National Park Service
U.S. Department of the Interior

Lassen Volcanic National Park
P.O. Box 100
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Lassen Volcanic National Park

Fire Management Plan – Environmental Assessment

December 2005

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Chapter 1 – PURPOSE AND NEED

1.1 Introduction

This Environmental Assessment (EA) documents the results of a study of the potential environmental impacts of an action proposed by the National Park Service (NPS) to amend the Lassen Volcanic National Park Fire Management Plan.

This plan has been prepared in compliance with:

- The National Environmental Policy Act (NEPA) of 1969 (42 United States Code (USC) 4321 et seq.), which requires an environmental analysis for major Federal Actions having the potential to impact the quality of the human environment;
- Council of Environmental Quality Regulations at 40 Code of Federal Regulations (CFR) 1500- 1508, which implement the requirements of NEPA;
- The National Historic Preservation Act (NHPA) (16 USC 470 et seq.), which requires protection of historic properties significant to the Nation's heritage;
- The Wilderness Act (16 USC 1131 et seq.), which requires the preservation of wilderness character and wilderness resources in an unimpaired condition for the park's 78,982 acres of Congressionally designated wilderness; and for the approximately 25,000 acres which are being studied for future designation;
- The Endangered Species Act of 1973 (ESA) (19 U.S.C. 1536 (c), 50 CFR 402), which requires that the effects of any agency action that may affect endangered, threatened, or proposed species must be evaluated in consultation with either the USFWS or NMFS, as appropriate;
- Clean Water Act of 1972, as amended (CWA) (33 USC 1251- 1387), which requires the protection of the chemical, physical, and biological integrity of the Nation's waters;
- Executive Order 11990, "Protection of Wetlands", which requires federal agencies to avoid, where possible, impacts on wetlands; and
- NPS Conservation Planning, Environmental Impact Analysis, and Decision Making; Director's Order #12 and Handbook.

Key objectives of NEPA are to help Federal agency officials make well- informed decisions about agency actions and to provide a role for the general public in the decision- making process. The study and documentation mechanisms associated with NEPA seek to provide decision- makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them. In this case, the Superintendent of Lassen Volcanic National Park is faced with a decision to amend the park's Fire Management Plan as described by the alternatives listed in Chapter 2 of this EA.

In making decisions about National Park Service administered resources, the Park Service is guided by the requirements of the 1916 Organic Act which states the agency's purpose: " to promote and regulate the use of national parks in conformance with their fundamental purpose which is to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the same in such manner and by such means as would leave them unimpaired for the enjoyment of future generations." This authority was further clarified in the National Parks and Recreation Act of 1978: "Congress declares that...these areas, though distinct in character, are united...into one national park system.... The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress."

The requirements placed on the National Park Service by the Organic Act and other environmental laws, mandate that resources are passed on to future generations "unimpaired" (NPS 2001). This EA addresses whether the actions of the various alternatives proposed by Lassen Volcanic National Park significantly impact, and possibly impair, resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

1.2 Purpose and Need

Wildland fire has long been recognized as one of the most significant natural processes operating within and shaping the northern Sierra Nevada and southern Cascade Mountain ecosystems (Skinner and Chang 1996, Agee 1993, Agee et. al. 1978, Kilgore 1973). Virtually all vegetation communities show evidence of fire dependence or tolerance (Beaty and Taylor 2001, Taylor 1990, 1993, Taylor and Skinner 1998, Taylor and Halperin 1991, Kauffman and Martin 1989, Kilgore and Taylor 1979). Many forest types in the park have been shaped by frequent fire return intervals (average 9 years; range 2-32 years) as evidenced by park research (Taylor 2000). At the same time wildland fire has the potential to threaten human lives and property. Consequently there is a need to manage wildland fire so that threats to humans and property are reduced, while at the same time restoring and/or maintaining its function as a natural process.

NPS policy directs that every park having vegetation capable of burning must have a fire management plan, and that the fire management plan must be accompanied by an environmental assessment to document the environmental consequences of the proposed actions *(NPS Director's Order 18)*. The park's first fire management plan was written in 1982. Additional fire management activities were assessed and documented in an EA and plan in 1993. The 1993 Fire Management Plan was again updated in 1998 to comply with national policy changes.

The fire management program in the park does not stand alone, but implements direction provided in higher level policy and planning documents such as:

- *NPS Management Policies* (NPS 2001),
- Lassen Volcanic National Park General Management Plan (NPS 2003),
- Lassen Volcanic National Park Resources Management Plan (NPS 1999a),
- Federal Wildland Fire Management Policy and Program Review (USDI and USDA 2001),
- The National Fire Plan (based on *Managing the Impact of Wildfires on Communities and the Environment, A Report to the President in Response to the Wildfires of 2000*),
- A 10- Year Comprehensive Strategy (*A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment*).

The park is currently operating under a fire management plan and environmental assessment written in 1993. There is a need to amend the 1993 Fire Management Plan to be in compliance with these recently developed or updated policy and planning directives.

1.3 Background

Lassen Volcanic National Park was established by an Act of Congress on August 9, 1916 (39 Stat. 442) "for recreation purposes by the public and for the preservation from injury or spoliation of all timber, mineral deposits and natural curiosities or wonders within said park and their retention in their natural condition and…provide against the wanton destruction of the fish and game found within said park and against their capture or destruction…" Incorporated into the park were Cinder Cone and Lassen Peak National Monuments, which were established by Presidential Proclamation (No. 753 and 754) on May 6, 1907, as part of the Lassen Peak Forest Reserve.

The park encompasses 106,372 acres of mountainous terrain at the southern end of the volcanic Cascade Mountain Range in northeastern California (See Figure 1- 1). Preserved within the park is the site of the most recent volcanic eruption within the continental

United States, prior to the Mount Saint Helens eruption in May 1980. Lassen Peak is one of the largest plug dome volcanoes in the world. The park is unique in that it also preserves, in a relatively small geographic area, examples of the three other types of volcanoes recognized by geologists: shield volcanoes, composite volcanoes and cinder cones. Also within the park is the most extensive, intact network of geothermal resources west of Yellowstone National Park, including outstanding examples of boiling springs, mud- pots, and fumaroles. The park preserves cinder cones, lava flows, and other volcanic evidence, as well as areas of undisturbed forests, lakes, and streams. Three biogeographic regions come together in the park: the southern Cascade Mountain Range, the northern Sierra Nevada Mountains, and the Basin and Range Province.

Approximately 400,000 people visit the park each year. The park provides opportunities for visitors to learn about volcanism and other park phenomena and enjoy various recreational pursuits such as sightseeing, camping, picnicking, and hiking. Seventy- four percent of the park is congressionally designated wilderness.

1.4 Fire Management Goals and Objectives

The purpose, goals and objectives of the park's fire management program are derived from agency mandates, policy statements, environmental laws and park planning documents. The Fire Management Plan (FMP) must respond to direction provided in federal and NPS policy statements such as the 2001 Review and Update of the 1995 Federal Wildland Fire Management Policy (USDI and USDA 2001). The fire program must comply with laws such as the National Park Service Organic Act, Endangered Species Act, Clean Air Act, Clean Water Act, Wilderness Act, National Historic Preservation Act and Archeological Resources Protection Act, and other laws related to the National Park Service. The park's General Management Plan (NPS 2003a), Natural and Cultural Resource Management Plan (NPS 1999a), and previous fire management plans also provide specific direction regarding park- specific resources and stewardship goals.

Within the framework of these higher- level agency policies and environmental laws, the Park's staff has identified the following goals and objectives for the fire management program. These goals apply to each of the proposed alternatives and their associated objectives would be used to measure the success of the fire management program. Collectively, they form the purpose for proposing action:

1. Ensure that firefighter and public safety is the first priority in every fire management activity. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* - page 21, Guiding Principle #1; *Management Policies 2001* – Section 4.5 Fire Management, 8.2.5.1 Visitor Safety, 9.1.8 Fire Suppression; *Director's Order #18: Wildland Fire Management* (NPS, 1998) - Section 5.1 Safety and Health).

Desired Outcome: Park visitors and staff are protected from the safety risks of fire management activities. Firefighters are able to manage fire and fuels with acceptably low levels of risk.

Five Year Objective: Visitors, staff, and firefighters sustain no injuries resulting from fire management activities.

Strategies:

- All personnel involved in fire management operations will receive a safety briefing describing known hazards and mitigating actions, current fire season conditions, and current and predicted fire weather and behavior.
- Individuals fully qualified using current National Wildfire Coordination Group standards will carry out fire management operations.
- Job Hazard Analyses (JHA) will be developed and implemented for every fire management activity. The JHA's will be reviewed by personnel prior to implementing fire management actions.
- All or portions of the park will be closed to the public when fire activity poses a threat to human safety (at the discretion of the Superintendent).
- Park neighbors, visitors, and local residents will be notified of all planned and emergency fire management activities that have the potential to impact them.
- Daily safety briefings will be completed for park fire staff. After action reviews, safety updates and near miss information will be shared and interpreted.

2. **Restore and maintain desired regimes to the maximum extent practicable so park ecosystems exhibit a high degree of health and function.** (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* - page 23, Policy Statement #4; *Management Policies 2001* - 4.1 General Management Concepts; *Director's Order #18: Wildland Fire Management* - Section 4 Operational Policies and Procedures.)

Desired Outcome: Fire and fuels management activities create and maintain a mosaic of native plant and animal communities that are sustainable and reflect desired ecological conditions.

Five Year Objective: Treat 15% of the parks burnable landscape, under prescription, over next five years.

Strategies:

- Restore fire to Lassen's undeveloped landscapes by implementing fire regimes compatible with contemporary conditions and ecological goals.
- Promote species diversity and restore the stability and resilience of the park's natural communities through targeted fire applications.
- Use treatments to restore composition and structure of highly altered natural communities, focusing on units with the highest FRID values.
- Reduce the introduction, abundance, and spread of non-native plant species, through targeted fire applications or post-fire treatments.

- Actively monitor and evaluate fire management activities, adapting prescriptions and program scale when appropriate.
- Collaborate with partner agencies, and universities in pursuing a refined understanding of fire in LVNP ecosystems.
- Employ adaptive management strategies, reviewing monitoring information annually. Research and monitoring data will be evaluated to refine fire applications and assure targets are being met.

3. Protect Cultural Resources (including prehistoric sites, ethnographic resources, cultural landscapes, and historic structures) from adverse influences of wildland fires, fire suppression, prescribed fires, and manual/ mechanical treatments. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* – pages 22- 23, Policy statements #3 and #7; *Management Policies 2001* - Section 5.3.1.2 Fire Detection, Fire Suppression, and Post- fire Rehabilitation and Protection, and Section 9.1.8 Structural Fire Protection and Fire Suppression; *Director's Order #18: Wildland Fire Management* - Section 4.4.c. Operational Policies and Procedures.)

Desired Outcome: Fire and fuels management action will result in a landscape supporting fire regimes of manageable severity and behavior.

Five Year Objective: Sustain no loss of known historic structure or ethnographic resources over the next five years.

Strategies:

- Focus a portion of fuels management activities in areas surrounding historic structures.
- Complete inventories and update site records for pre-historic sites and ethnographic resources.
- Complete cultural landscape inventory and develop treatment recommendations.
- Complete structure assessment and develop mitigations.
- Develop fire management projects designed to create fire safe landscapes surrounding important sites.
- Develop a resource advisor guide for the park and assure resource advisors are assigned to all incidents

4. Protect sensitive Natural Resources from adverse influences of wildland fires, fire suppression, prescribed fires, and manual/ mechanical treatments. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* - page 22, Policy statements # 2 and #3; *Management Policies 2001* - Section 4.1 General Management Concepts, Section 9.3.9 Wilderness Fire Management, and Section 4.5 Fire Management; *Director's Order #18: Wildland Fire Management* - Section 3 NPS Management Policies, Section 4.4.c. Operational Policies and Procedures, and Section 5.10 Debris Disposal.)

Desired Outcome: A sustainable park landscape supporting plant and animal communities reflective of presettlement conditions.

Five Year Objective: Sustain no net loss of sensitive natural resource values over the next five years.

Strategies:

- Assure review of all fire planning documents by Natural Resource staff and cluster Fire Ecologist.
- Complete surveys and update inventories for sensitive species.
- Complete habitat assessments for spotted owls and cascade frogs, developing wildfire mitigation strategies.
- Develop a resource advisor guide for the park and assure resource advisors are assigned to all incidents

5. Reduce hazardous accumulations of fuels in developed areas, near structures, roadways, wildland- urban interface areas, and cultural resources such as historic structures. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* – page 23, Policy statement #7; *Management Policies 2001* - Section 9.1.8 Structural Fire Protection and Fire Suppression; and *Director's Order #18: Wildland Fire Management* - Section 5.9 Fuels Management).

Desired Outcome: The fuel conditions in strategic areas adjacent to urban interface boundaries, developed areas, and cultural/historic sites are maintained at a level such that the values-at-risk are adequately protected from wildland fire.

Five Year Objective: Reduce hazard fuels in developed areas, urban interface boundaries, and cultural/historic zones to a level where at 90th percentile weather conditions, average flame lengths would be 4 feet or less.

Strategies:

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- Use manual and mechanical treatments to reduce hazard fuels in areas directly adjacent to Park facilities.
- Use prescribed fire, manual and mechanical hazard fuel reduction in strategic locations to reduce the threat of wildland fire spreading outside the Park boundaries.
- Apply manual and mechanical hazard fuel reduction adjacent to targeted significant cultural and historic sites to enhance protection from fire damage.
- Mechanical treatments are not considered within wilderness.
- Monitor the effects of prescribed fire and fuel reduction treatments so that their effectiveness as well as any resource impacts are identified and incorporated into future planning.

6. Maintain preparedness for fire response. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* – page 24, Policy statement #10; and *Director's Order #18: Wildland Fire Management* - Section 5.5 Preparedness).

Desired Outcome: LVNP staff effectively manages fire activities using the best available science. Professional conduct and performance occurs at all levels. Procedures and policies are adhered to during all operations.

