckoo habitat:** • Conservation measures for fire management activities in riparian and aquatic habitats would be implemented as described above.			X
	• Activities to reduce hazardous fuels or improve riparian habitats (prescribed burning or vegetation treatments) would be implemented within occupied suitable habitat for yellow-billed cuckoos only during the non-breeding season (October 1 – March 31).			X
	• Prescribed burning would only be allowed within ½ mile of occupied suitable habitat when weather conditions allow smoke to disperse away from the habitat when birds may be present (breeding season April 1 - September 30).			X
	• Vegetation treatment projects adjacent to occupied suitable habitat would be conducted when birds are not present (October 1 – March 31).			X
Heritage Resources[4]				

[4] Heritage Resource design criteria for the Coronado National Forest follow the "Programmatic Agreement", formally known as the *First Amended Programmatic Agreement Regarding Historic Property Protection and Responsibilities Among New Mexico Historic Preservation Officer and Arizona State Historic Preservation Officer and Texas State Historic Preservation Officer and Oklahoma State Historic Preservation Officer and the Advisory Council on Historic Preservation and United States Department of Agriculture Forest Service Region 3* (2003) and the *First Amended Programmatic Agreement Among USDA Forest Service, Southwestern Region and Arizona State Historic Preservation Officer and New Mexico State Historic Preservation Officer and Advisory Council on Historic Preservation Regarding Wildland Urban Interface and Other Large-Scale Hazardous Fuels Reduction Projects* (2004). Although written for and primarily applicable to National Forest System Lands, these stipulations will be considered for Coronado National Memorial and Ft. Huachuca as well. Plans or protection measures developed in the future for either agency would apply. The design criteria also incorporate elements from the Coronado National Memorial FMP, the National Environmental Protection Act (NEPA), and Ft. Huachuca heritage resource personnel. All proposed treatments would be reviewed by the appropriate land management agency Heritage Resource personnel.

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
H-1	**Any areas of intensive ground disturbance** will receive 100% survey (pre-field and on the ground), including but not limited to: - intensive mechanical treatments - hand and mechanical fire line construction - staging areas, constructed safety zones - water bars and other constructed erosion control features - other actions such as constructing fuelbreaks	X	X	X
H-2	**Prescribed burns** - As a minimum, surveys for prescribed burn areas would include survey of locations likely to contain additional fire-sensitive sites, based on pre-field research, expected fire behavior, and other relevant data. Additional survey may be conducted at the agency archeologist's discretion. The survey strategy shall identify the types of sites that are considered fire-sensitive for each fuels reduction project, using the guidelines below. This should include both known fire-sensitive sites and other sites considered fire-sensitive for the specific burn, based on fuel loading, site characteristics, and expected fire behavior. If existing inventories do not indicate the presence or likelihood of fire-sensitive properties, survey strategy may be determined by the archaeologist without prior consultation with the State Historic Preservation Office (SHPO). If existing inventories do indicate the presence or likelihood of fire-sensitive properties, the proposed survey strategy would be submitted to the SHPO for review in accordance with Stipulation 5 of the Agreement. The use of prescribed burns and protection of historic properties would take safety and natural resource protection into consideration.	X	X	X
H-3	**Hand thinning units** - Areas where machine piling or any other activity using mechanized equipment is planned would be surveyed 100 percent. Units where only hand thinning is planned, with no use of mechanized equipment and no follow-up prescribed burning, may or may not be surveyed at the discretion of the agency archeologist without prior SHPO consultation.	X	X	X
H-4	**Fuelwood sales** - Surveys of fuelwood sale units would follow a survey strategy similar to that previously described for thinning. Projects that affect 500 acres or less will be surveyed 100 percent.	X		

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
H-5	**Determining fire-sensitive sites:** Archaeologists would use site assessment and monitoring data, and would consult with fire management staff, to identify known and other project-specific fire-sensitive sites for individual project areas, and to ensure that fire personnel are appropriately qualified and briefed on cultural resource fire management guidelines, or are supervised by a qualified cultural resource advisor. Fire-sensitive sites include sites with organic (combustible) elements and rock-art sites. Other sites may be fire-sensitive depending on the severity of the fire (e.g. buried cultural deposits). Fire-sensitive sites officially determined ineligible for the National Register of Historic Places do not require protection under Section 106. Of the known fire-sensitive site types, only historic sites with wooden elements and rock art sites have been identified within the project area.	X	X	X
H-6	**Treatment actions within or adjacent to site boundaries:** Agreed-upon Standard Site Protection Measures - Various combinations of the following protection measures may be approved by the agency archaeologist to protect sites within WUI and other large-scale hazardous fuels reduction projects without additional SHPO consultation. The agency archaeologists may approve additional measures to further protect sites; however, if a lesser level of protection is recommended, or if it is likely that adverse effects cannot be avoided, the agencies shall consult with the SHPO on a case-by-case basis.	X	X	X
	Prescribed Burning • To protect fire sensitive sites, exclude the following from treatment area: Hand line, Black line, Wet line, Foam retardant, Structural fire shelter • Remove heavy fuels from site by hand • Prevent ignition of in-situ heavy fuels that cannot be removed (e.g., flush-cut & bury stumps) • Implement same protective measures for future maintenance burns • Prescribed burning would be allowed on non-sensitive sites.	X	X	X
	Protect selected other sites (option) • Allow burning over sites without fire sensitive features or materials: • No ignition points within site boundaries • No staging of equipment within site boundaries • Allow construction of safety zones and additional lines in 100% surveyed areas, with archaeological monitoring to assure recorded sites are avoided • Conduct post-fire monitoring (in accordance with inventory report)	X	X	X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
	Thinning, Hand and Mechanical Treatments - No thinning within site boundaries -or- allow thinning within site boundaries, provided: • Cutting is accomplished using hand tools only • Large-diameter trees are felled away from all features • Thinned material is hand carried outside site boundary • No use of mechanized equipment within site boundaries • No staging of equipment within site boundaries • No slash piles within site boundaries	X	X	X
	Fuelwood Sales - No fuelwood cutting or vehicles within site boundaries, or: • Allow fuelwood cutting within sites, but do not allow vehicles within site boundaries • Allow fuelwood cutting in areas of continuous, low-density scatters, with post-project monitoring	X		
H-7	**Newly Discovered Sites** - When previously unidentified cultural resources are discovered, or unanticipated detrimental impacts occur, all work would cease in the immediate vicinity and the appropriate heritage resource specialist would be notified.	X	X	X
H-8	**Notification** - Prior to project-specific implementation, all applicable NEPA and 36 CFR 800 regulations regarding scoping and Tribal consultation would be followed. In addition, Tribes would be notified of activities that may affect traditional practices, such as the gathering of beargrass or yucca.	X	X	X
H-9	**Chipping** – a chipper should not be placed within or immediately adjacent to an historic property or archaeologically sensitive sites. Spreading chips back across the site cannot cause ground disturbance.	X	X	X
H-10	**Lop and Scatter** – Lop and scatter using hand techniques is not considered ground disturbing providing no piling of downed material occurs. If mechanized equipment is used, survey at 100%.	X	X	X
H-11	**Mastication** – Sites would be avoided if a heavy-duty masticator (hydro axe/front end loader) is used, but would be evaluated on a case-by-case basis if light-duty (agra axe/bobcat) is used.	X	X	X
H-12	**Pile burning** – Pile burning would not be allowed within an historic property or archaeologically sensitive site boundaries. This would include no hand piling.	X	X	X
H-13	**Prune and Hand-removal, thin by hand** – These methods would be allowable within historic properties, as long as materials are not piled (i.e. scattered across the landscape)	X	X	X
Range Resources				

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
R-1	**Coordination with Allotments:** To ensure success of burning operations, it is imperative to coordinate plans with grazing permittees. Area to be burned must receive a minimum of one complete growing season rest prior to the burning period to ensure fine fuels are present to carry the fire. Burned areas must receive at least one complete growing season rest to ensure plant recovery and soil protection. If the first summer is dry, livestock will not enter a burned pasture until a second full growing season has passed. A growing season is the period from July to September every summer when peak herbaceous plant growth occurs.	X		
R-2	**Infrastructure Compensation** - Management burns must provide for protection or replacement of range infrastructure (e.g., fences, pipelines, water storage, etc.) Costs of replacement must be considered and planned for up front.	X		
Recreation				
Rec-1	**Notification** – Signs would be posted: • advising visitors when and where project activities will take place. • at trails and facilities to warn visitors of mechanical or pile burning operations occurring in the area. • at dispersed recreation sites to warn visitors of management activities in the area or they would be closed for safety until operations are complete.	X		X
Rec-2	**Rehabilitation of recreation infrastructure** - Trail treads, roads, or facilities would be rehabilitated if damaged during project operations.	X		X
Rec-3	**Treatments within Developed Sites** - Vegetation treatments within developed sites would be coordinated with the local recreation/facility manager to protect developments and lessen impacts to visitors' ability to use sites.	X		X
Rec-4	**Slash Disposal** - All slash and materials resulting from treatments within or adjacent to recreation facilities, trails or dispersed sites would be removed.	X		X
Rec-5	**Timing of Activities** - Project activities that occur within or adjacent to developed sites, dispersed sites or trails would be conducted outside the major use season.	X		X
Rec-6	**Noise Reduction** - In the Coronado National Memorial, actions would be taken to prevent or minimize unnatural sounds that adversely affect the memorial's resources or values or visitors' enjoyment of them.			X

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
Scenery				
S-1	The following applies to all Visual Quality Objectives (VQOs) in the project area for National Forest lands: a. Vegetation and fire treatment units would be shaped, scaled, and oriented in a manner that is natural appearing, mimicking existing vegetation patterns to blend with landscape characteristics. b. Straight lines and geometric shapes would be minimized in order to blend units to create free-form vegetative patterns that mimic natural patterns during vegetation and fire treatments. c. Where possible, islands of vegetation in various shapes and sizes would be left in random distribution patterns, providing a natural characteristic vegetative appearance, while meeting project objectives. d. The amount of slash within the project area would be decreased while meeting the project's objectives.	X		
S-1	e. Excess slash from roadwork would be piled and burned or buried. f. Slash may be lopped and scattered up to 18 inches except in foreground areas of sensitivity level 1 travel routes, use areas and water bodies. g. Fire control lines would be shaped, blended and oriented in a manner that is naturally appearing by following topographic features where possible. h. A landscape architect will be contacted to determine if any additional design criteria are necessary at the time prior to project implementation.	X		