Five Year Objective: Develop the capacity to maintain an extended attack wildland fire organization and a complex prescribed burn organization composed of LVNP personnel serving in at least 50% of the critical overhead positions.

Strategies:

- Maintain an active training and trainee assignment program.
- Develop the knowledge, skills, and abilities of LVNP employees in areas of fire management that benefit both the park and the individual.
- Support incident team participation and participation on fire incidents and projects.
- Create an environment where employees are able to develop to their fullest potential.
- Master the latest fire technology in order to predict and track fire danger and fire potential.

7. Maximize the efficiency of the fire management program by coordinating with other park divisions and neighboring agencies. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* – page 24, Policy statement #14; *Management Policies 2001* - Section 2.3.1.9 Cooperative Planning, and Section 4.1.4 Partnerships; and *Director's Order #18: Wildland Fire Management* - Section 4.4 Operational Policies and Procedures).

Desired Outcome: Lassen Volcanic National Park contributes significantly to the local, state, and national firefighting effort. Fire management activities are effectively managed jointly across administrative boundaries for common goals of safety and resource protection.

Five Year Objective: Maintain the number of shifts worked by LVNP staff in suppression, prescribed fire, and wildland fire use to a five year average of 900 shifts per year. Complete joint WFU agreement/plan with USFS.

Strategies:

- Coordinate preparedness and fuels management activities with the following entities: California Department of Forestry and Fire Protection (Tehama-Glenn and Shasta Unit), United States Forest Service (Lassen National Forest) and the Bureau of Land Management (NOD).

- Support the interagency Susanville Emergency Command Center.
- Status available resources with the ECC and send resources to incidents on the local, state, and national level.
- Annually review interagency agreements and modify as needed.
- Coordinate fuels activities through local fuels committees and interagency partnerships.
- Cooperatively manage wildland fires and prescribed fires across Unit boundaries with USFS and CDF.
- Support National Park Clusters with resources, overhead, and planning.

8. Evaluate the costs and benefits of alternative fire management strategies to ensure that financial costs are commensurate with protection or enhancement of resource and wilderness values. (Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* – page 22, Guiding principle #5, and page 24, Policy statements #10 and #11; and *Management Policies 2001* - Section 4.5 Fire Management).

Desired Outcome: Lassen Volcanic National Park (LVNP) achieves cost containment strategies commensurate with national standards for all fire management incidents.

Five Year Objective: Maintain balanced budgets and target treatment costs at a per acre cost of less then $200 for prescribed fire, $1500 for manual/mechanical and $350 for WFU over the next five years.

Strategies:

- Follow cost containment guidelines for all fire management activities.
- Utilize NPS cluster resources when possible
- Complete planning and project implementation at significant spatial scales.
- Use firefighting resources in a manner compensatory with values at risk.

9. Integrate fire management with all other aspects of park management and operations.
(Basis: *Review and Update of the 1995 Federal Wildland Fire Management Policy* - page 21 Guiding Principle #6; *Management Policies 2001* – Section 2.3.1.5 Science and Scholarship; and *Director's Order #18: Wildland Fire Management* – Section 4.4.g).

Desired Outcome: All park divisions support fire management actions and where appropriate use fire to achieve program specific goals.

Five Year Objective: Park fire management activities receive collective input, review and support from the all Divisions over the next five years.

Strategies:

- Schedule annual fire program review to provide other park divisions with updates on planned activities.
- Request review of fire effects data from resource management.
- Coordinate fire program outreach with park interpretation staff.
- Request dedicated staff time from cultural resource staff to assist with project compliance and review.

1.5 Scoping Issues and Impact Topics

The National Park Service in cooperation with the Lassen National Forest held seven public meetings to discuss proposed amendments to the Fire Management Plan and gather the public's concerns or issues with the proposal. The meetings took place in February and March of 2001 in the neighboring communities of Chester, Mineral, Susanville, Redding, Chico, Red Bluff, and Old Station, California. A total of 32 citizens participated in the meetings.

The major issues and concerns that came from the open house and other public input (e.g. email, written correspondence) were evaluated and sorted. Issues determined to be significant were those related to the effects of the proposed action, and those not already adequately addressed by laws, regulations, and policies. Significant issues were used in developing and evaluating the alternatives to the Proposed Action discussed in this EA.

During the fall of 2003, a meeting was held between Lassen National Forest and NPS staff to discuss the merits of continuing with an Interagency Fire Management Plan. It was decided at that time that because the Forest's FMP already included management of the Caribou Wilderness, the Park's FMP would not include it. It was also decided at this meeting that when each agency's FMPs are complete and include Wildland Fire Use (WFU), an agreement (MOU) would be written to address WFU fires crossing agency boundaries.

1.5.1 Significant Issues

Public response to the Proposed Action included the following concerns: "chainsaws and other mechanized devices are contrary to the whole wilderness concept." Also, "fire management goals such as community protection should be achieved by management activities occurring outside of wilderness." These concerns were restated into one significant issue.

Issue: The Park's program of fire management should minimize impacts to wilderness values. Within the park's General Management Plan there is a corollary goal that states:

"Wilderness visitors experience a landscape largely devoid of human impacts."

1.5.2 Impact Topics Evaluated in this Environmental Assessment

Impact topics were derived from issues raised during internal and external scoping. Not every conceivable impact of a proposed action is substantive enough to warrant analysis. The following list of topics did merit consideration in this environmental assessment, as determined by both the Park's compliance council and the interdisciplinary project team.

Geologic and Soil Resources: Soils can potentially be adversely affected by intense fires as well as by suppression activities, therefore, impacts to soils are evaluated in this analysis.

Water Resources: NPS policies require protection of water resources consistent with the Federal Clean Water Act. Both wildfires and fire suppression efforts can affect water resources by exposing soils, which leads to erosion during storm events and subsequent suspended solids and turbidity in downstream surface waters. Therefore, impacts to water resources are evaluated in this analysis.

Wetlands: Presidential Executive Orders mandate the protection of wetlands. Fire suppression activities can influence wetlands, and therefore impacts are evaluated in this analysis.

Vegetation: Since the plant associations in the park are heavily influenced by fire regimes, this environmental assessment considers the impacts of the proposed FMP alternatives on the park's vegetation.

Wildlife: The Federal Endangered Species Act prohibits harm to any species of fauna or flora listed by the U. S. Fish and Wildlife Service (USFWS) as being either threatened or endangered. Such harm includes not only direct injury or mortality, but also disrupting the habitat on which these species depend. There are resident populations of various species of reptiles, amphibians, birds, mammals, and invertebrates in the park. Therefore, impacts of the FMP alternatives on wildlife are evaluated in this analysis.

Noise: Noise is defined as unwanted sound. Fuels reduction, prescribed burns and fire suppression efforts can all involve the use of noise- generating mechanical tools and devices with engines, such as chain saws, trucks, helicopters, and airplanes. Each of these devices, in particular helicopters and chain saws at close range, are quite loud. Therefore, this impact topic is included in this analysis.

Air Quality: The Federal 1970 Clean Air Act stipulates that Federal agencies have an affirmative responsibility to protect a park's air quality from adverse air pollution impacts. Moreover, Lassen Volcanic National Park is designated as a Class I area. All types of fires generate smoke and particulate matter, which can impact air quality within the park and surrounding region to some extent. All of these considerations warrant the inclusion of impacts to air quality in this analysis.

Visitor Use and Experience (Recreation and Visual Resources): The 1916 NPS Organic Act directs the Service to provide for public enjoyment of the scenery, wildlife and natural and historic resources of national parks "in such a manner and by such means as would leave them unimpaired for the enjoyment of future generations." Fire management activities can result in the temporary closure of certain areas and/or result in visual impacts that may affect the visitor use and experience of the park. Therefore, the potential impacts of the proposed FMP on visitor use and experience are addressed in this analysis.

Human Health and Safety: Fires can be extremely hazardous, even life- threatening, to humans, and current federal fire management policies emphasize that firefighter and public safety is the first priority and all FMP's must reflect this commitment. Therefore, impacts to human health and safety are addressed in this analysis.

Cultural Resources: Section 106 of the National Historic Preservation Act of 1966 provides the framework for federal review and protection of cultural resources, and ensures that they are considered during federal project planning and execution. The Park contains many cultural resource sites. These cultural resources can be affected both by fire itself and fire suppression activities, thus potential impacts to cultural resources are addressed in this analysis.

Socio- economics: NEPA requires an analysis of impacts to the "human environment" which includes economic, social and demographic elements in the affected area. Therefore, this impact topic is included for further analysis in this analysis.

Park Operations: Severe fires can potentially affect operations at national parks, especially in more developed sites like visitor centers, campgrounds, administrative and maintenance facilities. These impacts can occur directly from the threat to facilities of an approaching fire, and more indirectly from smoke and the diversion of personnel to firefighting. Fires have caused closures of facilities in parks around the country. Thus, the potential effects of the FMP alternatives on park operations would be considered in this analysis.

Wilderness: The NPS wilderness management policies are based on provisions of the 1916 NPS Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. The public purpose of wilderness in national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use. Section 4(c) of the Wilderness Act of 1964 prohibits certain activities in wilderness by the public, and, at the same time allows the agencies to engage in those prohibited activities in some situations. Section 4(c) states:

> "… except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or

installation within any such area."

Therefore, unless a generally prohibited use is allowed by specific unit designation, most of these activities are prohibited. However, in the above language, Congress acknowledged that there are times when exceptions are allowed to meet the minimum required administration of the area as wilderness. For these exceptions, the Minimum Requirement Decision Guide has been followed. Because the park includes 78,982 acres of proposed wilderness, this impact topic is evaluated in this environmental assessment.

Table 1- 1. Impact Topics for Lassen Volcanic National Park
Fire Management Plan Environmental Assessment.

Impact Topic	Retained or Dismissed from Further Evaluation	Relevant Regulations or Policies
Soils	Retained	NPS *Management Policies 2001*
Water Resources	Retained	Clean Water Act; Executive Order 12088; NPS *Management Policies*
Wetlands	Retained	Executive Order 11988; Executive Order 11990; Rivers and Harbors Act; Clean Water Act; NPS *Management Policies*
Vegetation	Retained	NPS *Management Policies*
Wildlife	Retained	NPS *Management Policies;* Endangered Species Act
Noise	Retained	NPS *Management Policies*
Air Quality	Retained	Federal Clean Air Act (CAA); CAA Amendments of 1990; California Air Quality Standards; NPS *Management Policies*
Visitor Use and Experience (Recreation and Visual Resources)	Retained	NPS *Management Policies*
Human Health & Safety	Retained	NPS *Management Policies*
Cultural Resources	Retained	Section 106; National Historic Preservation Act; 36 CFR 800; NEPA; Executive Order 13007; Director's Order #28; NPS *Management Policies*
Park Operations	Retained	NPS *Management Policies*
Socioeconomics	Retained	40 CFR Regulations for Implementing NEPA; NPS *Management Policies*
Wilderness	Retained	The Wilderness Act; Director's Order #41; NPS *Management Policies*

1.5.3 Impact Topics Dismissed in this Environmental Assessment

NEPA and the CEQ Regulations direct agencies to "avoid useless bulk…and concentrate effort and attention on important issues" (40 CFR 1502.15). Certain impact topics that are sometimes addressed in NEPA documents on other kinds of proposed actions or projects have been judged to not be substantively affected by any of the FMP alternatives considered in this environmental assessment. These topics are listed and briefly described below, and the rationale provided for considering them, but dropping them from further analysis.

Ecologically Critical Areas: The Council on Environmental Quality requires consideration of the severity of impact on unique characteristics of the geographic area such as proximity to ecologically critical areas (e.g. biosphere reserve, world heritage site, wild & scenic rivers). Lassen Volcanic National Park has no designated ecologically

critical areas; therefore this topic is dismissed from further analysis.
Environmental Justice: None of the FMP alternatives would impact minority and low-income populations in a disproportionate manner. Therefore, this topic is dropped from additional consideration.

Waste Management: None of the FMP alternatives would generate noteworthy quantities of either hazardous or solid wastes that need to be disposed of in hazardous waste or general sanitary landfills. Therefore this impact topic is dropped from additional consideration.

Transportation: None of the FMP alternatives would substantively affect road, railroad, water-based, or aerial transportation in and around the park. One exception to this general rule would be the temporary closure of nearby roads during fire suppression activities or from heavy smoke emanating from wildland fires or prescribed burns. Over the long term, such closures would be very infrequent and would not significantly impinge on local transportation. Therefore, this topic is dismissed from any further analysis.

Utilities: Generally, some kinds of projects, especially those involving construction, may temporarily impact above and below-ground telephone, electrical, natural gas, water, and sewer lines and cables, potentially disrupting service to customers. Other proposed actions may exert a substantial, long-term demand on telephone, electrical, natural gas, water, and sewage infrastructure, sources, and service, thereby compromising existing service levels or causing a need for new facilities to be constructed. None of the FMP alternatives would cause any of these effects to any extent, and therefore utilities are eliminated from any additional analysis.