Design Criteria Number	Description	Jurisdiction Where Design Criteria are Applicable		
		Coronado National Forest	Fort Huachuca	Coronado National Memorial
S-2	The following applies to all VQOs in the project except maximum modification in the project area for National Forest land. Specifically this applies to the 0 to 300-foot immediate foreground away from the center point of the sensitivity level 1 travel routes and use areas. On the Coronado National Forest, this includes Scenic Byway 82 (from Sonoita south to Forest Road 61), Highway 83 to Parker Canyon Lake, and forest road 827 from the Fort Huachuca boundary into the forest. a. Slash would be lopped and scattered to a depth of 6 inches or less. b. No boundary paint would be used parallel to sensitivity level 1 Travel routes and use areas for leave trees. c. Slash treatment should generally be completed within one year in areas adjacent to and visible from Forest Service sensitivity level 1 travel routes and use areas. d. Brush-masticated slash should not exceed 6 inches in depth. e. Burned slash would be scattered to reduce the color contrast of the exposed soil. Unburned soil would be added to areas when needed to reduce color contrast on burn pile areas. f. Stumps that would be viewed by forest visitors would be cut flush to the ground or within 12 inches of the uphill side of the stump, whichever allows the stump to be shorter. Large-diameter tree stumps would be cut as low as possible. g. Tree prune heights would not exceed 10 feet or 1/3 the tree height, whichever is less. h. Shrub islands of various shapes and sizes would be left in a random distribution to provide a natural appearance, while meeting the project objectives. i. When placing piles for burning along private boundaries or within sensitivity level 1 travel routes and use areas, use topographic and other features (rock outcrops, hills, vegetation, etc.) to conceal burned piles viewed from private homes and travel corridors.	X		
S-2	j. When any private land boundary falls within or adjacent to the project boundary, a transition zone (a minimum of 300 feet) that gradually mimics the private land's vegetative patterns should be used to minimize the edges of the management activities (unless the private vegetation contradicts the project's objective or the private landowner desires the implementation of the prescription up their boundary). k. Placement of temporary use skid trails should be avoided within 100 feet of sensitivity level 1 travel routes and use areas where practical. These trails should be placed at different angles to each other and roads.	X		

Best Management Practices

Taken from Forest Service Handbook: 2509.22 – (R3) Soil and Water Conservation Practices Handbook, Southwest Region Directive

Chapter 20: Resource Management Activities

24.16 - Streamside Management Zone (Filter Strip) Designation

1. Objective. To designate a zone along streams (including ephemeral and intermittent streams, wet areas, meadows, riparian areas, or any area that has the hydrological characteristics of carrying water on or near the surface and that the delivery of sediments to this area can affect water quality) where management actions are designed to minimize adverse effects on water and related resources.

2. Explanation. Factors such as stream class, existing ground cover conditions, soil erosion hazard, channel aspect, channel stability, side slope steepness, and slope stability are considered in determining the constraints of activities and width of streamside management zones. Fisheries habitat condition and its estimated response to the proposed activities are also evaluated in determining the need for and width of the streamside management zone. The streamside management zone is not a zone of closely managed activity. It is a zone which acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habits; protects channel and streambanks; and promotes floodplain stability.

3. Implementation. Identify the streamside management zone requirements during the IRM process. Contracted projects are implemented by contractors or operators. Compliance with environmental analysis criteria, contract specification, and operating plans is assured by the Contracting Officers Representative or Timber Sale Administrator.

24.17 - Determining Tractor Loggable Ground.

1. Objective. Comply with Federal and State water quality standards when tractor logging.

2. Explanation. This practice is intended to minimize soil erosion, subsequent sedimentation and water quality degradation. The Timber Harvest Limitation rating provided by the TES is the basic method of determining tractor loggable ground.

3. Implementation. The TES is utilized by a trained and qualified Forest Service representative during the on-the-ground assessment of the timber sale. Consider the resulting Timber Harvest Limitation rating during the selection of logging and silvicultural methods and use it in determining acceptable intensity of and restrictions for land disturbance activities. Give interpretations of the considerations in the NEPA documentation. Provisions in the Timber Sale Contract specify the areas determined by the TES upon which tractors can operate.

   Tractor logging is generally not permitted on slopes exceeding 40 percent. Exceptions may be made after a thorough investigation of on site conditions and inclusion of special specified mitigation prescriptions in the timber sale contract. Tight administrative control of such operations is also required.

24.18 - Tractor Skidding Location and Design.

1. Objective. To minimize erosion and sedimentation by designing skidding patterns to best fit the terrain. To maintain the integrity of the streamside management zones, riparian areas, and other sensitive watershed areas.

2. Explanation. This is a preventative practice. The watershed factors that are considered include slope, soil stability, exposure, vegetative cover and any factor that may affect the peak flow and sediment yield potential of the land. The careful control of skidding patterns serves to minimize on site erosion and downstream channel damage by preventing the concentration of runoff in skid trails.

   Proper skid pattern management involves such things as locating skid trails to avoid stream courses and restriction of skidders to designated trails.

   Two complementary methods of complying with water quality standards when tractor skid trails are design:

   a. End-Lining. This method involves winching the log directly out of the sensitive areas (streamside management zone, wet meadow, riparian area, and so forth) with a cable operated from outside the sensitive area.
   b. Felling To The Lead. This method involves felling trees toward a predetermined skid pattern. Soil disturbance, compaction, and residual stand and site damage are minimized when this method is used.
   c. Implementation. For skid trail design, identify and evaluate sensitive areas in the environmental assessment review during the IRM process. A special Timber Sale Contract provision can be included in the Timber Sale Contract for the location of skid trails. The Sale Administrator locates the skid trails with the timber Purchaser or by agreeing to the Purchaser's proposed locations prior to construction. Guidelines for skid trail locations are referenced in the sale plan, the Timber Sale Administration Handbook (FSH 2409.23), the Timber Sale Contract, and on the Presale Cutting Unit Summary card (R3-2400-50).

24.2 - Log Landing Location.

1. Objective. To locate landings so creation of unsatisfactory watershed conditions which lead to water quality degradation is avoided.

2. Explanation. This practice is both administrative and preventative. Location of all landings shall be agreed to by the Forest Service and Purchaser prior to construction. The following criteria are used in evaluating landings:

   a. The cleared or excavated size of landings shall not exceed that needed for safe and efficient skidding and loading operations.
   b. Landing locations are selected which minimize the amount of excavation and on-site soil loss.
   c. Where possible, landings are located so that felled timber lying between drainages can be skidded to the landing without crossing channels.
   d. Landings are located where the least number of skid roads are required, and side cast will neither enter drainages nor damage other sensitive areas.
   e. Landings are positioned such that the skid road approach will be nearly level or less than 3 percent grade, far enough back to allow for good drainage.
   f. Landings are located so a minimum number of tractor roads enter the landing.
   g. Landings are not located in streamside management zones.

3. Implementation. Landing locations chosen by the contractor must be agreed to by the Timber Sale Administrator (SA). The SA can negotiate with the Purchasers' representative to select mutually

acceptable landing locations. To be an acceptable landing, it must meet the above criteria. Should agreement not be reached, the decision of the Forest Service shall prevail within the limitations of law.

24.21 - Erosion Prevention and Control Measures During Timber Sale Operations.

1. Objective. To ensure that the Purchaser's operations shall be conducted reasonably to minimize soil erosion.

2. Explanation. Timber is purchased by individuals or companies who either harvest the timber themselves or contract harvest to other parties. Therefore, it is necessary to ensure that purchasers understand and adhere to water quality prescriptions arrived at in the timber sale planning process. This is accomplished by setting forth the Purchaser's and the Forest Service's responsibilities in the Timber Sale Contract.

3. Implementation. Equipment shall not be operated when soil conditions are such that accelerated soil erosion will result. The kinds and intensity of control work required of the Purchaser shall be adjusted to soil and weather conditions and the need for controlling runoff. Erosion control work shall be kept current immediately preceding expected seasonal periods of precipitation or runoff.

   If the Purchaser fails to do seasonal erosion control work prior to any seasonal period of precipitation or runoff, the Forest Service may temporarily assume responsibility for the work, and any unencumbered deposits may be used by the Forest Service to do the work.

24.23 - Revegetation of Areas Disturbed by Harvest Activities.

1. Objective. Establish a vegetative cover on disturbed sites to prevent accelerated on-site soil loss and sedimentation of streamcourses.

2. Explanation. Where soil has been severely disturbed by Purchaser's operations, and the establishment of vegetation is needed to minimize erosion, the Purchaser shall take appropriate measures normally used to establish an acceptable vegetative groundcover, or take other agreed stabilization measures.

   This measure is applied in contracts where it is expected that disturbed soils in parts of the sale area will require vegetative cover for stabilization and the problems will not be mitigated by other contract provisions. Apply this measure on soil with moderate and severe erosion hazard ratings.

3. Implementation. Through the IRM process, an estimate of the need for vegetative cover is determined and included in the sale plan, and in the timber sale appraisal. Where the establishment of vegetation is needed, use provision C6.6 in the Timber Sale Contract. The Forest Service shall designate on-the-ground the disturbed soils, such as skid trails, landings, and temporary roads, and so forth, that must be treated.

   The Forest Service shall provide instructions as to soil preparation and the application of suitable seed mixtures, mulch, and fertilizer, and the timing of such work. It is the responsibility of the Sale Administrator (SA) to make sure that revegetation work is done correctly and in a timely manner.

24.24 - Log Landing Erosion Prevention and Control.

1. Objective. To minimize on-site soil loss and subsequent sedimentation of streamcourses, from log landings.

2. Explanation. This practice employs administrative, preventive, and corrective controls to meet the objective. After landings have served the Purchaser's purpose, the purchaser shall ditch or slope the landings to permit the drainage and dispersion of water. Landings will be properly drained when constructed before timber sale operations begin. Provisions are also made for revegetation. Other provisions may include ripping, scarifying, smoothing and sloping construction of drainage ditches, prevention of water draining off roads from reaching a landing, spreading slash, covering with wood chips, or applying straw mulch. Unless agreed otherwise, cut and fill banks around landings shall be sloped to remove overhangs and otherwise minimize erosion. The specific work needed on each landing will depend on the actual ground conditions. As part of the IRM process the interdisciplinary team assesses the need for stabilization.

3. Implementation. Timber Sale Contract requirements provide for erosion prevention and control measures on all landings. It is the responsibility of the Timber SA to ensure that this practice is properly implemented on the ground.

24.25 - Erosion Control on Skid Trails.

1. Objective. To comply with Federal and State water quality standards by minimizing on-site soil loss and sedimentation of streamcourses derived from skid trails.

2. Explanation. This practice employs preventive measures in order to meet the objective. The Timber Sale Contract requires the installation and maintenance of erosion control measures on skid trails, tractor roads, and temporary roads. Normally, the work involves constructing cross ditches and water spreading ditches. Grass seeding may also be required. This can be added to the Timber Sale Contract by use of contract clause C6.601. These areas are designated on-the-ground as logging and temporary access construction progresses.

3. Implementation. Location of all erosion control measures are designated and agreed to on-the-ground by the SA. The SA will identify site-specific preventive work to be required of the Purchaser. The Purchaser is obligated to maintain erosion control structures after construction, specified in contract provisions for one year unless maintenance need is caused by other National Forest users.

24.26 - Meadow Protection During Timber Harvesting.

1. Objective. To avoid unacceptable groundcover, a reduction of soil productivity, soil compaction, severe soil erosion, and water not complying with Federal and State water quality standards in meadows.

2. Explanation. This is an administrative and preventive action. Unauthorized operation of vehicular or skidding equipment in meadows that are designated on SAMs and marked on the ground is prohibited. Vehicular or skidding equipment shall not be used on meadows except where roads, landings, and tractor roads are approved. Unless otherwise agreed, trees felled into meadows shall be removed by end-lining. Logging slash shall be removed from the meadow.

3. Implementation. The concerns and constraints mentioned above are set forth in Timber Sale Contract requirements. It is the responsibility of the Timber SA to ensure that this practice is properly implemented on the ground.

24.27 - Streamcourse Protection.

1. Objective. To protect the natural flow of streams (including ephemeral and intermittent). To provide unobstructed passage of stormflows. To reduce sediment and other pollutants from

entering streams. To restore the natural course of any stream as soon as practicable where diversion of the stream may occur as a result of timber management activities.

2. Explanation. This management practice employs administrative, preventive, and corrective measures to meet the objectives. The following points are fundamental to protecting streams and streamcourses:

   a. Location and method of streamcourse crossings must be agreed to prior to construction. This is done when locations of skid trails, tractor roads, and temporary roads are agreed on by the Forest Service and the Purchaser.
   b. Purchaser shall repair damage to a streamcourse, including damage to banks and channel.
   c. All timber sale debris shall be removed from streamcourses within 48 hours, unless otherwise agreed, and in an agreed manner that will cause the least disturbance.
   d. Equipment shall not operate within streamside management zones as determined in the IRM process. Streamside management zone boundaries may be modified by the SA to meet unforeseen operation conditions.
   e. When ground skidding systems are employed, logs will be end-lined out of streamside management zones. Equipment is permitted to cross streamside management zones and streamcourses only at locations agreed to by the SA and the Purchaser.
   f. Lead-out ditches, water bars and other erosion control structures will be located so as not to channelize drainage water directly into streamcourses. Energy dissipaters will be located at the end of these structures to spread the water. This allows the sediments to drop out and the water to infiltrate.
   g. Logs will be fully suspended in cable log harvesting operations within the streamside management zone when required.
   h. All streamcourses are to be protected with a streamside management zone.

3. Implementation. The SA works with the Purchaser's representative to ensure that the Timber Sale Contract clauses covering the above items are carried out on the ground. Specialists can be called upon to help the SA with decisions. In the event Purchaser causes debris to enter streamcourses in amounts which adversely affect the natural flow of the stream, water purity, or fishery resources, Purchaser shall remove such debris as soon as practicable, but not to exceed 48 hours and in an agreed-upon manner that will cause the least disturbance to streamcourses.

24.28 - Erosion Control Structure Maintenance.

1. Objective. To ensure that constructed erosion control structures are stabilized and working.

2. Explanation. Erosion control structures are only effective when they are in good repair and stable condition. Once the erosion control structures are constructed and seeded, there is a possibility that they may not be adequately vegetated or they may be damaged by subsequent harvest activities or large storms. It is necessary to provide follow-up inspection and structural maintenance in order to avoid these problems and ensure adequate erosion control.

3. Implementation. During the period of the Timber Sale Contract, the Purchaser shall provide maintenance of soil erosion control structures constructed by the Purchaser until they become stabilized, but not for more than one year after construction. If erosion control structures are damaged by other National Forest uses, the Purchaser is not responsible.

   The Forest Service may agree to perform such structure maintenance under B4.225 (Cooperative Deposits), if requested by the Purchaser, subject to agreement on rates. If the Purchaser fails to

do seasonal maintenance work, the Forest Service may assume the responsibility and charge the Purchaser accordingly.

24.3 - Slash Treatment in Sensitive Areas.

1. Objective. To comply with Federal and State water quality standards by protecting sensitive areas (including streamside management zones, landslide areas, and so forth) from degradation, which would result from using mechanized equipment for slash disposal.

2. Explanation. Special slash treatment may be prescribed in sensitive areas to facilitate slash disposal without use of mechanized equipment. Meadows, wetlands, streamside management zones, and landslide areas are typically sensitive areas where equipment use is normally prohibited. Slash treatment methods identified during the IRM process are indicated for each cut unit on the sale area map.

3. Implementation. An assessment of the sale area shall be made in the timber sale planning process. Sensitive areas needing protection are identified. Results shall be documented in the sale plan and identified in the Timber Sale Contract and on the SAM. The Timber SA shall inspect the treatment for correct and satisfactory slash disposal accomplishment.

31.1 - Fire and Fuel Management Activities.

1. Objective. To reduce public and private losses which result from wildfires and/or subsequent flooding and erosion, by reducing the frequency, intensity, and destructiveness of wildfire.

2. Explanation. Administrative, corrective and preventive measures include:

   a. Fuelbreak construction.
   b. Vegetation management.
   c. Greenbelt establishment to separate urban areas from wildlands.
   d. Fuel reduction blocks and corridors.
   e. Access roads for rapid ingress and egress.
   f. Fire suppression.
   g. Fuel utilization and modification programs.
   h. Public information and education programs.

3. Implementation. Fuel Management is implemented through normal program planning and budgeting and the Integrated Resource Management (IRM) process. Fuel management projects are planned, evaluated, and documented by an ID team. Management constraints and multiple resource protection measures and monitoring requirements are prescribed by the ID team and are documented in the project environmental analysis. Application of constraints and protection measures are the responsibility of the project officer.

31.11 - Consideration of Water Quality in Formulating Fire Prescriptions.

1. Objective. To provide for water and soil resource protection while achieving management objectives through the use of prescribed fire.

2. Explanation. Prescription elements will include such factors as weather, slope, aspect, soils and soil moisture, fuel type and amount, and fuel moisture which influence the fire intensity and thus have a direct effect on whether or not a litter layer remains after burning, and whether or not a water repellent layer is formed. Spatial distribution and contiguous size of the planned burn area

in a watershed are considered in developing prescriptions to reduce the effects of peak flow change on channels.

3. Implementation. The prescription elements are defined by the ID team during project planning using the IRM process. Field investigations are conducted as required to identify site-specific conditions which may affect the prescription. Both the optimum and tolerable limits for water quality needs should be established. Additional monitoring requirements established through IRM, will be used to verify or deny the validity of prescriptions.

31.12 - Protection of Water Quality from Prescribed Burning Effects.

1. Objective. To maintain soil productivity, minimize erosion, and prevent detrimental amounts of ash, sediment, nutrients, and debris from entering water bodies.

2. Explanation. Some of the techniques used to prevent water quality degradation are:

   a. Construct water bars in firelines.

   b. Reduce fuel loading in drainage channels.

   c. Maintain the integrity of the streamside management zone.

   d. Avoid intense fires on sensitive soils, which may promote water repellency, nutrient leaching, and erosion.

   e. Modify desired fire behavior prescriptions relative to burn unit location in watersheds.

   f. Retain or plan for sufficient groundcover to prevent erosion of the burned site.

3. Implementation. The ID team identifies streamside management zones and soils with hydrophobic tendencies as part of the project plan. Forest Service and/or other crews are used to prepare and implement prescribed burning plans.

D – Huachuca FireScape Monitoring Plan

Background

The Huachuca FireScape Project seeks to integrate the fire and fuel management activities of three Federal agencies across 400,000 acres of Federal lands (Figure 1). Cooperating agencies include the USDA Forest Service (Coronado National Forest), the USDI National Park Service (NPS, Coronado National Memorial), and the Department of Defense (DOD, Fort Huachuca Army Installation). At present, the Forest Service provides most of the wildland fire management resources for all three agencies. Activities planned within the project area include both prescribed fire and non-fire treatments. Non-fire treatments include a variety of options for thinning dense stands of trees and shrubs, reducing surface and ladder fuels, and creating openings in forest canopy where it exists. Fire treatments consist of prescribed burning and burning piles of hand cut materials. Projects will be implemented incrementally over approximately 10 years. Each proposed activity applies a defined prescription (a plan that describes what and how much vegetation should be manipulated) and a cost-efficient treatment (a method to achieve the prescription).

In *Protecting People and Sustaining Resources in Fire-Adapted Ecosystems – A Cohesive Strategy* (Federal Register 2000), the Forest Service acknowledged some uncertainty surrounds fire management treatments despite a considerable amount of science supporting an understanding of fire adapted ecosystems. “It is essential that monitoring be conducted to validate assumptions, reduce uncertainties, and measure progress.” The strategy relies on “adaptive management…monitoring, research, and further integration of social sciences.” The Huachuca FireScape Project proposes “ecological restoration” (FSM 2020.5) across broad landscapes rich in biodiversity. Knowledge about the ecosystems is uncertain, as are the outcomes. Clearly, the project needs to follow the adaptive management process.

The adaptive management cycle has 4 steps: 1) objectives are developed to describe the desired condition; 2) management is designed to meet the objectives, or existing management is continued; 3) the response of the resource is monitored to determine if the objective has been met; and 4) management is adapted (changed) if objectives are not reached (Elzinga et al. 1998). Based on this, and many other published definitions, monitoring of resources is an essential step in the adaptive management cycle.

In the FireScape planning area, the Huachuca Mountains, Patagonia Mountains, and Whetstone Mountains are “sky islands”, isolated mountain ranges that rise above the desert floor. As a result of their geographic location, sky islands harbor an impressive diversity of ecosystems that provide habitat for myriad plant and animal species. The Coronado National Forest is the most biologically diverse National Forest in the western United States. Nine major vegetation communities have been mapped on the Forest. There are 25 threatened and endangered species and 359 species listed by NatureServe as “imperiled” or “vulnerable to extirpation or extinction” (http://www.natureserve.org/). Of the 361 bird species on the Coronado National Forest, 42 are listed by U.S. Fish and Wildlife as Birds of Conservation Concern and 41 are on the Partners in Flight Watch List.

The identification of a large suite of species of conservation concern suggests there are many species whose presence and condition may need to be addressed beyond just providing for healthy ecosystems. Some species are likely to benefit from restoration projects, while others may not respond as predicted. A strategic monitoring plan, which identifies appropriate levels of monitoring, coordinated among partner agencies and other groups will provide data essential for adaptive management.