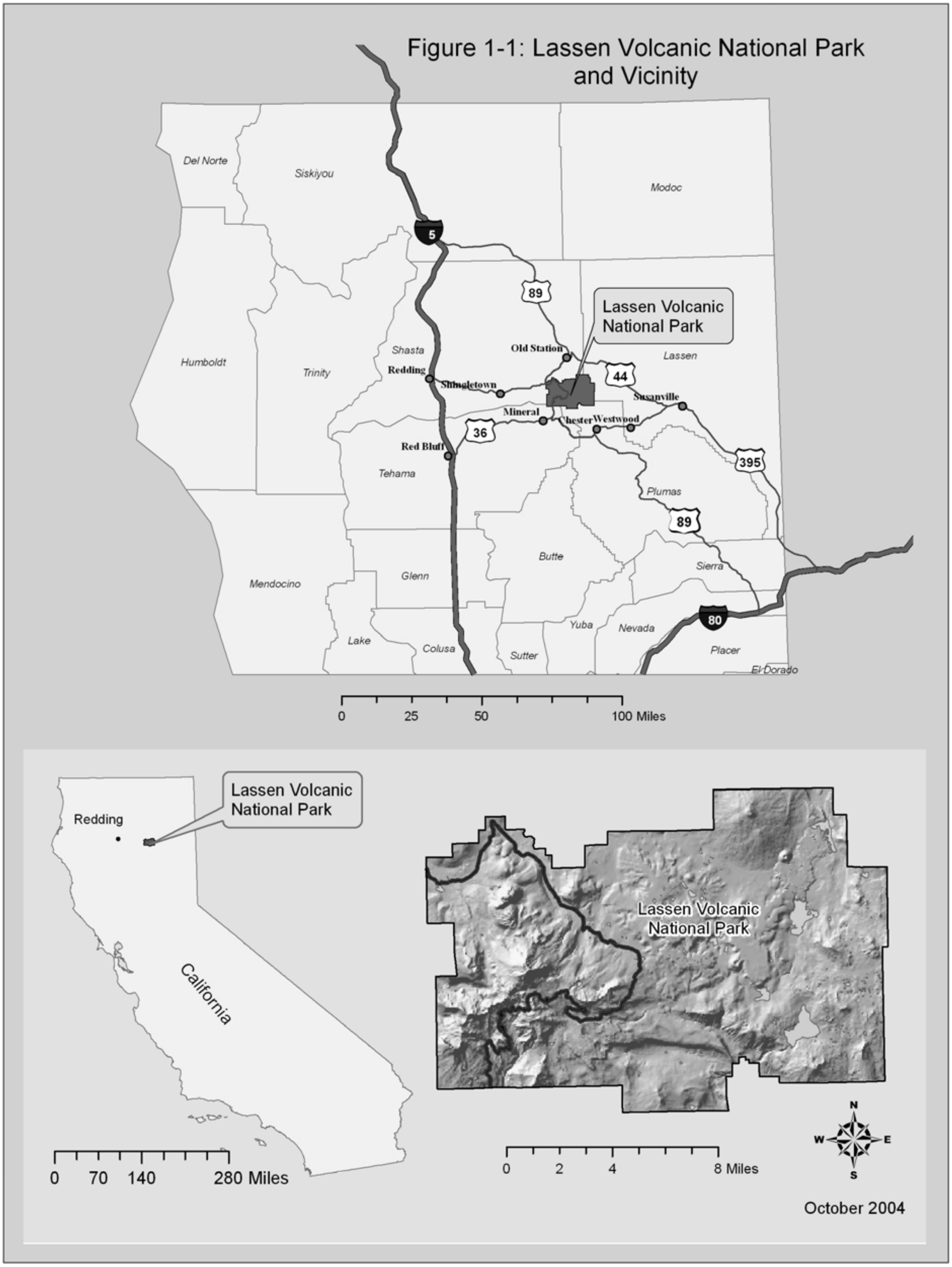
Land Use: Fire management activities would not affect land uses within the park or in areas adjacent to it. Therefore, this impact topic is not included for further analysis in this environmental assessment.

Prime and Unique Agricultural Lands: Prime farmland has the best combination of physical and chemical characteristics for producing food, fed, forage, fiber, and oilseed crops. Unique land is land other than prime farmland that is used for production of specific high-value food and fiber crops. Both categories require that the land is available for farming uses. Lands within Lassen Volcanic Lake National Park are not available for farming and, therefore, do not meet these definitions. This impact topic is not evaluated further in this environmental assessment.

Indian Trust Resources: Indian trust assets are owned by Native Americans but held in trust by the United States. Indian trust assets do not occur within Lassen Volcanic National Park and, therefore, are not evaluated further in this environmental assessment.

Resource Conservation, Including Energy, and Pollution Prevention: The National Park Service's *Guiding Principles of Sustainable Design* provides a basis for achieving sustainability in facility planning and design, emphasizes the importance of biodiversity, and encourages responsible decisions. The guidebook articulates principles to be used such as resource conservation and recycling. Proposed project actions would not minimize or add to resource conservation or pollution prevention within Lassen Volcanic National Park and, therefore, this impact topic is not evaluated further in this environmental assessment.

Figure 1-1: Lassen Volcanic National Park and Vicinity



Chapter 2 - ALTERNATIVES

This chapter describes the range of alternatives, including the Proposed Action and No Action Alternatives, formulated to address the purpose of and need for the proposed project. These alternatives were developed through evaluation of the comments provided by individuals, organizations, governmental agencies, and the park's fire management interdisciplinary team (IDT).

2.1 Definitions

Several wildland fire management terms are used to describe the alternative courses of action analyzed in this EA. The following definitions are provided to help the reader distinguish the similarities and differences among the alternatives for the proposed project.

Wildland Fire - Any non- structure fire, other than prescribed fire, that occurs in the wildland.

Appropriate Management Response - Specific actions taken in response to wildland fire to achieve protection and fire use objectives.

Fire Management Unit (FMU) - Any land management area defined by common objectives, land features, access, values to be protected, political boundaries, fuel types, or major fire regimes that sets it apart from an adjacent unit. FMUs are delineated in Fire Management Plans. These units have assigned management objectives and pre- selected strategies assigned to accomplish these objectives.

Fire Management Strategy – A set of objectives for managing fire that considers fire behavior, public and firefighter safety, resource protection, values at risk, legal constraints and cost efficiency.

Fire Management Tactic - Site- specific activities and techniques that are implemented to meet a selected strategy.

Threat to Human Lives – Anything that would result in the loss of human life or would result in the park not meeting federal and state requirements for health and human safety.

2.2 Fire Management Strategies Common to All Alternatives

The following descriptions of wildland fire management strategies are common to all of the alternatives. The particular mix of strategies and where they are applied across the landscape uniquely define each alternative, as developed in response to the project needs and objectives, significant issues, and impact topics. Each alternative is thoroughly described beginning in section 2.4 of this chapter. A Minimum Requirement Analysis for all actions, projects, and activities in Wilderness has been completed for all alternatives.

2.2.1 Wildland Fire Suppression

Wildland fire suppression is an appropriate management response to some wildland fires. Suppression includes the full range of tactics: confine, contain, and control. All suppression actions are implemented with firefighter and public safety as the highest consideration, but also seek to minimize loss of resource values, economic expenditures, and/or the use of critical firefighting resources.
Definitions of confine, contain and control:

- **Confine:** The least aggressive wildland fire suppression strategy, typically allowing the fire to burn itself out within determined or existing boundaries such as rocky ridges, streams and possibly roads.
  Example: Fire occurs in a remote location with obvious barriers to fire spread.
- **Contain:** A moderately aggressive wildland fire suppression strategy which can be expected to keep the fire within established boundaries of constructed firelines under prevailing conditions.
  Example: Unwanted fire occurs near a trail junction and the trails are used as firelines.
- **Control:** The most aggressive wildland fire suppression strategy, typically constructing fireline on the fires edge to stop the spread of the fire in the quickest time possible.
  Example: Unwanted fire occurs near a developed area. Aggressive suppression action is taken to immediately stop the spread of the fire.

Various fire suppression techniques are used to break the continuity of forest fuels, cool a fire, and slow the advance of a flaming front. Actions may include constructing fire lines; cutting vegetation; applying water, foam or retardant; and using fire to check, direct, or delay the spread of unwanted fire. All suppression actions are guided by minimum impact suppression guidelines (MIST). MIST guidelines are summarized in section 2.6 Mitigation Measures.

Historically, most park fires have been < 5 acres. Fires of this size can be suppressed using hand tools - sometimes supported with a chainsaw for cutting fuels, a fire engine or portable pump for delivering water; and/or a helicopter to transport water, supplies, and firefighters. Fires > 5 acres and small fires with a greater potential for spread, may require the use of drip torches, fusees, fire line explosives, retardant- filled aircraft or extensive water drops.

When determining suppression tactics, collateral damage to park resources as a result of the proposed suppression action is considered. Least cost or minimum acres burned are not the sole determining factors in choosing tactics. Considering public and firefighter safety first, tactics selected are those which create the least collateral damage to park resources.

It is NPS policy to avoid the use of fire retardant as much as possible. The use of heavy equipment, such as dozers, tractors, and tracked- vehicles, can be considered if there is a threat to life and property. During initial attack, the incident commander would call the Duty Officer to request approval to use such equipment. During extended attack fires where an Incident Management Team is in place, the authority and limitations for use of this equipment would be included in the Delegation of Authority.

All human caused wildland fires will be suppressed using the appropriate management response.

2.2.2 Prescribed Fire

Prescribed Fire is any fire ignited by management actions to meet specific objectives. Prescribed fire is applied to the landscape (< 4000 acres per treatment unit) under specified environmental conditions (e.g. weather and fuel moisture); and is confined to a predetermined area with a pre- determined range of fire intensity and rate of spread as documented in an approved prescribed fire plan. The fuels to be burned may be in either their natural or modified state (e.g. cut down and scattered or piled).

Individual burn units are prepared by digging handline to mineral soil around the unit perimeter, pruning and cutting trees and shrubs with chainsaws, or using natural barriers such as snow, creeks, rock outcrops, roads and trails to enclose the unit in a controllable line. Personnel then light fuels in the unit using hand ignition devices such as fusees, fire line explosives, or drip torches. Aerial ignitions are commonly accomplished using a helitorch which dispenses a combination of gasoline and gelling agent; or by dispensing plastic spheres that ignite from an exothermic reaction between ethylene glycol and potassium permanganate crystals. Once ignited, prescribed fires are monitored and "held" by fire crews to ensure the fire is contained and controlled. Actions to control a prescribed fire include the use of fire engines and/or portable pumps for delivering water; and/or a helicopter to transport water, supplies, and firefighters. All management actions are guided by minimum impact suppression guidelines (MIST). MIST guidelines are summarized in section 2.6 Mitigation Measures. A prescribed fire burn plan approved by the park Superintendent and a Smoke Management Plan approved by the appropriate Air District must be in place prior to implementing a prescribed fire.

2.2.3 Wildland Fire Use

Wildland fire use (WFU) is the management of naturally ignited wildland fires to accomplish specific pre- stated *[defined]* resource management objectives in predefined geographic areas (NPS, et al., 1998). One of the basic premises of managing fire is that every wildland fire will receive an "Appropriate Management Response." Because every fire in the wildland is different, decisions need to be made that are appropriate for the management of each individual fire.

For all wildland fire use incidents, the *Wildland Fire Use Coordination and Communication Protocol* will be utilized to manage and coordinate smoke/emissions between the park and the Air Districts. This Protocol aids in the development of mitigation measures before smoke/emissions become a concern. The Air Districts will provide information regarding air quality based on trigger points that should be used to implement smoke/emissions mitigation measures. The park and the Air Districts will plan mitigation efforts well in advance of their needed use. In order to ensure that emissions can be minimized safely and cost effectively prior to the occurrence of substantial smoke/emission impacts, actions need to be planned early in the WFU management process. The processes included in the Protocol provide an agreed upon framework for the coordination process, which can be amended by the Air Districts and the park based on local needs.

The Wildland Fire Implementation Plan (WFIP) is the planning and decision document required for all wildland fires. This planning document has three stages of implementation:

Stage 1: This is the initial fire assessment for all fires. This includes the decision criteria checklist which determines whether the fire will be managed as fire use or suppressed.

Stage 2: For fires continuing as WFU, this stage is for the short term implementation actions which include; short term fire behavior predictions and risk assessment, short term implementation actions, complexity analysis, and a stage 3 needs assessment.

Stage 3: Long term implementation actions. It is anticipated that less than 20% of all of the fires will require a stage 3 analysis which includes a Maximum Manageable Area (MMA) definition, fire behavior predictions, long- term risk assessment, and long term implementation actions. While each WFU will have its own stage 1 and 2 analysis, stage 3 can include one fire or can be combined into a complex of multiple fires. In the case of multiple fires, each fire will have its own analysis completed concerning the probability of the fire reaching an area of concern. Each fire within an MMA will also have its own Management Action Points (MAP'S) for implementing various tactical approaches. All management actions are guided by minimum impact suppression guidelines (MIST). MIST guidelines are summarized in section 2.6 Mitigation Measures.

Because of unique situations, such as the relative small size of the park combined with unnaturally high fuel loading, Lassen Volcanic National Park has taken the basic definition of WFU and developed five general tactics for implementing various fire scenarios. These scenarios are the same for each alternative and were developed to enhance success in managing fires within the boundaries of the park. In the WFIP, different tactical approaches can be implemented individually or by combining several, depending on the needs of the given fire. They are meant as a guide to approved tactics within the park

Each tactical approach also takes into account the four factors involved in a Wildland Fire Risk Assessment:

- Implementation Risk- availability of resources, seasonal severity, fire objectives
- Ecological Risk- fire regime, fire effects, condition class
- Critical Concerns- internal/external involvement, social/political/economic impacts, fire duration
- Safety- tactical complexity, threats to life and property, fire behavior

The following are the scenarios:

1. Monitoring of Free Roaming WFU.
   Scenario: The fire is burning in a location where control concerns are minimal and easily mitigated, and fire behavior will produce desired fire effects.

Tactic: The fire is allowed to burn freely with little or no on the ground disturbance. Fire may be monitored on site and/or from the air. The fire is allowed to burn unimpeded for its duration. Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Projected fire growth is in a naturally defensible area.
- Seasonal severity contributes to desired fire effects.
- Critical concerns are able to be mitigated.
- Minimal on the ground tactics increase safety

2. Herding the Fire.

Scenario: Fire is burning towards an identified control line on a section of the fire while it remains free burning on other sections. (A control line may be a road, trail, natural feature, stream, or constructed handline that management has pre-identified.)