To implement projects under the FireScape proposal, the agencies must develop an implementation plan. The plan will provide for monitoring requirements, as described in this monitoring plan. The monitoring objectives and actions listed in this monitoring plan are subject to individual agency funding, staffing, and programmatic priorities and therefore will be implemented within the constraints determined by these variables. The Huachuca FireScape Project is a cooperative project, with opportunities to share limited resources among its partners, pursue grants, and develop new partnerships with non-governmental organizations and the academic community. These opportunities will be used to leverage agency resources to implement needed monitoring.

Monitoring Policy

National direction specific to U.S. Departments of Agriculture and Interior to monitor ecosystem restoration projects is focused primarily at the region or program level. Each agency has its own project level monitoring policy. The following is a brief listing of National and agency level monitoring policy and directives.

National Monitoring Policy

- Protecting People and Sustaining Resources in Fire-Adapted Ecosystems--A Cohesive Strategy (Federal Register Notice Vol. 65, No. 218, pp. 67479-67511)
  - Monitor to evaluate the effectiveness of various treatments to reduce unnaturally intense fires while restoring forest ecosystem health and watershed function.
  - Study, document and monitor examples of various treatments and their effectiveness in restoring ecological processes, protecting communities, and protecting key ecosystem components.
- The Federal Wildland Fire Management Policy and Program Review (2001 Federal Fire Policy)
  - Fire management planning, preparedness, prevention, suppression, fire use, restoration and rehabilitation, **monitoring**, research, and education will be conducted on an interagency basis with the involvement of cooperators and partners.*(emphasis added)*
- A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment – 10-year comprehensive strategy (August 2001)
  - Guiding principle for Goal 3 (Restore Fire Adapted Ecosystems): Monitor restoration and rehabilitation projects for effectiveness and share the results in order to facilitate adaptive implementation
- Healthy Forest Restoration Act (2003)
  - Monitoring and assessment shall include a description of the changes in condition class, using the Fire Regime Condition Class Guidebook or successor guidance, specifically comparing end results to: (A) pretreatment conditions; (B) historical fire regimes; and (C) any applicable watershed or landscape goals or objectives in the resource management plan or other relevant direction.
  - The Secretary shall, to the maximum extent practicable, develop a process for monitoring the need for maintenance of treated areas, over time, in order to preserve the forest health benefits achieved.

USDA Forest Service Policy

- Ecological restoration activities should be planned, implemented, monitored, and evaluated in consideration of current and desired conditions and the potential for future changes in environmental conditions, including climate change (FSM 2020.3).

- Adaptive management, monitoring, and evaluation are essential to ecological restoration (FSM 2020.6).
- The District Ranger has the authority and responsibility to (1) monitor and evaluate wildlife and fish management prescriptions to measure compliance with objectives, determine effects and adjust subsequent management actions when needed (FSM 2604.22); and (2) conduct monitoring and evaluation of management indicators on the District (FSM 2620.45).
- Conduct fire management planning, preparedness, suppression, monitoring, and research, and fire use on an interagency basis and involve affected partners. Integrate with forest planning whenever possible (FSM 5103.3).

2.3 USDI National Park Service Policy

Monitoring of wildland fires and non-fire fuels treatments is the primary way of assessing whether the fire program is meeting management goals and objectives for hazardous fuels reduction, ecosystem restoration, and maintenance of ecosystem health. Information gathered during fire monitoring is essential for decisionmaking, and it provides documentation and an administrative record of fire activities. The information gained through monitoring serves to increase the knowledge of fire effects and fire behavior on park lands. Additionally, monitoring provides a feedback loop for adaptive management that allows fire managers to improve prescriptions and fire plans based on the new knowledge gained from field measurements. For effective adaptive management, monitoring must be based on and designed to assess both short- and long-term objectives. (RM-18, section 4).

DOD Fort Huachuca Policy

The DOD requires military installations to prepare and implement Integrated Natural Resources Management Plans (INRMP) under authority of the Sikes Act Improvement Act (16 U.S.C. 670 et seq.). The *Fort Huachuca Integrated Resource Management Plan* (2001) provides direction to inventory and monitor resources that are “indicators of overall ecosystem integrity, habitat conditions, capability of lands to support military missions, status of sensitive species or communities, and other special interests”, and to analyze monitoring data to implement an adaptive management strategy, using landscape level monitoring protocols (p. 91). Fire monitoring includes a goal to “monitor effects of fire and fuels management on Fort Huachuca ecosystems” (p. 107).

FireScape Project Goals and Objectives

Project Goals

Goals for the FireScape Project are: 1) to reduce the costs, resource damage, and threats to public and firefighter safety from future wildland fires; 2) to restore and sustain ecological processes in fire-dependent ecosystems; 3) to create and maintain fuel conditions that produce manageable fire behavior and intensity; and 4) to move vegetation and fuel conditions toward their historic condition and ecological resiliency where feasible, both in the broader landscape and within individual ecological units (USFS 2008).

Project Objectives

Elzinga et al. (1998) defined monitoring as the systematic and repetitive collection of information to evaluate changes in condition and progress toward meeting a management objective. The overall objective for the FireScape Project is to move each Ecological Unit [5] (EU) toward the “desired

[5] The project area is stratified into fifteen **ecological units** (Appendix; see also EU map in the Environmental Assessment for the project). Ecological mapping units are composites of geology, soils, climate, topography, and vegetation that form a logical basis for fire management. Lang (2005) describes the mapping process.

vegetative condition" (Huachuca FireScape Project EA Appendix, part A, Table 20). Specific objectives for some key ecological conditions, such as soil stability, forage production, and wildlife habitat and populations were not written. The implicit assumption is there is a strong tie between the desired vegetation condition, wildlife habitat quality, and species population levels. Because this assumption has had little testing, and none on the project area, it will need to be validated with monitoring. Implementation plans developed for the Huachuca FireScape Project will need to develop specific management objectives to focus monitoring of treatments, evaluation of their success, and subsequent management changes. Well developed, good quality objectives are essential to adaptive management. A good objective meets the criteria of being results oriented, measurable, time limited, specific, and practical (from the *Open Standards for the Practice of Conservation – www.conservationmeasures.org*).

Completion of the table of current and desired conditions for each key ecological attribute listed in this monitoring plan will provide the majority of the elements of good quality objectives and provide the basis for the monitoring plan. If management objectives stated in the implementation plans differ significantly from what is predicted by the monitoring team, this monitoring plan may need to be revised.

Monitoring Design

Monitoring Objective Setting Process

In order to monitor the success of fire treatments discussed in the EA, the monitoring team needed to devise a way to quantify the management objectives developed by the Huachuca Area Fire Management Plan (HAFP 2005). Although desired vegetative condition statements had been developed for each EU (Huachuca FireScape Project EA Appendix, part A, Table 20), the team needed to describe monitoring indicators, unambiguous and measurable aspects of the desired condition statements. Additionally, we needed to develop monitoring indicators for the other desired conditions that are not described in the vegetation descriptions: fire regime, fuels, soils, range, non-vegetative components of wildlife habitat, and wildlife populations.

To develop these indicators, we used a process reviewed by the Conservation Measures Partnership, a consortium of experts in the field of adaptive management, including representatives from multiple large conservation NGOs, adaptive management consultants, and the IUCN (see www.ConservationMeasures.org). This process is adopted in the Open Standards for the Practice of Conservation, a set of adaptive management standards that are reflected in the work of the participating organizations and that these experts believe are fundamental to effective conservation (Conservation Measures Partnership 2007).

We first combined certain EUs with similar characteristics to form 8 units for the purposes of monitoring. We then developed a set of key ecological attributes for the EUs. Key ecological attributes are critical aspects of the EU that help define and assess its ecological viability and integrity. These attributes, if missing or altered, would lead to continued or further degradation. The "desired vegetative condition" statements identify certain ecological attributes of the vegetation, such as plant species composition and canopy cover. Additional attributes, such as fire frequency, soil condition, forage production, and wildlife habitat features (e.g., snags, hiding cover) were added by the monitoring team to more fully evaluate how well the management actions are affecting ecosystem function and other resources of the project area. While the list of key ecological attributes could be long, we limited the list to those that are essential to ecosystem function and likely to respond to ecosystem restoration projects.

Because the key ecological attributes are not always concise or measurable, we then developed monitoring indicators, measurable parameters that represent the key ecological attributes and are suitable for monitoring. We developed one or more monitoring indicator for each key ecological attribute. While a myriad of indicators can be identified, the number of indicators ultimately selected for monitoring purposes is the minimum required to measure both the effectiveness of management actions, as well as the need to take action where none has yet been proposed. Key ecological attributes and monitoring indicators are presented in Table 22.

A simple, but effective, grading scale can be used to assess the current health and desired condition of selected indicators. In other words, if used periodically throughout the project cycle, this grading scale will tell managers if progress is being made toward achieving management objectives. When assessing the condition of indicators, it is important to recognize how they can vary in time and space. Therefore, historic range of variability is incorporated into the ratings. A description of the ratings is as follows:

- **Very Good** -- The factor is functioning at an ecologically desirable status, and requires little human intervention.
- **Good** -- The factor is functioning within its range of acceptable variation; it may require some human intervention.
- **Fair** -- The factor lies outside of its range of acceptable variation & requires human intervention. If unchecked, the target will be vulnerable to serious degradation.
- **Poor** -- Allowing the factor to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible.

Monitoring Objective

The objective of monitoring is to detect a change (positive or negative) in the status of key ecological attributes (e.g., movement from fair to good condition). Initial indicator ratings will be based on peer reviewed literature and expert knowledge. FireScape partners will convene periodically to review the monitoring results and assess their condition and trend. Monitoring may detect a change in indicator ratings that can be reliably linked to the vegetation treatment. However, it is possible that other factors, such as unusual precipitation patterns or the introduction of disease or non-native species, may have played an equal or greater role in altering the condition of one or more key ecological attributes. Therefore, control sites will be necessary to assess the status of indicators and compare with those at treatment sites.

Role of Single Species Survey and Inventory

These indicators might not include parameters measured in pre-project surveys that are required to meet design criteria for protection of T&E species, cultural sites, and other sensitive resources. Objectives for pre-project surveys are to confirm presence or absence of the sensitive resource so that impacts can be avoided or minimized. Surveys for threatened and endangered species are typically required for consultations with U.S. Fish and Wildlife Service. These surveys differ from the monitoring plan in that they are expected to be completed prior to the project and will not be repeated over time to evaluate project effectiveness. Exceptions are ongoing long-term monitoring for the following species: Pima pineapple cactus (annual population monitoring at one site on CNF), Huachuca water umbel (bi-annual monitoring of 3 populations on CNF), Gila topminnow (annual surveys by AGFD), Sonoran tiger salamander (annual surveys of stockponds by AGFD), lesser long-nosed bat roosts (several roosts monitored annually) and agave density (5 transects read annually on CNF).

Monitoring Priorities

The number of indicators reflects the choice of indicators that together would provide a means to evaluate the success of the ecosystem restoration project. This number is undoubtedly greater than the capacity of each agency would support. Therefore, we ranked the indicators to highlight critical monitoring needs without losing sight of other, equally important parameters. Monitoring priorities (essential, recommended, and opportunistic) are based on a combination of factors, foremost of which are predicted sensitivity to management actions (as documented in peer-reviewed literature), ecological importance, feasibility and cost to monitor, and agency compliance requirements (e.g., FireScape Project mitigation measures, species Recovery Plans, Biological Opinions, Forest Plan requirements). Indicators ranked essential are critical to ecosystem function, are sensitive to change and well-tested or simple to monitor at relatively low cost. Indicators that are recommended are also important to monitor but may be more difficult and expensive to measure. With additional partner agency resources (primarily staff) recommended indicators can, and should, be monitored. Opportunistic indicators are not as well-tested and should be monitored if and when outside funding, external researchers, and/or volunteers become available to assist with monitoring. For any specific site and treatment, circumstances may dictate that lower priority indicators are the most appropriate to employ.

Monitoring Methods

The following is a general explanation of the primary methods to be used for monitoring indicators. Some of these methods are currently in use in the project area, while others have not been tested. Adjustments will likely be needed as these methods are applied and new methods and approaches are developed. Sample design, field methods (protocols), and data management analysis will be determined prior to implementation. They will be compliant with Natural Resource Information System (NRIS) standards and guidelines.

Fire Seasonality, Frequency, Severity and Risk Monitoring

Indicators for these attributes include treatment time of year (season), percent of EU in desired fire frequency, percent of plan area with very high severity fires per year, percent bare ground and canopy kill, and fuel load arrangement, alignment and values at risk (Table 22).

Range transects and line intercepts (explained below) are used to measure ground cover and tree canopy kill. Fuel load and fire risk is evaluated from photo guides and field observations documented by fuels and fire experts. Photo points are used to document pre-treatment fuel conditions, including fuel load and arrangement, as well as risk from fire. Burn boundaries (prescribed and wildfire) are monitored with a global positioning system (GPS) and analyzed with a geographic information system (GIS). Fuel load will be evaluated prior to treatment and 5 years following treatment. Taken together, these data are used to help determine the fire regime condition class (FRCC). Fire behavior modeling is used to demonstrate treatment effectiveness in reducing risk.

Vegetation and Habitat Monitoring

Indicators in this group include 1) tree composition, size class distribution, and density; 2) canopy cover; 3) snag, nest cavity and bark roost availability; 4) shrub composition and structure; 5) understory plant species composition; 6) ground cover; and 7) forage production for livestock (Table 22).

A suite of vegetation indicators is measured along the same transects, increasing sampling efficiency and reducing costs. Paced frequency, dry weight rank, and Fetch transects (per 1996 Interagency Technical References: Sampling Vegetation Attributes, and Utilization Studies and Residual

Measurements) currently in use by the Forest Service Range Program will be used to measure 1) bare soil, rock, gravel and litter cover, 2) perennial plant basal cover, 3) plant species composition (from dry weight rank), 4) plant species frequency and 5) plant distribution (= Fetch). Fetch can be used to assess soil stability. Ecological site guides are applied to the range transect area. The Sierra Vista Ranger District has established about 200 of these range transects. Additional range transects may be necessary if the number of existing transects in a treatment area is inadequate. Livestock forage production will be determined by clipping and weighing perennial grasses or by ocular estimate.

Line intercept is used to measure tree and shrub density and canopy cover. Browse is measured using the Cole Browse Method. Agave encountered along transects are also recorded.

The availability and suitability of snags and cavities for primary and secondary cavity nesting birds and bat roosts is measured in fixed area plots (see breeding bird monitoring below).

Aquatic habitat is monitored immediately following treatment and 1 year later. Visual survey of aquatic sites and upstream habitat is done to assess the amount of ash that has potential to enter aquatic habitats for T&E species.

Permanent photo points are established and mapped before treatment. Location for photo points typically will be the range transects, line intercepts, and/or wildlife study plots (explained below). Additional photo points may be needed to document fuel load and arrangement. In some situations, photo points are the primary monitoring tool. Comparing pictures of the same site taken over a period of years furnishes visual evidence of vegetation, fuel and soil changes.

Range transects are read 1 year prior to the treatment, 1 to 3 growing seasons after treatment, and every 5 years after treatment. Shrub and tree cover are measured prior to the project and 1, 2, 5, and 10 years after treatment. All other vegetation indicators are measured immediately prior to treatment and 1 year after treatment.

Some indicators are measured only for treatments in protected and restricted forest types, as defined in the Recovery Plan for the Mexican Spotted Owl (e.g., tree basal area, number of trees per size class, percent canopy cover). The Region 3 Mexican Spotted Owl Microhabitat Protocol (USDA Forest Service 1998) applies to silviculture thinning, management-ignited fire, and other activities directed at modifying forests and woodlands (excluding prescribed natural fire). Indicators are measured in plots (fixed- and variable-radius) at a fixed distance along a transect. Monitoring is required pre-treatment and post-treatment after most of the treatment effects have occurred but no longer than 3 years.

Wildlife Monitoring

Wildlife monitoring is coordinated with existing external monitoring programs, principally AGFD but also with academic institutions and NGOs, for greater efficiency and to ensure best monitoring practices are implemented. Monitoring methods are designed to record species occurrence, distribution and abundance. Habitat use information is collected opportunistically.

Breeding birds are monitored in area-constrained plots (15 hectare) consistent with a coordinated State-wide approach to bird monitoring that is being developed and tested by the Arizona Bird Conservation Initiative (ABCI). The approach provides opportunities for the input of “citizen science.” This is a rapid survey (4-5 hours), followed with a more intensive survey of selected sites for protocol validation. A minimum of one plot is strategically located in treatment areas and recorded prior to treatment and 1-year after treatment. Birds are monitored a minimum of twice per year: once in spring and once in summer rainy season. When funding and/or volunteers are available, birds are

monitored a third time, post-monsoon. A subset of the breeding bird monitoring plots is retained for long-term effectiveness monitoring, with plots stratified by EU. Available funding and available work force determines the frequency of long-term monitoring.

In the same bird monitoring plots, nest cavities and trees with loose bark are inspected for occupancy. An optional nest box study can provide additional data to evaluate nesting dates, clutch size and nestling condition. These parameters are highly sensitive to vegetation and prey (insect) conditions.

Bat, small mammal, and lizard monitoring is recommended or opportunistic (i.e., when funding and volunteer labor is available). Bat monitoring is coordinated with the Arizona Bat Conservation Strategic Plan, which calls for Statewide species and habitat monitoring. Species diversity is measured with one or more of the following: mist net, harp trap, and acoustic monitoring, depending on the target species. For these surveys, riparian species (e.g., red bat and yellow bat) are targeted. Monitoring methods for small mammals is species-specific but typically involves live traps (Sherman and pitfall traps). Monitoring for lizards is typically done with a belt transect (Visual Encounter Survey) but other methods (e.g., time-limited search) work equally well for certain species.

Watershed Condition

Channel stability is evaluated through measurement of channel width: depth, bank cover and pebble counts. These data are compared with the baseline condition determined at least 1 year prior to treatment. Existing data can be used, with an immediate post-treatment evaluation.

Partner Coordination

A goal of FireScape is to increase efficiency of treatments by coordinating across land management jurisdictions. The EUs are mapped without regard to jurisdiction. Monitoring will be coordinated across EUs to maximize agency resources and prevent over-sampling, under-sampling, or poor sampling design.

Based on monitoring results or information needs identified during monitoring or project planning, FireScape partners might recommend research studies and seek partnerships and funding to facilitate their implementation.

Table 22. FireScape monitoring indicators and priorities

No.	Attribute	Indicator	Ecological Unit and Monitoring Priority							
			1	2	3, 14	5 - 8	9	15	10 - 12	13
1	Fire Seasonality	Time of year	E	E	E	E	E	E	E	E
2	Fire Frequency	% of EU in desired Frequency	E	E	E	E	E	E	E	E
3	Fire Severity	3.1 % bare ground over time	E	O	O	E	E	E	E	E
		3.2 % of planning area with very high severity fires per year	E	O	O	E	E	E	E	E
		3.3 % canopy kill	E	R	R	E	E	E	E	E
4	Fire Risk to life, property, and ecosystem	Fuel Load, Arrangement, Alignment, values at risk	E	E	E	E	E	E	E	E
5	Tree composition and structure; snag and bark availability; MSO "micro-habitat"	5.1. Density of fire adapted species	R		E	E	E	E	E	R
		5.2. Density of juniper by size class			E	E	E	E	E	
		5.3. Density of other species that would increase with lack of fire (particularly in smaller size classes)	R		E	E	E	E	E	R
		5.4. Number of trees per size class (w/in PAC)				E			E	E
		5.6. Total basal area of trees >5 inches drc (w/in PAC)				E			E	E
		5.7. % canopy cover (w/in PAC)				E			E	E
		5.8. Oak canopy cover by size class				E	E			
		5.9. Number of snags by size class per ha	E			E			E	E
		5.10. Number of trees with suitable nesting cavities	O		O	E	O	O	E	O
		5.11. Bark availability	O		O	E	O	O	E	O
6	Shrub composition and structure; Browse	6.1 Shrub density/cover by size class, particularly manzanita and mesquite in smaller size classes		E	E	E	E	E	O	
		6.2 Browse availability, composition, age class		O			R	R		

No.	Attribute	Indicator	Ecological Unit and Monitoring Priority							
			1	2	3, 14	5 - 8	9	15	10 - 12	13
7	Understory plant species composition; ground cover; MSO "micro-habitat"	7.1. % cover native perennial grasses	E	E	E	E	E	E	O	O
		7.2. Native grass species composition	E	E	E	E	E	E	O	O
		7.3. % cover native/nonnative forbs	E	E	E	E	E	E	O	O
		7.4. Abundance and distribution of special status species	E	E	E	E	E	E	E	E
		7.5. Agave abundance	O	R	R	R	R	O	O	O
		7.6. Number of logs >12 inches (w/in PAC)				E			E	E
		7.7. Large woody debris cover	E			E			E	E
		7.8. Litter cover		E	E	E	E	E	E	
8	Livestock forage production	Pounds per acre (over 3+ years)	O	O	R	E	E	E	O	O
9	Ecological condition	NRCS ecological site guide	E	E	E	E	E	E	O	O
10	Livestock distribution	% of pasture where utilization is >10%	O	O	R	E	E	E	O	O
11	Bark and cavity users	Pick one based on EU, $, frequency, etc								
		11.1. Breeding success of cavity nesters (e.g., clutch size, offspring condition)	O		O	E	O	O	E	O
		11.2. Distribution and habitat use of bark-roosting bat species	O		O	R	O	O	R	O
		11.3. Distribution and habitat use of bark-nesting bird species	O		O	R	O	O	R	O
12	Insect abundance or availability	Insect density or biomass				R	R	R	R	
13	Insectivorous species	Pick one based on EU, $, personnel, etc:								
		13.1. Breeding bird abundance	R	O	O	E	E	E	E	R
		13.2. Bat distribution and habitat use	R	O	O	R	O	O	R	R
		13.3. Lizard abundance	O	O	O	R	O	O	R	O