Tactic: The fire may be allowed to burn up to but not cross this line, and may be allowed to burn freely on other parts of the fire. On the ground actions may include the use of chainsaws and hand tools for removing fuels while constructing handline, and improving existing roads and trails. Portable pumps and fire engines may also be used to supply water. Helicopters may be used to support holding actions with water drops as well as air tankers on rare occasions; however the use of retardant will need prior approval from the wilderness coordinator. Handheld firing devices such as drip torches, fire quick flares and fusees may be used to burn out along a control line and aerial firing may be used to burn out where handheld devices are impractical. Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Seasonal severity contributes to desired fire effects.
- Ability to mitigate safety concerns through standard firefighting guidelines
- Projected fire growth and predicted fire behavior allow for tactical advantage in prepping and implementing herding tactic.
- Ability to mitigate critical concerns.

3. Management Controlled Growth.

Scenario: The fire is burning in an area that would prove to provide resource benefits from the fire. The determining factor in using this tactic is when fire behavior predictions and fire growth simulations create concerns over the ability to maintain control of the fire for its duration. Many locations in the park that would create this scenario are some of the highest priority areas for getting fire back onto the landscape.

Another determining factor for this scenario is when predicted smoke impacts may be unacceptable due to the timing of large acre burning periods.

Tactic: Management would identify one or more Target Burn Areas (TBA) within the MMA. Each TBA would have defensible boundaries, either constructed or existing, could be any size, and act as the fires progression. The development of TBA's would mimic as much as practical, fire growth simulations such as in FARSITE. (FARSITE is a fire growth simulation software commonly used for planning purposes on wildland fires). The TBA's perimeter or entire area may be burned under more manageable conditions such as after rain, or periods of high relative humidities. After one TBA is burned and the fire spread is checked, the next TBA may be burned at the next opportunity. This could be done immediately or later in the season, all depending on favorable burning conditions.

For mitigating smoke impacts, management could either delay fire spread by checking, or advancing fire spread during times of good smoke dispersion. Checking or advancing fire spread may not always be possible due to firefighter safety and potential control problems.
Considerations for this tactic:

- Resources commensurate with complexity are readily available.
- Seasonal severity/predicted seasonal severity may produce unwanted fire behavior.
- Resource benefit objectives can be met while meeting objectives of fire control.
- Undesirable fire effects may be mitigated by management controlled ignition.
- Many critical concerns can be mitigated through controlled ignition.
- Ability to mitigate safety concerns is increased through proactive, not reactive management.
- Threats to property or park boundary mitigated in pre planning.

4. Management Controlled Intensity.
Scenario: The fire is burning in an area that would provide resource benefits from the fire. The determining factor in this scenario is undesirable fire effects may occur due to hot burning conditions or the unnatural buildup of fuels. The main objective of this tactical strategy is mitigating the undesirable fire effects in areas that have missed several fire return intervals, or other areas that are in need of fire treatments at a lower intensity level. The goal would be that the next WFU in these areas would be more of a free roaming fire and require less aggressive management.

Tactic: After fire growth predictions have been completed and an MMA has been determined, areas that may be at high risk for undesirable fire effects will be identified. This can be stands of similar forest types within the MMA, or can even be identified as an entire Target Burn Area.

One unique aspect of this scenario is that it can be employed as a part of a free roaming fire, one that is being herded, and can be used within management controlled growth or used only as a stand alone tactic. The identified areas may be ignited by management when fire conditions are favorable for desired fire effects, such as following a rain shower, times of high humidities, or taking advantage of early season burning conditions.
Considerations for this tactic:

- Resources commensurate with complexity are readily available.

- Seasonal severity/predicted seasonal severity may produce undesirable fire effects.
- Resource benefit objectives can be met while meeting objectives of fire control.
- Undesirable fire effects can be mitigated by management controlled ignition.
- Many critical concerns can be mitigated through controlled ignition.
- Ability to mitigate safety concerns is increased through proactive, not reactive management.
- Threats to property and the park boundary are mitigated in pre planning.

5. Delaying Fire Spread
Scenario: Temporary extenuating circumstances (air quality concerns, cumulative impacts, visitor safety, national fire situation, seasonality, availability of fire management resources etc.) occur at the time of a natural ignition that would preclude immediate growth of a WFU fire. This scenario could also include if a portion or the entire perimeter of an established WFU is checked for the above reasons. The objective of this scenario is to take advantage of the potential resource benefits WFU provides, but at an appropriate time. Timing for allowing a WFU to burn will then be commensurate with favorable or improved extenuating circumstances (as listed above).

Tactic: Fire spread on a new WFU fire would be checked at the closest natural barriers or by constructed "check" line. When the temporary extenuating conditions that warranted the checking of the fire spread have abated or have been mitigated, the fire will then be allowed to spread from where it was checked. Management would then have the option of re- lighting the checked edge of the fire, or advancing the fire spread to mimic predictions of what the fire might have burned had it not been checked. The WFIP process would be followed and a fire specific plan would be created. The analysis portion of this plan would model predicted growth to guide management on where to advance the fire.

Considerations for this tactic:

- Time is extended to obtain critical resources.
- Fire is delayed so that seasonal severity produces desirable fire effects.
- Resource benefit objectives can be retained by not suppressing a desired WFU.
- Desired fire effects can be obtained by managed timing of fire.
- Many critical concerns can be mitigated through pre- planning.
- Ability to mitigate safety concerns is increased through proactive, not reactive management.
- Threats to property and the park boundary are mitigated in pre planning.

It is recognized that extenuating circumstances (air quality concerns, cumulative impacts, visitor safety, aesthetics, national fire situation, seasonality, etc) would require some potentially beneficial fires to be suppressed. In this event, any suppressed fires that are candidates for managed wildland fire may be re- ignited when conditions that triggered the suppression action have abated or have been mitigated. If the suppressed fire would have attained significant acreage and thus increased resource benefits, (obtained through FARSITE analysis), the fire may be re- ignited as close as practical to the predicted fire spread.

2.2.4 Manual Fuel Treatments

Manual treatment is the use of hand tools or hand operated power tools. Manual treatments are used to cut, clear or prune herbaceous and woody species to effectively reduce hazardous accumulations of wildland fuels and to create defensible space near structures as well as along prescribed fire boundaries. In the park, manual treatment could be used 1) to remove excess woody debris from the ground; 2) to remove "ladder" fuels, such as low limbs and brush (which could carry fire from the forest floor into the crowns of trees); and 3) to thin dense stands of trees, near developed areas, to reduce the horizontal continuity of fuels.

Material resulting from manual treatments would be cast back on site, placed into piles and burned on site or depending on size, quantity and location, may be chipped and removed from the site.

2.2.5 Mechanical Fuel Treatments

Mechanical treatments include the use of larger mechanized equipment such as front end loaders, tub grinders, and other large equipment in order to move and process larger material. Mechanical treatments are only considered for developed areas of the park that are experiencing forest health decline. In some of the developed areas, stands of old growth mixed conifer are experiencing insect and disease damage which is killing many large trees. For forest health and the safety of visitors, larger trees as well as dense pole size thickets need to be removed from these developed areas.

Material resulting from mechanical treatments would usually be removed from the site. In some instances, material may be piled and burned on site.

2.3 Alternatives Considered But Not Analyzed Further In This Environmental Assessment

2.3.1 Suppress All Fires; Use Manual and Mechanical Treatments Only

Under this alternative, the FMP would be amended to require that all fires within Lassen Volcanic National Park be suppressed with available resources. Prescribed fires would not be permitted. This alternative reflects the fire management strategy of the park prior to 1982. Under this alternative, protecting resources at risk, reducing hazardous fuels and restoring forest structure to desired conditions would be accomplished using mechanical treatments (e.g. chainsaws, whole- tree harvesters, etc.). This alternative was rejected because it is inconsistent with current National Park Service and federal wildland fire management policy, and the park's General and Resource Management Plans. Specifically, these guiding documents 1) recognize the necessary and beneficial role that fire plays in many ecosystems, 2) promote the use of fire as one of many tools to meet management objectives, and 3) require a minimum tool assessment that would likely limit or negate the use of manual/mechanical treatments within wilderness.

2.4 Alternatives Considered and Analyzed In This Environmental Assessment

2.4.1 Alternative 1 (No Action) – Continued Implementation of the 1993 Fire Management Plan

This alternative meets the purpose and need by continuing the fire program according to the Fire Management Plan approved in 1993 and updated in 1998. Because the Lassen Forest updated its FMP to include management for the Caribou Wilderness, continued implementation of this alternative only includes NPS owned lands. The goals emphasized under this alternative are to:

- Allow fire, as an ecosystem process in the biotic communities of the planning unit, to resume its natural roll to the fullest practical extent, either through the careful application of prescribed fire or wildland fire use.
- Eliminate unacceptable environmental impact on biotic communities due to unwarranted fire suppression efforts.
- Protect human life and property by defining suppression and fire prevention responsibilities, organization levels and decision- making processes, thus providing for the rapid, aggressive, safe and most effective fire suppression possible.

Under this alternative, Lassen Volcanic National Park is divided into two fire management units each having a different management emphasis (structure and resource protection, and wildland fire use) based on the relationship of identified natural and cultural resources, live and dead fuels, and terrain features (refer to Figure 2- 1).

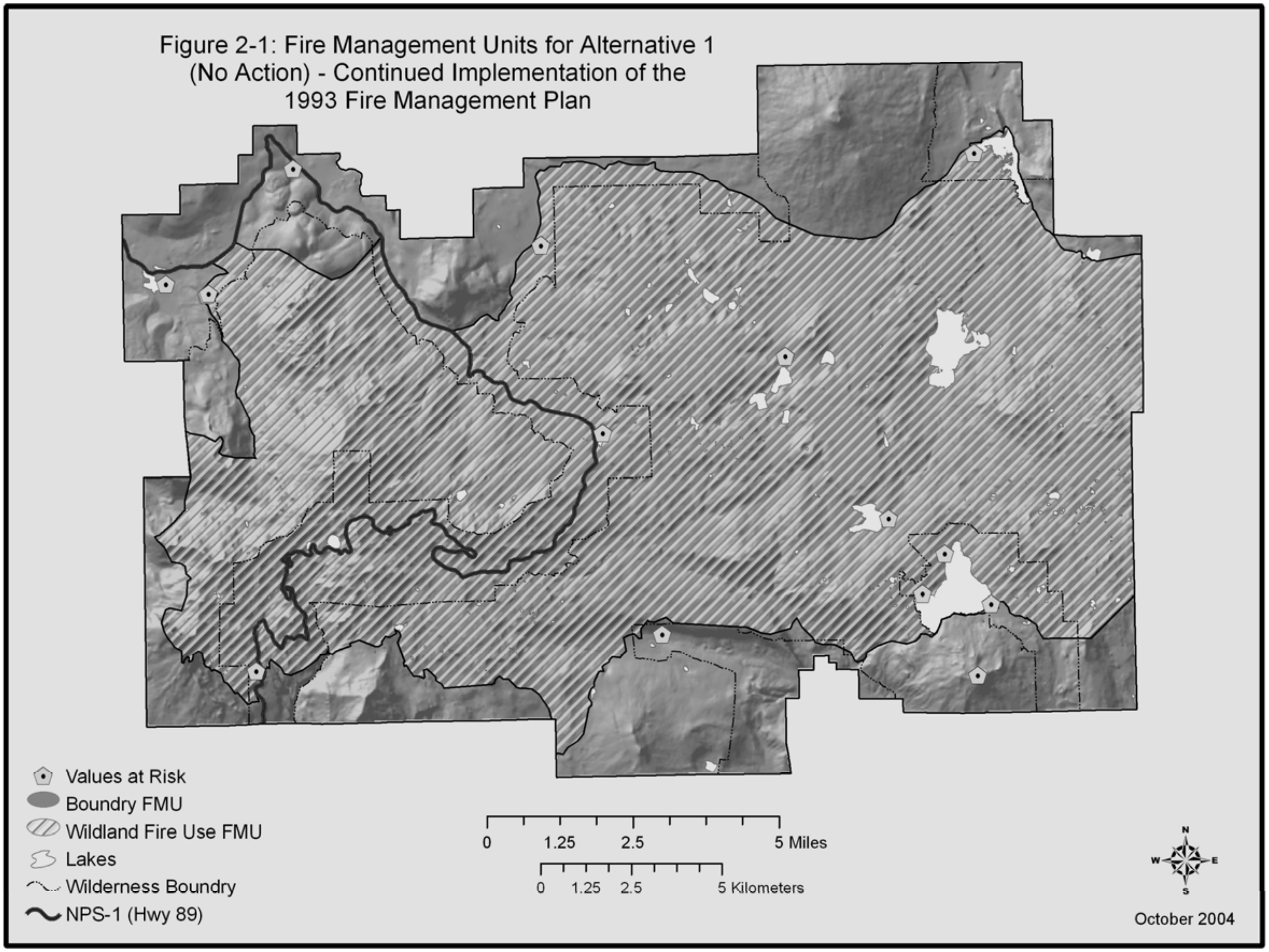


Figure 2-1: Fire Management Units for Alternative 1
(No Action) - Continued Implementation of the
1993 Fire Management Plan
Values at Risk
Boundry FMU
Wildland Fire Use FMU
Lakes
Wilderness Boundry
NPS-1 (Hwy 89)
0
1.25
2.5
5 Miles
0
1.25
2.5
5 Kilometers
N
S
E
W
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This alternative does NOT include manual and/or mechanical treatments as a strategy for reducing hazardous fuels, restoring forest structure, or protecting resource values at risk. This alternative would protect certain improvements located within the park that were identified in 1993 as values at risk. Table 2- 1 lists these values at risk by name. This alternative does include suppression, wildland fire use, and prescribed fire strategies as summarized in Tables 2- 2, 2- 7, 2- 8 and as described in the FMU sections that follow.

Table 2- 1. List of Values at Risk for Alternative 1 (No Action) – Continued Implementation of the 1993 Fire Management Plan.

Name	**Type**
Hat Creek	Private land w/ bldg
Twin Lakes	NPS ranger station
Horseshoe Lake	NPS ranger station
Summit Lake	NPS ranger station plus campground and water supply
Juniper Lake	Private home sites w/ bldg(s)
Mineral	NPS Admin. Site

Fire Management Unit 1 - Wildland Fire (Suppression): *(32,023 acres)*

The Suppression FMU consists of discontinuous areas found along the park's north, south, and west boundaries. This Suppression FMU encompasses areas of high risk from unwanted fires including adjacent federal lands, developed areas with improvements belonging to the NPS, and privately owned in- holdings and residential structures. A ¼ mile buffer would be maintained around the values at risk.

Appropriate management strategies for this FMU are limited to wildland fire suppression and prescribed fire. Manual and mechanical treatments and wildland fire use are not allowed in this FMU under this alternative. Prescribed fire treatments total 17,600 acres (55% of the FMU area).

Fire Management Unit 2 - Wildland Fire Use: *(74,349 acres)*

The Wildland Fire Use FMU is located at the heart of the park, interior to the Suppression FMU, but excludes the areas identified as Values at Risk that are described above.

With the exception of the Lassen Park Road corridor, most of this FMU is designated wilderness. In this Unit wildland fire use strategies are employed when a naturally ignited fire occurs under favorable environmental and spatial conditions, creating specific desirable resource benefits for the life of the fire. If a wildland fire use fire does not continue to meet resource objectives, the appropriate suppression response would be employed. Manual and mechanical treatments are not allowed in this FMU under this alternative. Up to 14% of the acres in this FMU would be treated with wildland fire use (up to 10,000 acres) over the 10- year treatment period. This proportion of wildland fire use takes into account an objective of managing at least one wildland fire per season based on historical mean fire sizes of 1100 acres (range 100- 3800 acres) as reported by Taylor (2000).

Under this alternative, approximately 7,900 acres (11% of the FMU area) would be treated with prescribed fire to meet resource management objectives. The primary purpose of prescribed fire in this FMU is to create defensible fire use boundaries.

Table 2- 2. Summary of Alternative 1- (No Action) Implement the 1993 Fire Management Plan.

Fire Management Unit (FMU)	Total Acres in FMU	Proportion of Area to be Treated over 10 Years	Long- term Treatment Schedule Summary			
			Wildland Fire Use	Prescribed Fire	Manual Treatments	Mech. Treatments
Suppression	32,023	55%	0	17,600	0	0
Wildland Fire Use	74,349	24%	10,000	7,900	0	0
Totals	106,372	33%	10,000	25,500	0	0
Proportion of Park Area Treated by Each Fire Management Strategy			9%	24%	0	0

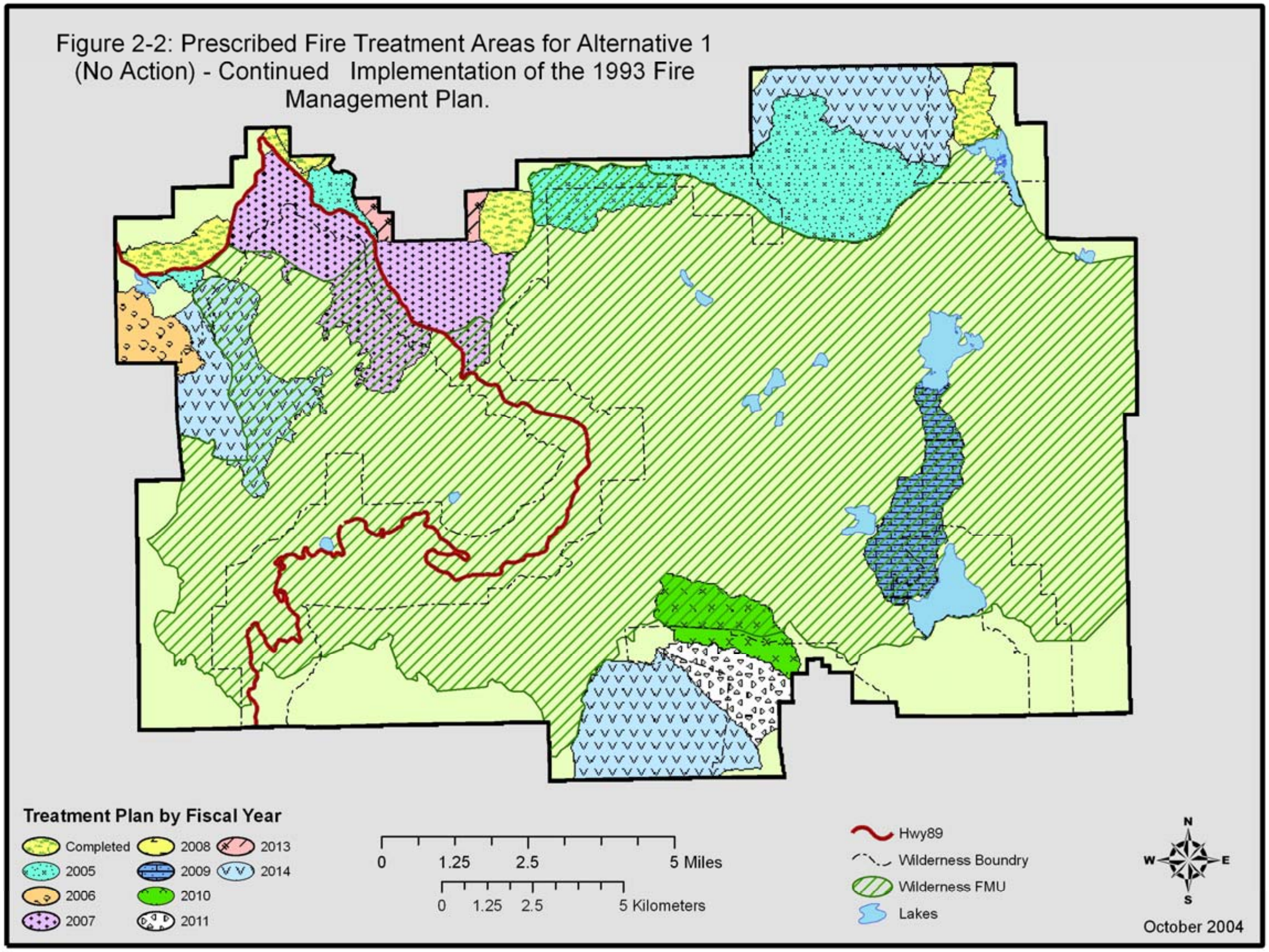
Figure 2-2: Prescribed Fire Treatment Areas for Alternative 1 (No Action) - Continued Implementation of the 1993 Fire Management Plan.
Treatment Plan by Fiscal Year
Completed
2005
2006
2007
2008
2009
2010
2011
2013
2014
0
1.25
2.5
5 Miles
0
1.25
2.5
5 Kilometers
Hwy89
Wilderness Boundry
Wilderness FMU
Lakes
N
W
E
S
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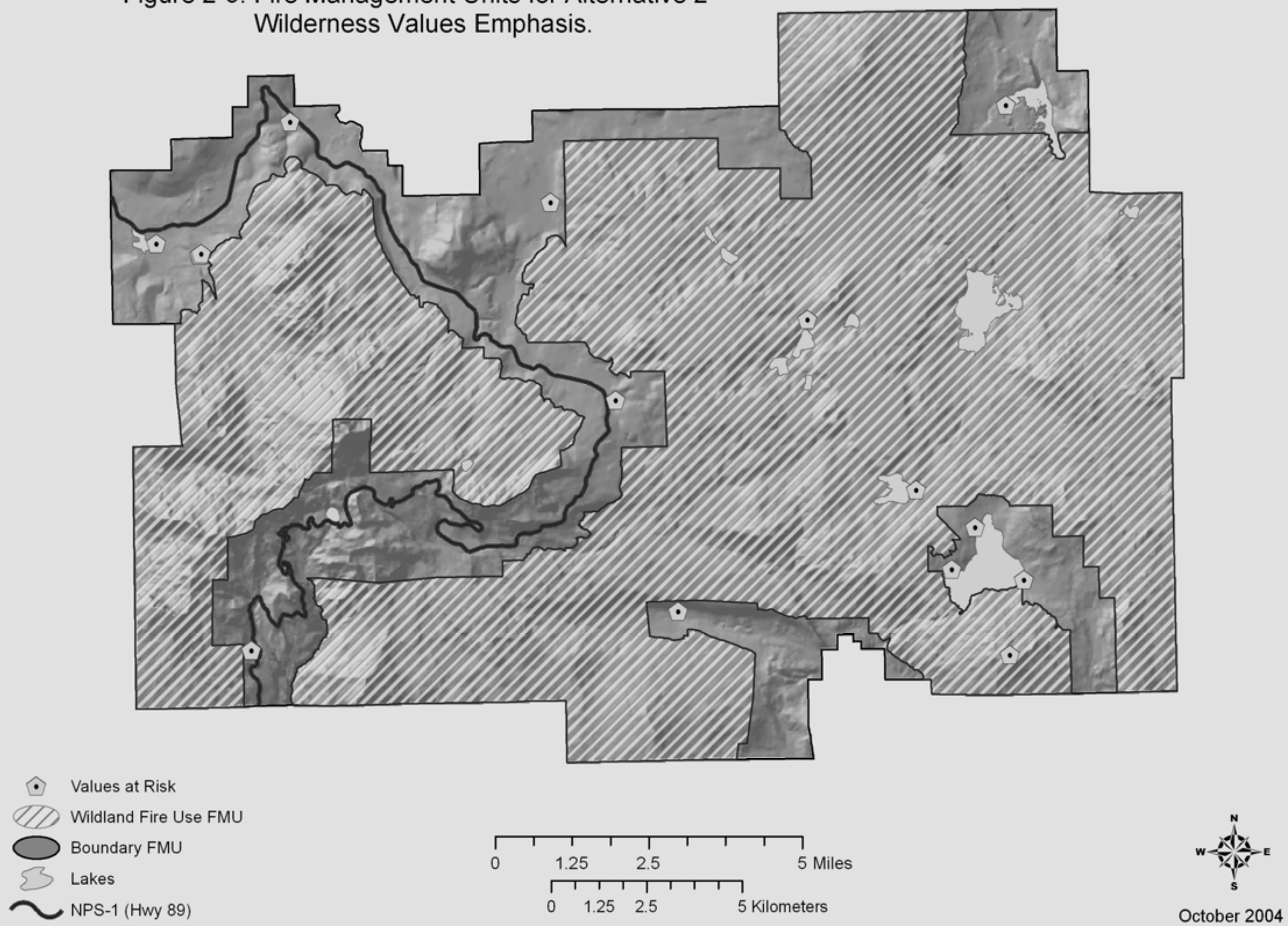
2.4.2 Alternative 2 – Wilderness Values Emphasis

This alternative meets the purpose and need through the designation of two fire management units that correspond roughly to areas of 1) undesirable fire risk to infrastructure or leaving the park; and 2) designated wilderness (refer to Figure 2- 3). This alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow manual fuel treatments as a fire surrogate (refer to Tables 2- 4, 2- 7, 2- 8 and the description of the FMUs in the sections that follow). In addition, this alternative responds to the importance of protecting wilderness values, by promoting fewer fire management activities within wilderness.

Figure 2-3: Fire Management Units for Alternative 2 - Wilderness Values Emphasis.



The values at risk for this alternative include those identified for Alternative 1 plus six additional areas. Under this alternative, the values at risk would be protected based on the most natural defensible distance rather than a strict ¼ mile buffer that is specified under the No Action Alternative. Table 2-3 shows the list of values at risk along with their location with respect to the surrounding FMU.

Specific management strategies are described for each Fire Management Unit in the sections that follow.

Table 2-3. List of Values at Risk for Alternative 2 - Wilderness Values Emphasis.

Name	Type
Hat Creek	Private lands w/ bldgs
Twin Lakes	NPS ranger station
Horseshoe Lake	NPS ranger station
Summit Lake	NPS ranger station, horse camp, campground, water supply
Juniper Lake	Private lands, ranger station, campground, horse camp
Mineral	NPS Admin. Site
Manzanita Lake	Campground, housing, ranger station, museum and education center, water supply
Mt. Harkness	NPS fire lookout
Warner Valley	NPS ranger station, historic bldgs, campground, guest ranch
Southwest Entrance	SW Visitor Services Facility, other bldgs, campground, water supply
Butte Lake	NPS ranger station, campground, water supply
Crags and Lost Creek	NPS campgrounds

Fire Management Unit-1 BOUNDARY: *(28,009 acres)*

The Boundary FMU consists of discontinuous areas and discrete patches found along the park's north, south, and west boundaries, similar to the Suppression FMU under Alternative 1, but with fewer total acres. This FMU also includes the Lassen Park Road corridor that bisects the west- central portion of the park.

This FMU exists in part because the administrative boundary of Lassen Volcanic National Park does not coincide with natural barriers to fire. Fires originating in the park could cross administrative boundaries if left unchecked, and vice versa. Depending on the management objectives of the park's neighbors for particular areas, such fires could complicate or jeopardize the neighbor's ability to meet its objectives. In other cases where management objectives for the park and its neighbor complement one another, prescribed and wildland fires would be allowed to cross the administrative boundary.

All fires within this FMU would be evaluated for the appropriate management response. Restoring the lands within this FMU to a natural fire regime is a primary resource management goal, yet the risk of undesirable fire effects to infrastructure or the risk of a fire leaving the park is sufficient to make suppression the default strategy. Under this alternative Wildland Fire Use would only be considered in this FMU when:

- The fire has obvious barriers to spread
- Fire movement is into the WFU unit or not towards developed areas or out of park.
- When the fire happens late enough in the season where analysis shows limited fire movement, or when environmental factors (weather, fuels, and topography) suggest no problematic fire behavior.
- There is coordination with the neighboring Lassen National Forest.

All management strategies, with the exception of mechanical thinning, are allowed in this FMU including: wildland fire suppression, prescribed fire, limited wildland fire use and manual treatments. However, prescribed fire and manual treatments would be the primary strategies used for hazard fuel and restoration objectives in this FMU. Planned treatments total 11,200 acres (or 40% of the FMU area).

Fire Management Unit-2 WILDLAND FIRE USE *(78,363 acres)*

The Wildland Fire Use FMU coincides with the location of designated wilderness within the park.