No.	Attribute	Indicator	Ecological Unit and Monitoring Priority							
			1	2	3, 14	5 - 8	9	15	10 - 12	13
14	Ground dwelling species	Distribution & abundance (pick one)								
		14.1 lizards	R	R	R	R	R	R	R	R
		14.2 snakes	O	O	R	R	R	R	R	O
		14.3 small mammals	O	O	R	R	R	R	R	O
		14.4 Breeding bird density	R	O	O	E	E	E	E	R
15	Aquatic habitat	Amount of ash that enters occupied aquatic habitat	E		E	E	E	E	E	E
16	Watershed stability	16.1. Ground cover (rock, litter, plant)	R	R	R	R	R	R	R	R
		16.2. Channel stability	R							R

1 Ecological Units (Cleland et al. 2008): 1 = Low Gradient Riparian; 2 = Chihuahuan Desert Scrub; 3 and 14 = Grasslands; 5 and 8 = Oak Savanna and Open Woodlands; 9 = Grass-Chaparral and Oak Savanna; 15 = Grass-Chaparral and Oak Woodland; 10, 11, and 12 = Oak-Pine Woodland and Mixed Conifer; 13 = High Gradient Riparian

2 Monitoring Priorities: H = high, M = Medium, L = Low

E - Actions Relevant to Cumulative Effects Analyses

The following tables provide summarized information used in the cumulative effects analyses of the various resources. Each resource section analyzed only those activities that were relevant to the resource in question and the cumulative effects area. A more detailed list of past, present and foreseeable actions is located in the project record.

Table 23. Past and ongoing activities of a broad nature that contribute to the existing condition

Activity	Time Period
Historic Logging – Sawmills in Garden, Sawmill, Carr, Ramsey, Miller, Sunnyside, and Copper Glance Canyons	1880 - 1905
Fuelwood cutting (pre-regulated) for mining and Ft. Huachuca	1880 - 1940
Forest Service Timber Sales including fuelwood	1906 - present
Range Allotments	1906 - present
Fort Huachuca military activities	1877- present
Huachuca Mountains mining (production)	1880 – 1960
Patagonia Mountains mining (production)	1700s-1970
Whetstone Mountains mining (production)	1880 - 1970
Parker Canyon Lake Construction	1963
Agriculture – Farms and Orchards	1880-1920

Table 24. Acres of past, ongoing and foreseeable actions by ecological unit (EU)

Ownership	Activity or Event	EUs	Acres	Timing
Forest Service	42 Range Allotments	3, 5, 6, 7, 8, 9, 10, 11, 12, 14, 15	307,557	Ongoing
Forest Service Fuels Treatments				
Thin by Hand/Handpile and Burn	Miller Canyon	11	232	Past
	Carr Canyon	11	208	Past
	Ash Canyon, Phase 1	5	125	2008
	Hunter Phase 1	5, 10, 11	115	2008-
	Hunter Phase 2	5, 10, 11	71	2006-2008
Prescribed Burn	Lone Mountain	3, 5, 7, 10	4,217	2000/2005
	Merrittt	5, 7, 10	3,527	2007
	Border 1	5, 10, 12	1,160	2008
	Border 2	5, 12	3,112	2008
Forest Service Wildfires				
	Unnamed wildfires	2, 3, 5, 7, 9, 11, 12, 14	2,753	1987-2004
	Hunter	12	9	1985
	Providencia	6, 14	915	1986
	Shanon	6, 8	1,312	1986
	Lampshire	7, 9	1,848	1987
	Peak	5, 10, 12, 14	6,723	1988
	Cocaine	3, 5	615	1989
	Sheep Ranch	3	149	1991
	Miller	5, 10, 11, 12	2,714	1994

Ownership	Activity or Event	EUs	Acres	Timing
	Lone	5, 12	392	1999
	O'Leary Canyon	5	9	1999
	Merrittt	5, 7, 10	2,605	2002
	Oversight	11, 12	2,241	2002
	Ryan	3, 5, 7, 9, 14	22,821	2002
	A Bar	5, 7	487	2003
	Ash	5, 10, 14	555	2003
	Redrock	7, 9	1,812	2003
	Aztec	6, 7, 8	1,297	2005
	Sunday	5, 10	364	2005
	103 Fire	5, 10, 12	1,773	2006
Forest Service Mastication	Lochiel Mastication	5, 9	1,274	2006
	Mowry Mastication	3, 5, 9	1,489	2007
	S Mowry Mastication	5	1,442	2008
Forest Service Prescribed Burns	Kilo/Lima	3, 14	670	No date
	No name available	14	126	2004
	No name available	2	2,621	2005
	No name available	14	4,013	2005
	No name available	1	3	2006
	No name available	11	417	2006
	No name available	14	4,938	2006
	No name available	3	370	2007
	No name available	11	596	2007
	No name available	14	2,440	2007
	No name available	1	88	2008
	No name available	3	1,343	2008
	No name available	11	578	2008
	No name available	14	1,522	2008
The Nature Conservancy, Ramsey Canyon	Thin + lop/scatter or Thin + chip	11 (oaks)	30 (total for 5 years)	2002-2007
	Thin + lop/scatter or Thin + chip	11 (oaks)	10/year	2008 and beyond
	Burn thinned area	11 (oaks)	50	Once per 10 years
	Riparian restoration activities	13	½-mile-long corridor	ongoing
Babocomari Ranch Company	Mesquite removal	Probably 14	~ 300/year	2002-2008
	Whitethorn acacia herbicide treatment	Probably 14	~ 300/year (1500 completed, another 1500 planned)	ongoing
	Water improvements and fencing	Probably 14	No data	ongoing

F – Fire and Fuels Analysis Maps

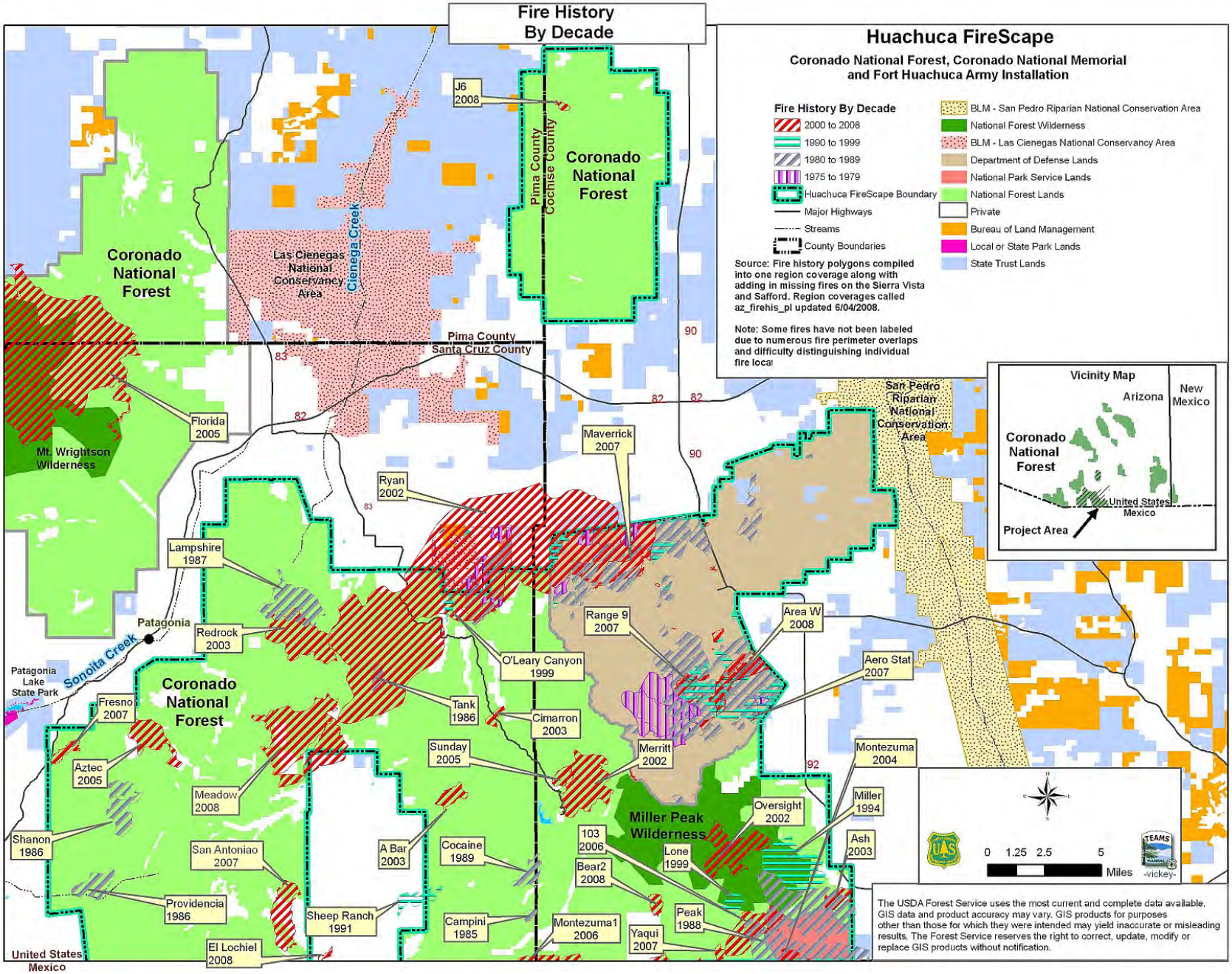
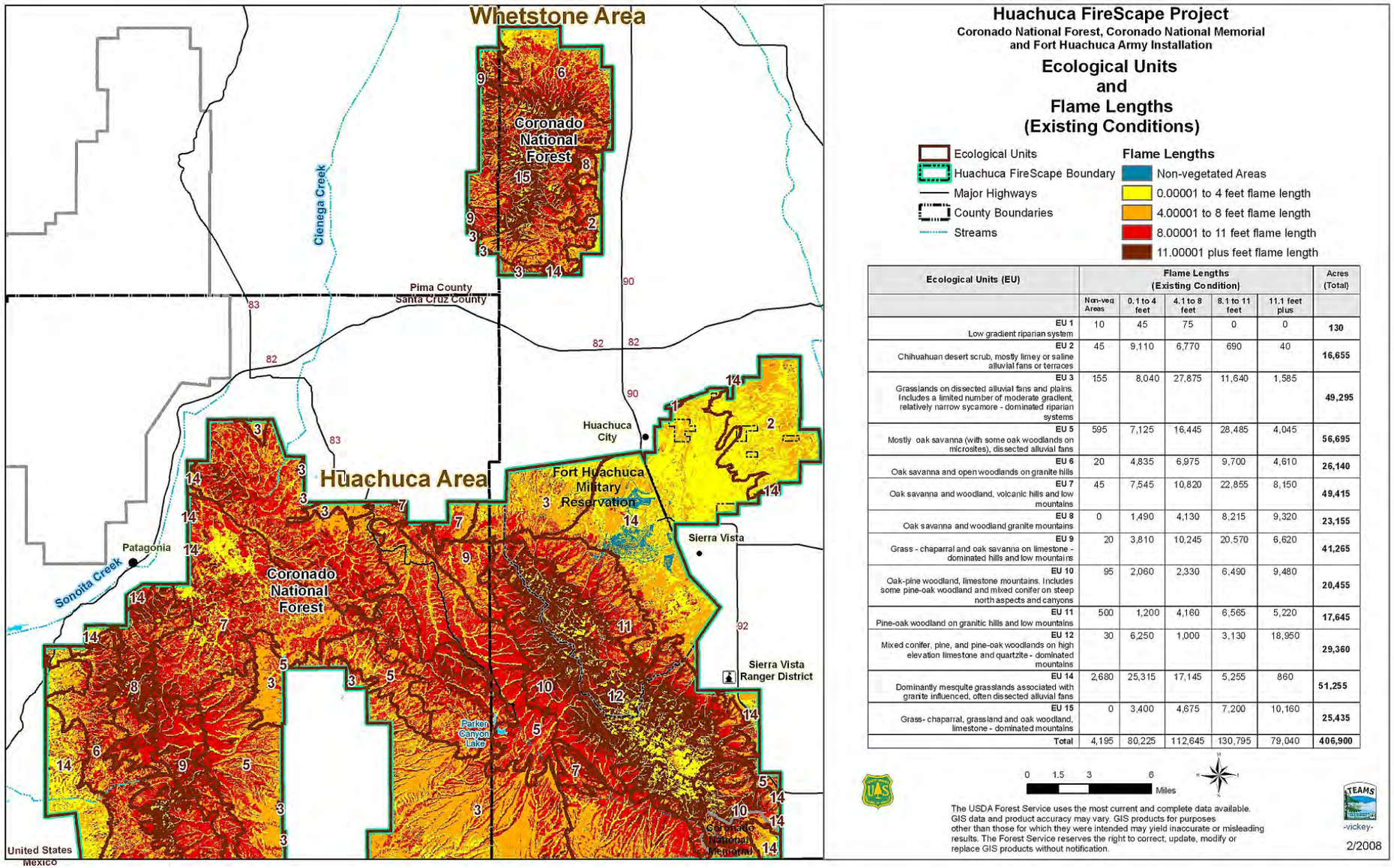
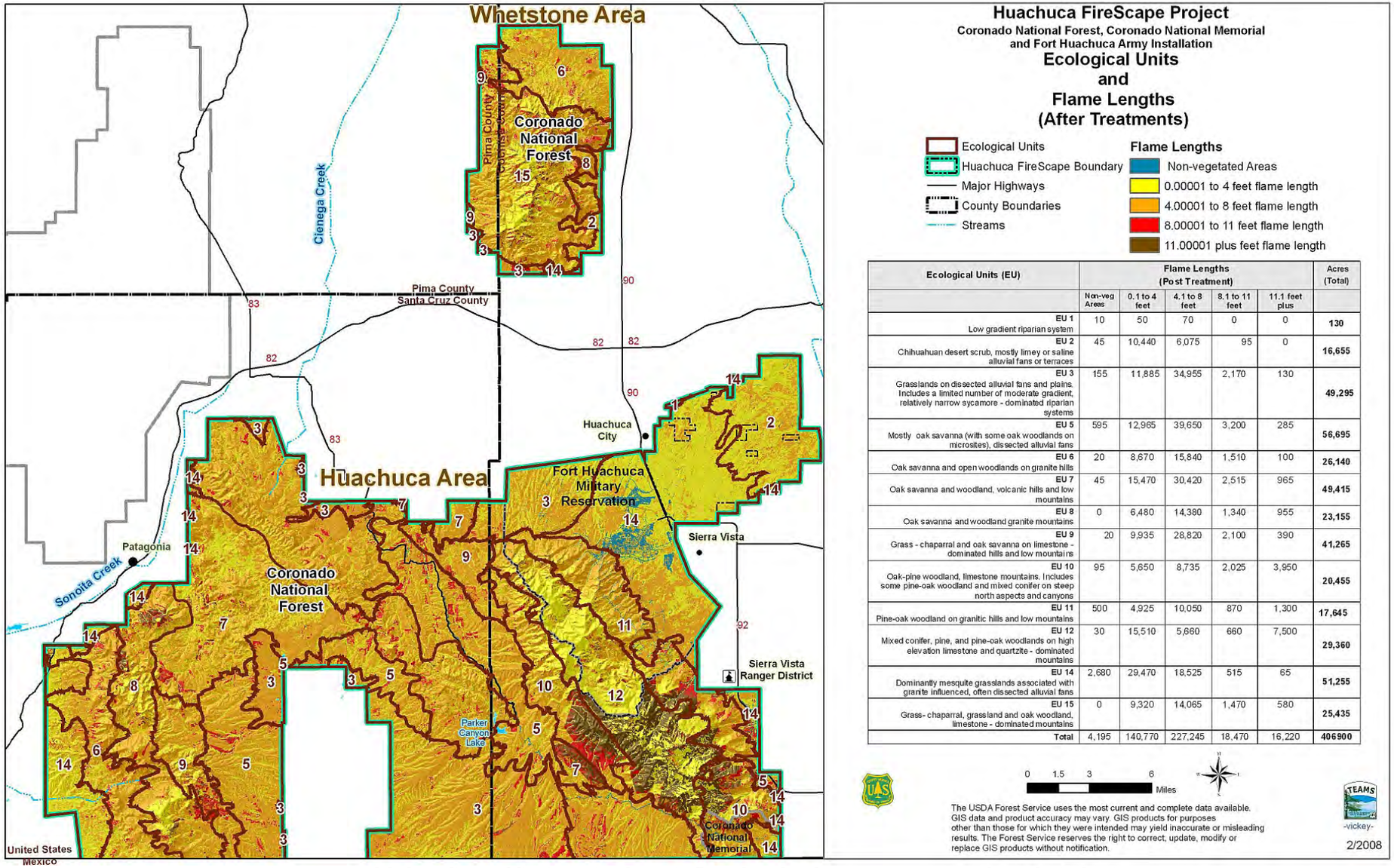


Figure 19. Map of fire history in the project area by decade



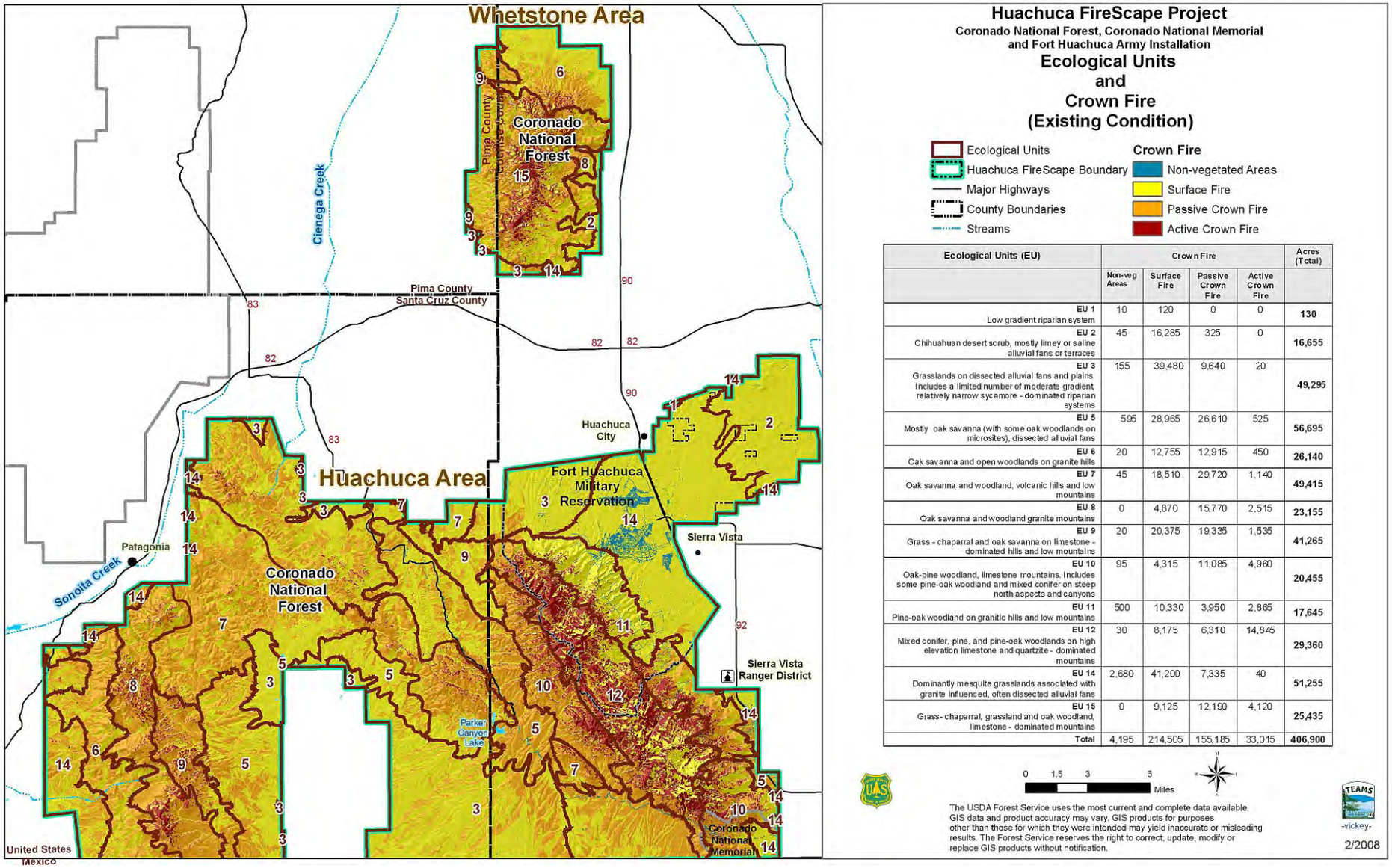
Ecological Units (EU)	Flame Lengths (Existing Condition)					Acres (Total)
	Non-veg Areas	0.1 to 4 feet	4.1 to 8 feet	8.1 to 11 feet	11.1 feet plus	
EU 1 Low gradient riparian system	10	45	75	0	0	**130**
EU 2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	45	9,110	6,770	690	40	**16,655**
EU 3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore - dominated riparian systems	155	8,040	27,875	11,640	1,585	**49,295**
EU 5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	595	7,125	16,445	28,485	4,045	**56,695**
EU 6 Oak savanna and open woodlands on granite hills	20	4,835	6,975	9,700	4,610	**26,140**
EU 7 Oak savanna and woodland, volcanic hills and low mountains	45	7,545	10,820	22,855	8,150	**49,415**
EU 8 Oak savanna and woodland granite mountains	0	1,490	4,130	8,215	9,320	**23,155**
EU 9 Grass - chaparral and oak savanna on limestone - dominated hills and low mountains	20	3,810	10,245	20,570	6,620	**41,265**
EU 10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	95	2,060	2,330	6,490	9,480	**20,455**
EU 11 Pine-oak woodland on granitic hills and low mountains	500	1,200	4,160	6,565	5,220	**17,645**
EU 12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite - dominated mountains	30	6,250	1,000	3,130	18,950	**29,360**
EU 14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	2,680	25,315	17,145	5,255	860	**51,255**
EU 15 Grass- chaparral, grassland and oak woodland, limestone - dominated mountains	0	3,400	4,675	7,200	10,160	**25,435**
Total	4,195	80,225	112,645	130,795	79,040	**406,900**