In this FMU wildland fire use strategies would be employed when a naturally ignited fire occurs under favorable environmental and spatial conditions, creating specific desirable resource benefits for the life of the fire. If a wildland fire use fire does not continue to meet resource objectives, the appropriate suppression response would be employed. Manual and mechanical treatments and prescribed fire strategies are not allowed in this FMU under this alternative.

Managed wildland fire use would be the primary tool used to meet resource management objectives. All naturally occurring fires would be evaluated for their potential to accomplish resource objectives through the Wildland Fire Implementation Plan (WFIP) process. Up to 26% of the acres in this FMU would be treated using managed wildland fire (up to 20,000 acres) over the 10- year treatment period. This proportion of managed wildland fire takes into account an objective of managing at least one wildland fire per season based on historical mean fire sizes of 1100 acres (range 100-3800 acres) as reported by Taylor (2000).

Table 2- 4. Summary of Alternative 2 – Wilderness Values Emphasis.

Fire Management Unit (FMU)	Total Acres in FMU	Proportion of FMU to be Treated over 10 Years	Long- term Treatment Schedule Summary			
			Wildland Fire Use	Prescribed Fire	Manual Treatments	Mech. Treatments
Boundary	28,009	40%	1,000	9,200	1,000	0
Wildland Fire Use	78,363	26%	20,000	0	0	0
Total Acres	106,372	29%	21,000	9,200	1,000	0
Proportion of Park Area Treated by Each Fire Management Strategy			20%	9%	<1%	0

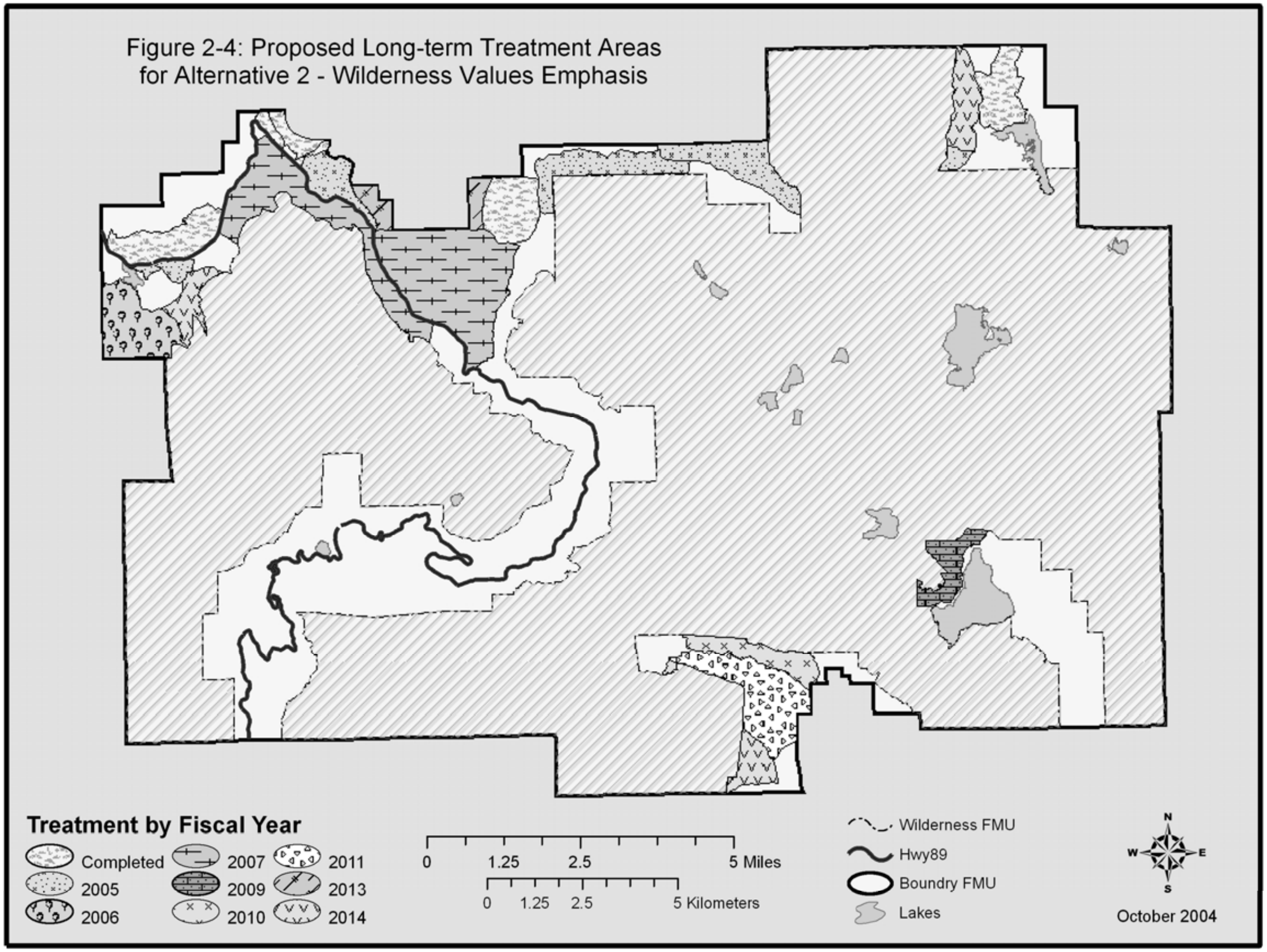


Figure 2-4: Proposed Long-term Treatment Areas
for Alternative 2 - Wilderness Values Emphasis
Treatment by Fiscal Year
Completed
2005
2006
2007
2009
2010
2011
2013
2014
0
1.25
2.5
5 Miles
0
1.25
2.5
5 Kilometers
Wilderness FMU
Hwy89
Boundry FMU
Lakes
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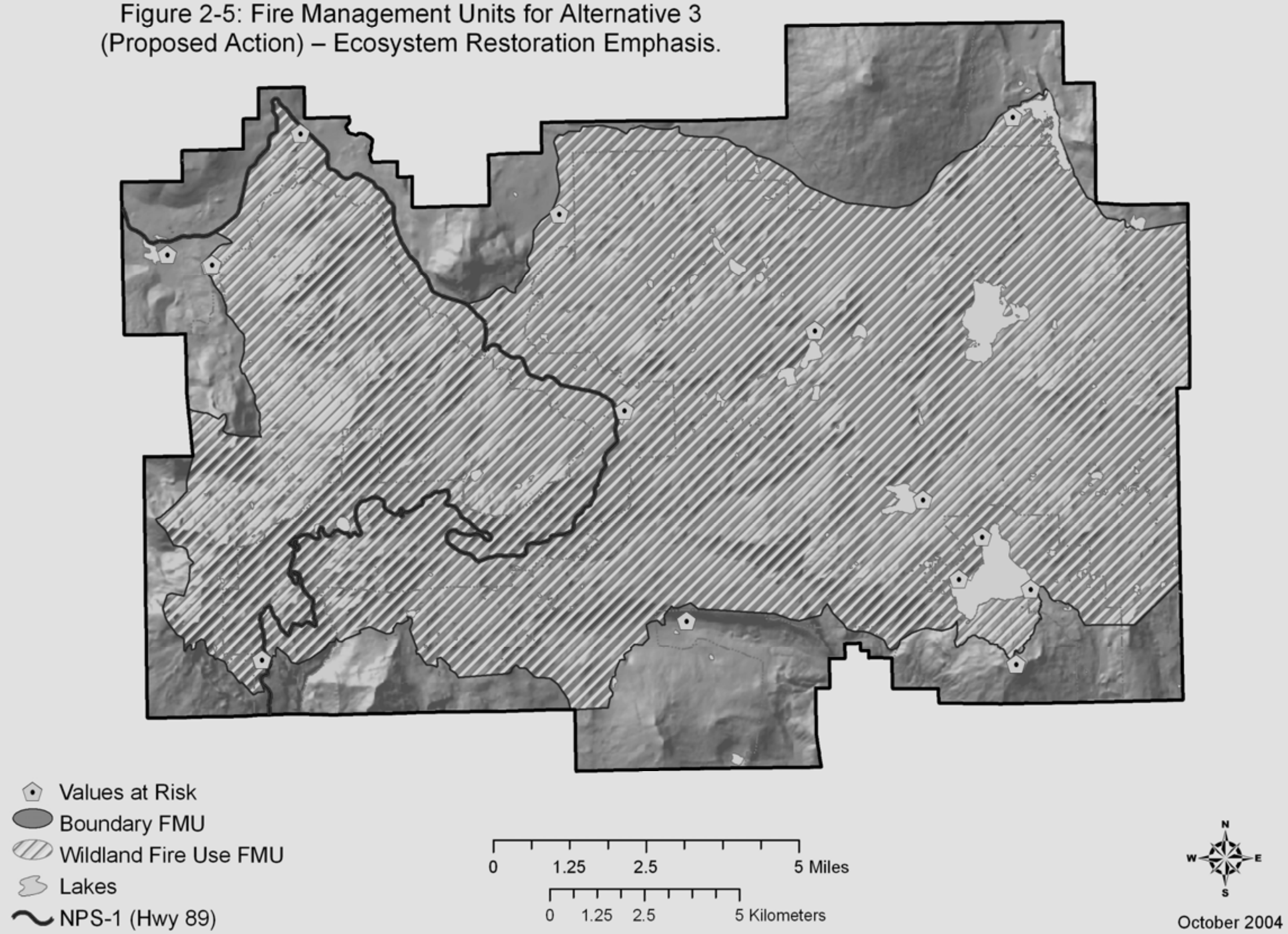
2.4.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

This alternative meets the purpose and need through the designation of two fire management units that correspond roughly to areas of 1) undesirable fire risk to infrastructure or leaving the park; and 2) designated wilderness (refer to Figure 2-3). Similar to Alternative 2, this alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow manual fuel treatments as a fire surrogate (refer to Tables 2-6, 2-7, 2-8 and the description of the FMUs in the sections that follow). In addition, this alternative adds minimal use of mechanical thinning around resource values at risk (table 2-5) that are not within the wilderness boundary.

This alternative differs from the No Action and Alternative 2 in the amount of prescribed fire that is proposed (38,700 acres versus 25,500 and 9,200). Under this alternative, 36% of the park's total land base would be treated using prescribed fire over a 10-year period. The majority of the prescribed fire projects are strategically located to aid in creating a defensible boundary in support of the Wildland Fire Use program, while at the same time restoring natural fire regimes to a significant portion of the park.

Figure 2-5: Fire Management Units for Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis.



The values at risk for this alternative are the same as identified for Alternative 2. Identical to Alternative 2, the values at risk under this alternative would be protected based on the most natural defensible distance rather than a strict ¼ mile buffer. Table 2-5 is a list of values at risk within the park.

Table 2- 5. List of Values at Risk within the Lassen Volcanic National Park for Alternative 3 (Proposed Action) Ecosystem Restoration Emphasis.

Name	Type
Hat Creek	Private lands w/ bldgs
Twin Lakes	NPS ranger station
Horseshoe Lake	NPS ranger station
Summit Lake	NPS ranger station, horse camp, campground, water supply
Juniper Lake	Private lands, ranger station, campground, horse camp
Mineral	NPS Admin. Site
Manzanita Lake	Campground, housing, ranger station, museum and education center, water supply
Mt. Harkness	NPS fire lookout
Warner Valley	NPS ranger station, historic bldgs, campground, guest ranch
Southwest Entrance	SW Visitor Services Facility, other bldgs, campground, water supply
Butte Lake	NPS ranger station, campground, water supply
Crags and Lost Creek	NPS campgrounds

Fire Management Unit-1 BOUNDARY: *(29,766 acres)*

The Boundary FMU consists of discontinuous areas and discrete patches found along the park's north, south, and west boundaries, similar to the Boundary FMU under Alternative 2, but with more total acres.

Similar to Alternative 2, this FMU exists in part because the administrative boundary of Lassen Volcanic National Park does not coincide with natural barriers to fire. Fires originating in the park could cross administrative boundaries if left unchecked, and vice versa. Depending on the management objectives of the park's neighbors for particular areas, such fires could complicate or jeopardize the neighbor's ability to meet its objectives. In other cases where management objectives for the park and its neighbor complement one another, prescribed and wildland fires would be allowed to cross the administrative boundary.

All fires within this FMU would be evaluated for the appropriate management response. Restoring the lands within this FMU to a natural fire regime is a primary resource management goal, yet the risk of undesirable fire effects to infrastructure or the risk of a fire leaving the park is sufficient to make suppression the default strategy. Under this alternative Wildland Fire Use would only be considered in this FMU when:

- The fire has obvious barriers to spread
- Fire movement is into the WFU unit or not towards developed areas or out of park.
- When the fire happens late enough in the season where analysis shows limited

fire movement, or when environmental factors (weather, fuels, and topography) suggest no problematic fire behavior.

- Fire can be actively secured on Park boundary flank so movement out of the Park is unlikely.
- There is coordination with the neighboring Lassen National Forest.

In developed areas of the park, manual and/or mechanical fuel treatments are currently the best options available for reducing tree densities and overall stocking to sustainable levels. From a forest health perspective, selectively reducing tree densities and stocking levels through careful thinning has been shown to improve stand vigor and reduce insect and disease mortality. From a fire management perspective, reducing tree densities in overgrown stands is necessary to break up vertical and horizontal distribution of ladder fuels so that developed sites and surrounding forests can be adequately protected from wildfire.

Only 150 acres would have the potential for being treated mechanically and all of those acres surround the Resource Values at Risk (Table 2- 5) that are not within the wilderness boundary.

Quantitative assessments of forest stands within each area would be made to determine whether fuel treatments are necessary. To do this, stand condition indicators including basal area (BA) stocking, stand density index (SDI), stand resiliency index (SRI) would be derived from statistically significant sample plot data, and then compared with site carrying capacities (site quality). Site quality would be determined for each stand using standard forestry practices and published yield tables (Dunning and Reineke 1933).

Basal area (BA) is a measure of stand stocking that describes the proportion of an area that is occupied by tree boles. Basal area is more meaningful than tree density because large trees contribute considerably more to stocking and uses more resources than small trees. The “fully stocked” BA is a threshold value used to represent complete occupancy of a site. Values that exceed this value are considered above sustainable carrying capacity. Stand Density Index (SDI) is another measure of stocking that is based on the relative relationship between tree density and the average tree size in the stand. SDI differs from BA in that it is not dependent on site quality or stand age. Maximum recommended SDI values represent thresholds beyond which growth and vigor decrease and susceptibility to insects and pathogens increase. Stand Resiliency Index (SRI) is a relative measure of the potential risk of forest stands to crown fires. SRI is a function of tree size, tree density, and crown characteristics.

All above stand indicators measure very high values within many of park’s low elevation forests. This means that some low elevation forests could become candidates for manual and/or mechanical fuel treatments where these forests come into contact with developed areas. For example, at Manzanita Lake, the location of the park’s largest and most popular campground, mean BA is 36%- 48% over carrying capacity, and several stands exceed 500 ft^2/acre (105%- 123% above carrying capacity). Likewise, the average SDI is approximately 30% above the maximum sustainable value. SDI values within individual stands can rise to as high as 105% above maximum sustainable value. And finally, average SRI values indicate that Manzanita Lake campground is at high risk for crown fire spread. Tree density in the campground currently exceeds 690 trees per acre. Tree densities exceeding 300 trees per acre are generally considered very high.

The overall strategy to achieve healthy and fire resistant forests in developed areas would vary from site to site. For example at Manzanita Lake dense, pole- sized thickets of white fir would be thinned heavily underneath desirable large pine and fir trees and in interspaces where planting and natural regeneration of shade intolerant pine would occur in the future. More variable thinning intensities would be applied elsewhere to maintain screening cover and spatial heterogeneity, while keeping in mind the overall goal of reducing stocking levels to more sustainable levels. A typical thinning target is to project stand growth to carrying capacity 20 years after treatment. Therefore using a combination of diameter limit cut thinning and drip line radius cut thinning, BA would be reduced to 75% of maximum and SDI to 64% of maximum. A more natural stand structure would result as evidenced by average stand diameter (quadratic mean diameter) increasing from 9" to 19".

All wood materials — both merchantable and unmerchantable — generated from thinning projects would be removed from the park. An exception might be small amounts of wood chips kept for designated projects. Soils would be protected by using low impact rubber tire skidders, designating before hand all skidding routes in efforts of avoiding sensitive areas, conducting projects when soils are dry, and de- compaction of soils in the vicinity log decks following removal of logs. Pine slash would be promptly removed from the site to reduce buildup of bark beetles. Sumps would be flush cut or ground with a stump grinder and treated with an anti- fungal agent to prevent spread of annosus root disease. Wildlife surveys would be conducted.

All management strategies are allowed in this FMU including: wildland fire suppression, prescribed fire, limited wildland fire use and manual and mechanical treatments. However, prescribed fire and manual and mechanical treatments would be the primary strategies used for hazard fuel and restoration objectives in this FMU. Planned treatments total 19,950 acres (or 67% of the FMU area).

Fire Management Unit-2 WILDLAND FIRE USE *(76,606 acres)*

The Wildland Fire Use FMU is located at the heart of the park, interior to the Boundary FMU, and is similar in location to the Wildland Fire Use FMU described in Alternative 2, but includes fewer total acres.

Most of this FMU is designated wilderness. In this FMU wildland fire use strategies would be employed when a naturally ignited fire occurs under favorable environmental and spatial conditions, creating specific desirable resource benefits for the life of the fire. If a wildland fire use fire does not continue to meet resource objectives, the appropriate suppression response would be employed.

Managed wildland fire, with the addition of prescribed fire, would be the primary tools used to meet resource objectives. All naturally occurring fires would be evaluated for their potential to accomplish resource objectives through the Wildland Fire Implementation Plan (WFIP) process. Up to 26% of the acres in this FMU would be treated using managed wildland fire (up to 20,000 acres) over the 10- year treatment period. This proportion of managed wildland fire takes into account an objective of managing at least one wildland fire per season based on historical mean fire sizes of 1100 acres (range 100- 3800 acres) as reported by Taylor (2000).

Compared to Alternative 2, an additional 20,700 acres would be treated with prescribed fire to meet resource management objectives. The primary purpose of prescribed fire in this FMU is to create defensible wildland fire use boundaries.

Table 2- 6. Summary of Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis.

Fire Management Unit (FMU)	Total Acres in FMU	Proportion of FMU to be Treated over 10 Years	Long- term Treatment Schedule Summary			
			Wildland Fire Use	Prescribed Fire	Manual Treatments	Mech. Treatments
Boundary	29,766	67%	1,000	18,000	800	150
Wildland Fire Use	76,606	53%	20,000	20,700	200	0
Total	106,372	57%	21,000	38,700	1000	150
Proportion of Park Area Treated by Each Fire Management Strategy			20%	36%	1%	<1%

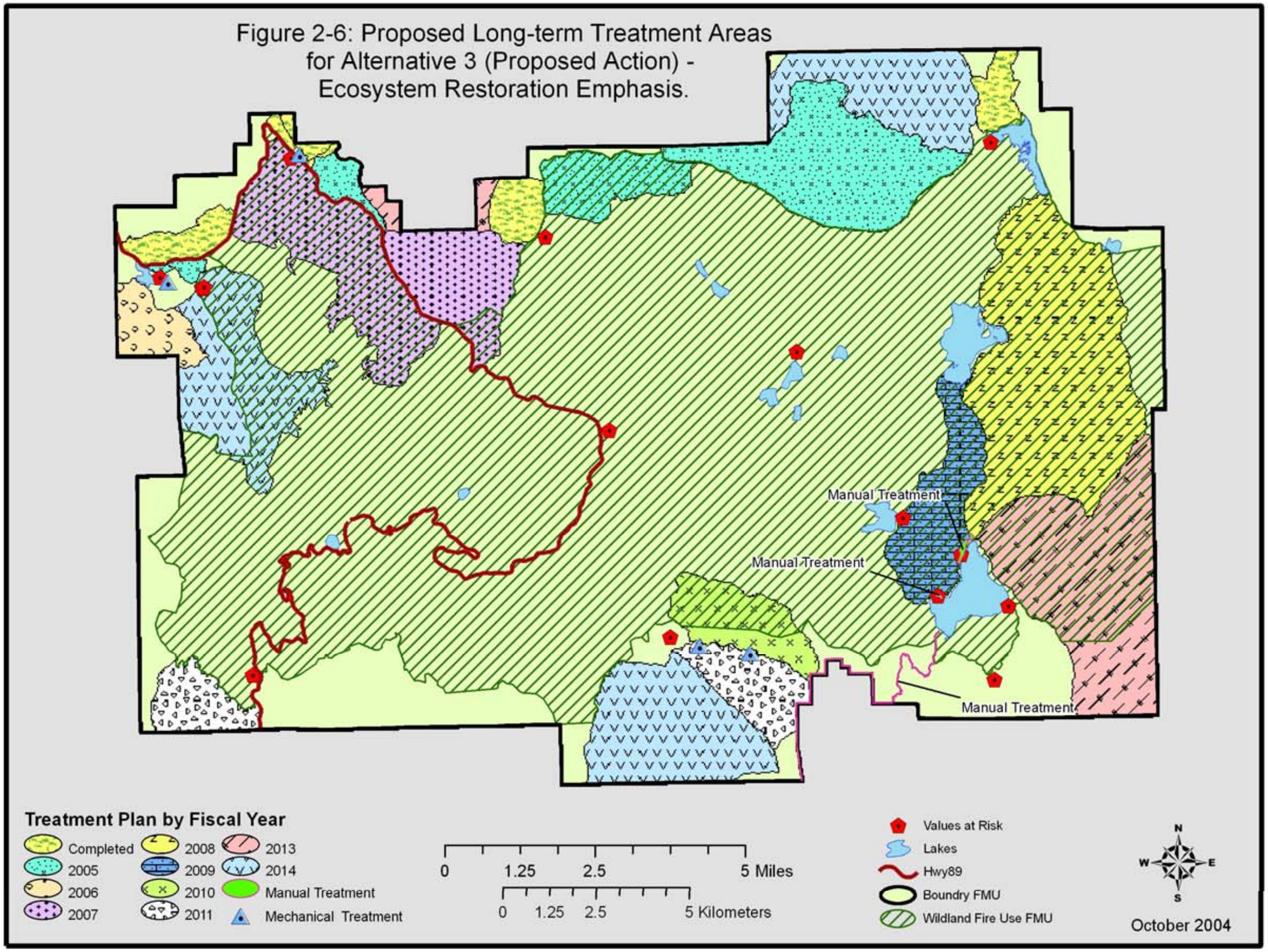


Figure 2-6: Proposed Long-term Treatment Areas
for Alternative 3 (Proposed Action) -
Ecosystem Restoration Emphasis.
Manual Treatment
Manual Treatment
Manual Treatment
Treatment Plan by Fiscal Year
Completed
2005
2006
2007
2008
2009
2010
2011
2013
2014
Manual Treatment
Mechanical Treatment
0
1.25
2.5
5 Miles
0
1.25
2.5
5 Kilometers
Values at Risk
Lakes
Hwy89
Boundry FMU
Wildland Fire Use FMU
N
W
E
S
October 2004

2.4.4 Summary of Fire Management Strategies by Alternative

The alternatives proposed and evaluated in this environmental assessment are similar in many ways. The tables below summarize the fire management strategies and treatment activities proposed for each of the alternatives. The subtle differences among the alternatives can be identified with careful study of these tables along with Table 3- 10.

Table 2- 7. Summary of Fire Management Strategies for All Alternatives.

Alt. 1	Fire Management Strategy				
FMU	Fire Suppression	Wildland Fire Use	Prescribed Fire	Manual Treatments	Mechanical Treatments
Suppression	Yes	NO	Yes	NO	NO
Wildland Fire Use	Yes	Yes	Yes	NO	NO

Alt. 2	Fire Management Strategy				
FMU	Fire Suppression	Wildland Fire Use	Prescribed Fire	Manual Treatments	Mechanical Treatments
Boundary	Yes	Limited	Yes	Yes	NO
Wildland Fire Use	Yes	Yes	NO	NO	NO

Alt. 3	Fire Management Strategy				
FMU	Fire Suppression	Wildland Fire Use	Prescribed Fire	Manual Treatments	Mechanical Treatments
Boundary	Yes	Limited	Yes	Yes	Yes
Wildland Fire Use	Yes	Yes	Yes	Yes	NO

Table 2- 8. Summary of Proposed Treatments by Alternative.

Alternative No.	Total Park Area Proposed for Treatment	Proposed Treatment Type			
		Wildland Fire Use	Prescribed Fire	Manual Treatments	Mechanical Treatments
Alt. 1 (No Action)	35,500 ac 33%	10,000 ac 9%	25,500 ac 24%	0 ac 0%	0 ac 0%
Alt. 2	31,200 ac 29%	21,000 ac 20%	9,200 ac 9%	1,000 ac 1%	0 ac 0%
Alt. 3 (Proposed Action)	60,850 ac 57%	21,000 ac 20%	38,700 ac 36%	1,000 ac 1%	150 ac <1%

2.4.5 Environmentally Preferred Alternative

The National Park Service is required to identify the environmentally preferred alternative(s) for any of its proposed projects. That alternative is the alternative that would promote the national environmental policy expressed in NEPA (Section 101 (b)). This includes alternatives that:

1) Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

2) Ensure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings;

3) Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

4) Preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;

5) Achieve a balance between population and resource use that would permit high standards of living and a wide sharing of life's amenities; and

6) Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

In essence, the environmentally preferred alternative would be the one(s) that "cause(s) the least damage to the biological and physical environment; it also means the alternative which best protects, preserves, and enhances historic, cultural, and natural resources" (DOI, 2001a).

In this case, Alternative 3 (Proposed Action) is the environmentally preferred alternative for Lassen Volcanic National Park since it meets goals 1, 2, 3, and 4 described above and it provides for the ability to achieve all of the goals and objectives described in section 1.4 (see table 2- 10). Under this alternative, fire management activities would help restore natural fire regimes, including the influences on native vegetation function and structure. This alternative would reduce hazardous fuel loadings in the park and help protect park resources and adjacent lands from the threat of future wildfires. Alternative 3 best protects and helps preserve the historic, cultural, and natural resources in the park for current and future generations. Alternatives 1 and 2 do not provide for the ability to meet all of the goals and objectives described in section 1.4. Neither of these two alternatives allow for the treatment of a full 15% of the park's burnable landscape, under prescription, over the next five years. Furthermore, neither of these two alternatives allow for the reduction of fuels in all developed areas, urban interface boundaries, and cultural/historic zones to a level where at 90th percentile weather conditions, average flame length would be 4 feet or less. For these reasons, alternative 3 is the environmentally preferred alternative.

2.5 Impact Definitions

Table 2- 9 depicts the impact definitions used in this Environmental Assessment. Significant impact thresholds for the various key resources were determined in light of compliance with existing state and federal laws, and with existing Lassen Volcanic National Park planning documents as listed in Sections 1.1 and 1.2 of this EA.

Table 2- 9. Summary of Impact Definitions for Lassen Volcanic National Park Fire Management Plan EA.