Figure 20. Modeled existing condition of fire intensity shown in flame lengths across the ecological units



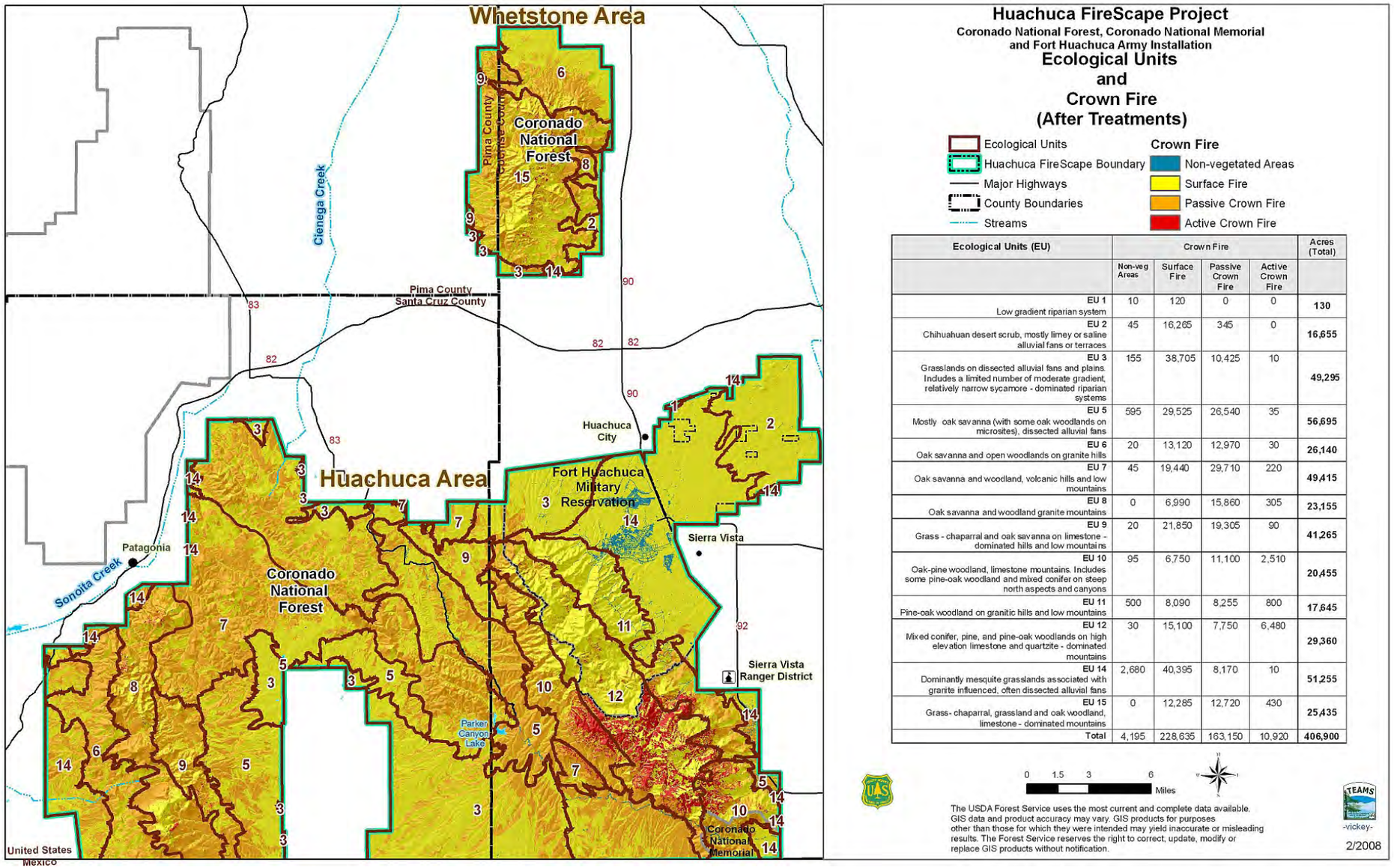
Ecological Units (EU)	Flame Lengths (Post Treatment)					Acres (Total)
	Non-veg Areas	0.1 to 4 feet	4.1 to 8 feet	8.1 to 11 feet	11.1 feet plus	
EU 1 Low gradient riparian system	10	50	70	0	0	**130**
EU 2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	45	10,440	6,075	95	0	**16,655**
EU 3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore - dominated riparian systems	155	11,885	34,955	2,170	130	**49,295**
EU 5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	595	12,965	39,650	3,200	285	**56,695**
EU 6 Oak savanna and open woodlands on granite hills	20	8,670	15,840	1,510	100	**26,140**
EU 7 Oak savanna and woodland, volcanic hills and low mountains	45	15,470	30,420	2,515	965	**49,415**
EU 8 Oak savanna and woodland granite mountains	0	6,480	14,380	1,340	955	**23,155**
EU 9 Grass - chaparral and oak savanna on limestone - dominated hills and low mountains	20	9,935	28,820	2,100	390	**41,265**
EU 10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	95	5,650	8,735	2,025	3,950	**20,455**
EU 11 Pine-oak woodland on granitic hills and low mountains	500	4,925	10,050	870	1,300	**17,645**
EU 12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite - dominated mountains	30	15,510	5,660	660	7,500	**29,360**
EU 14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	2,680	29,470	18,525	515	65	**51,255**
EU 15 Grass- chaparral, grassland and oak woodland, limestone - dominated mountains	0	9,320	14,065	1,470	580	**25,435**
Total	4,195	140,770	227,245	18,470	16,220	**406900**

Figure 21. Modeled condition of fire intensity shown in flame lengths after treatment across the ecological units



Ecological Units (EU)	Crown Fire				Acres (Total)
	Non-veg Areas	Surface Fire	Passive Crown Fire	Active Crown Fire	
EU 1 Low gradient riparian system	10	120	0	0	**130**
EU 2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	45	16,285	325	0	**16,655**
EU 3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore - dominated riparian systems	155	39,480	9,640	20	**49,295**
EU 5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	595	28,965	26,610	525	**56,695**
EU 6 Oak savanna and open woodlands on granite hills	20	12,755	12,915	450	**26,140**
EU 7 Oak savanna and woodland, volcanic hills and low mountains	45	18,510	29,720	1,140	**49,415**
EU 8 Oak savanna and woodland granite mountains	0	4,870	15,770	2,515	**23,155**
EU 9 Grass - chaparral and oak savanna on limestone - dominated hills and low mountains	20	20,375	19,335	1,535	**41,265**
EU 10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	95	4,315	11,085	4,960	**20,455**
EU 11 Pine-oak woodland on granitic hills and low mountains	500	10,330	3,950	2,865	**17,645**
EU 12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite - dominated mountains	30	8,175	6,310	14,845	**29,360**
EU 14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	2,680	41,200	7,335	40	**51,255**
EU 15 Grass- chaparral, grassland and oak woodland, limestone - dominated mountains	0	9,125	12,190	4,120	**25,435**
Total	4,195	214,505	155,185	33,015	**406,900**

Figure 22. Modeled existing condition of crown fire potential across the ecological units



Ecological Units (EU)	Crown Fire				Acres (Total)
	Non-veg Areas	Surface Fire	Passive Crown Fire	Active Crown Fire	
EU 1 Low gradient riparian system	10	120	0	0	**130**
EU 2 Chihuahuan desert scrub, mostly limey or saline alluvial fans or terraces	45	16,265	345	0	**16,655**
EU 3 Grasslands on dissected alluvial fans and plains. Includes a limited number of moderate gradient, relatively narrow sycamore - dominated riparian systems	155	38,705	10,425	10	**49,295**
EU 5 Mostly oak savanna (with some oak woodlands on microsites), dissected alluvial fans	595	29,525	26,540	35	**56,695**
EU 6 Oak savanna and open woodlands on granite hills	20	13,120	12,970	30	**26,140**
EU 7 Oak savanna and woodland, volcanic hills and low mountains	45	19,440	29,710	220	**49,415**
EU 8 Oak savanna and woodland granite mountains	0	6,990	15,860	305	**23,155**
EU 9 Grass - chaparral and oak savanna on limestone - dominated hills and low mountains	20	21,850	19,305	90	**41,265**
EU 10 Oak-pine woodland, limestone mountains. Includes some pine-oak woodland and mixed conifer on steep north aspects and canyons	95	6,750	11,100	2,510	**20,455**
EU 11 Pine-oak woodland on granitic hills and low mountains	500	8,090	8,255	800	**17,645**
EU 12 Mixed conifer, pine, and pine-oak woodlands on high elevation limestone and quartzite - dominated mountains	30	15,100	7,750	6,480	**29,360**
EU 14 Dominantly mesquite grasslands associated with granite influenced, often dissected alluvial fans	2,680	40,395	8,170	10	**51,255**
EU 15 Grass- chaparral, grassland and oak woodland, limestone - dominated mountains	0	12,285	12,720	430	**25,435**
Total	4,195	228,635	163,150	10,920	**406,900**

Figure 23. Modeled condition of crown fire potential after treatment across the ecological units