Key Resources	**"Minor" Impact**	**"Significant" Impact**
Soils	Minor damage to or loss of the litter/humus layers that causes minor localized increases in soil loss from erosion; fire severe enough to cause minor harm to soil community; minor, temporary surface sterilization of soils that does not cause long term loss of soil productivity that would alter or destroy vegetation community; short- term and localized compaction of soils that does not prohibit re-vegetation	Damage to or loss of the litter/ humus layers that would increase soil loss from erosion on a substantial portion of the burn area; fire severe enough to damage soil community; substantial surface sterilization of soils that may cause long term loss of soil productivity and that may alter or destroy a portion of the vegetation community; long- term and widespread soil compaction that affects a large number of acres and prohibits re-vegetation
Water Resources (Including Wetlands)	Minor damage to or loss of the litter/humus layers that increases sedimentation on no more than 0.1% of a subwatershed; localized and indirect riparian impact that does not substantively increase stream temperatures or affect stream habitats; no alteration of natural hydrology of the wetlands	Damage to or loss of the litter/ humus layers that increases sedimentation on greater than 0.1% of a subwatershed; localized and indirect riparian impact that may substantively increase stream temperatures or affect stream habitats; alteration of natural hydrology of the wetlands

Key Resources	**"Minor" Impact**	**"Significant" Impact**
Vegetation	Short- term changes in plant species composition and/or structure, consistent with expected successional pathways of a given plant community from a natural disturbance event; thinning of small diameter understory trees	Violation of the Endangered Species Act of 1973; removal of numerous large diameter or old growth trees greater than 75cm at breast height;
Wildlife	Temporary displacement of localized individuals or groups of animals; isolated mortality of individuals not afforded special protection by state and/or federal law	Violation of the Endangered Species Act of 1973; mortality of species that jeopardize the resident population
Noise	<65 dBA at sensitive receptors; temporary noise levels <90 dBA	>65 dBA noise level at occupied sensitive receptors (campgrounds, wilderness areas, hiking trails, Threatened & Endangered species); continued exposure to noise levels > 90 dBA for workers/general public
Air Quality	Minimal to negligible air emissions and temporary smoke accumulation; temporary and limited smoke exposure to sensitive resources	Violation of state and federal air quality standards; violation of Class I air quality standards; prolonged smoke exposure to sensitive receptors; or considerable smoke levels, current or predicted, in sensitive areas.
Visitor Use & Experience (Including Recreation, Visual Resources, and Park Operations)	Temporary displacement of recreationists or closure of trails, and recreation areas during off- peak recreation use; temporary or short- term alteration of the vista, or temporary presence of equipment/structures in localized area; smoke accumulation during off- peak recreation use	Permanent closure of trails and recreation areas; conflict with peak recreation use; long- term change in scenic integrity of the vista; substantive smoke accumulation during peak recreation use
Human Health & Safety	Minor injuries to any worker; limited exposure to hazardous	Serious injury to any worker

Key Resources	"Minor" Impact	"Significant" Impact
	compounds or smoke particulates at concentrations below health- based levels	or member of the public; exposure to hazardous compounds or smoke particulates at concentrations above health- based levels.
Cultural Resources	No Adverse Effect to Historic Properties including archeological resources, historical structures, cultural landscapes, ethnographic resources and museum objects listed or eligible for listing on the National Register of Historic Places	Adverse Effect to Historic Properties including archeological resources, historical structures, cultural landscapes, ethnographic resources and museum objects listed or eligible for listing on the National Register of Historic Places
Park Operations	Temporary suspension of non- critical park operations; negligible impact to park buildings and structures	Prolonged suspension of all park operations; adverse impacts to park buildings and structures
Socio- economics	Minimal to no short or long-term economic impact on local or regional economy (>2%); proportionate impact on poor or minority communities	A change in local or regional economy greater than 2%; disproportionately high and adverse impact on poor or minority communities
Wilderness	Short- term and local impacts that conflict with wilderness values but are of limited duration and scope	Long- term and regional impacts that conflict with wilderness values or are of unlimited duration or scope

2.6 Mitigation Measures

Every fire event within Lassen Volcanic National Park would be monitored, and each mitigation measure listed below would be evaluated to determine 1) if it was implemented as stated, and 2) to evaluate if it was effective at mitigating the impact to the resource it was designed to protect. Monitoring reports would become part of the permanent record of each fire event.

Mitigation measures are prescribed to prevent and/or mitigate adverse environmental impacts that may occur from fire management activities. The following mitigation measures are common to all three alternatives.

2.6.1 Fire Management Activities

- Whenever consistent with safe, effective suppression techniques, the use of natural barriers would be used as extensively as possible.
- Fire retardant agents must be on an approved list for use by the Forest Service and Bureau of Land Management.
- Mechanical equipment such as tractors, graders, bulldozers or other tracked vehicles would generally not be used for fire suppression. The Incident Commander through a delegation of authority from the Superintendent (for fire where an incident management team is assigned) or an initial attack Incident Commander through radio approval from the Fire Management Duty Officer can authorize the use of heavy earth- moving equipment in extreme circumstances in the face of loss of human life and/or property.
- When handline construction is required, construction standards would be issued requiring the handlines to be built with minimum impact. Fire control methods near cultural sites, especially the construction of control lines that expose mineral soil, would be developed in consultation with an archeological technical specialist to avoid adverse effects to cultural materials. All control lines would be rehabilitated. Erosion control methods would be used on slopes exceeding 10% where control line construction took place.
- All sites where improvements are made or obstructions removed would be rehabilitated to pre- fire conditions, to the extent practicable.
- Educational/informational materials would be developed and distributed to the park visitor and local communities on what to expect during fire management activities including potential noise from chainsaws during line construction, smoke dispersion, safety, helicopter and airplane use, and information on where and when these activities would occur.
- A rehabilitation plan as required by NPS- 18, with the use of a Burned Area Emergency Rehabilitation (BAER) Team, would be formulated and implemented in advance of demobilization from major fire events.

2.6.2 Soil and Water Resources (Including Wetlands)

- Creek or river crossings would be limited to set and existing locations.
- Except for spot maintenance to remove obstructions and for in- stream structures to enhance pooling for pumping purposes, no improvements would be made to intermittent/perennial waterways, springs or seeps, trails, or clearings in forested areas.
- Fire lines would be located outside of highly erosive areas, steep slopes, and other sensitive areas.
- Fire control strategies would be sensitive to wetland values, and firelines would not "tie" into wetland or bog margins except when relying on those areas to naturally retard the fire without constructed line.

- Foams and retardants would not be used within 200 feet of any upstream surface waters.
- Mechanical fuel treatments would not be conducted within 200 feet of any surface water resource.
- Crews would implement Minimum Impact Suppression Techniques (MIST) to minimize and/or eliminate adverse soil impacts resulting from ground crew activities.
- Mechanical equipment would use multiple entry and exit points within a treated area to minimize concentrated soil compaction or soil disturbance impacts resulting from continued use of a single entrance and/or exit.
- Crews would implement MIST fire suppression guidelines to minimize and/or eliminate adverse impacts to surface water resources. These include:
  - Preferred use of water for aerial drops
  - Prohibition of fire retardant use in drainages specified by the resource advisor
  - Restriction of the use of lakes as water sources as approved by the resource advisor
  - Restriction of camps and toilet facilities from being located within 200 feet of surface water resources.

2.6.3 Visitor Experience and Use

- Fire managers would consider potential impacts to visitor use and experience when determining management actions related to planned and unplanned incidents.

2.6.4 Wildlife and Plants

Bald Eagles

- A limited operating period (LOP) would be placed from January 1st to August 31st (nesting season) around all known bald eagle nest sites. This consists of a half-mile diameter circle around the nest tree.
- Avoid disturbance within a half- mile diameter during the LOP. Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No nest trees or known perch trees would be removed.
- Avoid using Snag Lake as a helicopter dip site (unless approved by Resource Advisor) during fire suppression activities.
- Use of helicopters during fire suppression would be allowed no lower than 1,300 feet (1/4 mile) above the canopy during the LOP within a half- mile radius of nest trees.
- After the nesting season, cooler burn prescriptions would be used and some degree of hazard fuel removal could be used to limit the potential for crown fires in nest areas and suitable habitat.

- For prescribed burns implemented after the LOP, construct a fire line around the nest tree a radius of 50 feet and burn out from the fire line to protect the nest tree.
- Park staff will continue to monitor bald eagle populations annually.

California Spotted Owl

- A limited operating period (LOP) would be placed from March 1st through August 31st (nesting season) around all known spotted owl nest trees. This would consist of a quarter- mile diameter circle around known nest trees.
- Avoid disturbance within a quarter- mile diameter during the LOP. Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No nest trees or known perch trees would be removed.
- Use of helicopters during fire suppression would be allowed no lower than 1300 feet (1/4 mile) above the canopy within a quarter- mile diameter circle of nest trees during the LOP.
- After the nesting season, cooler burn prescriptions would be used and some degree of hazard fuel removal could be used to limit the potential for crown fires in nest areas and suitable habitat.
- For prescribed burns implemented after the LOP, construct a fire line around the nest tree a radius of 50 feet and burn out from the fire line to protect the nest tree.
- Park staff will conduct surveys for spotted owls in treatment areas prior to ignition of prescribed fires.

American Peregrine Falcon

- A limited operating period (LOP) would be placed from February 1st through July 31st (nesting season) around all known peregrine falcon nest sites. This would consist of a half- mile diameter circle around known nest sites.
- Avoid disturbance within a half- mile diameter circle during the LOP. Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No known perch trees would be removed.
- Use of helicopters during fire suppression would be allowed no lower than 1300 feet (1/4 mile) above the cliff within the half- mile diameter circle during the LOP.
- Park staff will continue to monitor peregrine falcon populations annually.

Sierra Nevada Red Fox

- Construct a fire line around known den sites a radius of 50 feet and burn out from this line to protect the den.
- Avoid controlled burning or manual or mechanical thinning projects if pups are known to be in the area.

Cascades Frog

- Lakes with current existing populations of Cascades frogs will be avoided as helicopter dip sites and drafting sites. A list of the current populated lakes will be given to the Resource Advisor upon request.

Little Willow Flycatcher

- Construct fire line around patches of willow or alder where known nest sites occur.
- Park staff will conduct surveys for willow flycatchers in treatment areas prior to ignition of prescribed fires where suitable habitat exists.

Plants

- Park staff would clean fire management equipment prior to its use to prevent the spread of noxious weeds;
- Park staff would stage fire management operations away from known noxious weed infestations, and would construct fire lines away from known patches;
- Park staff would survey for noxious weeds in treatment units prior to ignition of prescribed fires;
- If threatened, endangered, or sensitive plant species are found in a treatment unit, a buffer surrounding the plants would be imposed that prohibits physical damage to the identified population. The assigned Resource Advisor would be consulted when determining the appropriate buffer.

2.6.5 Cultural Resources

- Fire control methods near cultural sites, especially the construction of control lines that expose mineral soil, would be developed in consultation with an archeological technical specialist to avoid adverse effects to cultural materials;
- Prior to all prescribed fire and non- fire fuel treatments, project areas would be inventoried for cultural resources and strategies to negate or minimize identified potential adverse effects would be developed and implemented;
- During wildfire and wildland fire use events, mitigation measures will be implemented for previously identified cultural resources in affected areas, and for cultural resources identified during archeological surveys of fire control lines and staging areas;
- Fire retardant use would be prohibited in the vicinity of any historic structure, unless there is imminent threat from wildfire to the historic structure;
- A designated Cultural Resource representative would conduct an inspection and develop a plan to protect any existing or new cultural resources identified before and after prescribed fires.

- Cultural resource digital databases and GIS layers would be maintained in a current status and available on CDs during fire season to expedite the management decision making process.
- The Park Archeologist, Northern California Sub- cluster Fire Archeologist, or PGSO Fire Archeologist, if available, would be notified immediately in the event of wildfire or Wildland Fire Use (WFU) and would participate in the WFU go/no- go process.
- An archeological resource specialist and/or resource advisor is recommended if extended attack is required and the wildfire is in an archeologically sensitive area.
- When American Indian Cultural Sites are threatened by fire, or fire suppression activities then the affiliated American Indian Tribes would be notified.
- Identified historical structures, cultural landscapes, ethnographic and archeological sites determined eligible or listed on the National Register of Historic Places would be priorities in resource protection planning.
- All WFUs would include an archeological monitor as part of the incident management team if documented archeological resources are threatened or the fire is located in an archeologically sensitive area.
- An archeologist would participate in the planning and execution of rehabilitation efforts following wildfires and WFUs.

2.6.6 Wilderness Values

In October 1972, Congress designated 75% of the park (78,982 acres) as the Lassen Volcanic Wilderness. The 2003 General Management Plan for Lassen Volcanic National Park proposes an additional 25,000 acres be included for wilderness designation. Parkland proposed for wilderness expansion is currently managed as natural areas with the objective of protecting and conserving the natural resources found within these areas. National Park Service wilderness management policies are based on provisions of the 1916 National Park Service Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. These policies establish consistent service- wide direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man- made improvements and the use of motorized vehicles in wilderness. All park management activities proposed within wilderness are subject to review following the minimum requirement concept and decision guidelines.

Wilderness use at Lassen includes such activities as hiking, backpacking, horseback riding, swimming and fishing in the summer, and winter cross country skiing and snowshoeing. The average annual overnight wilderness use in the park is approximately 7,750 person nights per year. There are approximately 150 miles of trail and 15 trail bridges within the park's wilderness. The park includes portions of two congressionally designated trails, the Nobles Emigrant Trail, a component of the California National Historic Trail, and the border- to- border Pacific Crest National Scenic Trail. There are three historic structures maintained within the wilderness: Mt. Harkness Fire Lookout, and Twin Lakes and Horseshoe Lake patrol cabins.

- Wildland fire operations within the Wilderness Area would adhere to the requirements of the Wilderness Act, NPS Management Policies, and the NPS Director's Orders 18 and 41 Wilderness Preservation and Management;
- All fire management activities within the Wilderness Area would employ minimum actions and tools necessary based upon the Minimum Requirement and Minimum Tool Determination;
- All fire management activities within the Wilderness Area would follow established MIST implementation guidelines;
- All fire management activities within the Wilderness Area would follow established Rehabilitation Guidelines for Wilderness Fire Suppression Activities;
- A Resource Advisor would be made available to advise fire crews and to monitor resource damage;
- When Wilderness campsites or travel routes are closed during fire management activities, visitors would be rerouted to alternative travel routes or campsites;
- Mechanical fuel treatments would not be allowed within the Wilderness Area.

2.6.7 Air Quality

- The Park and local Air Quality Management Districts will hold an annual meeting prior to each fire season to discuss the previous years fire management activities and discuss what went well and how to improve.
- The park will comply with all Local, State, and Federal Air Quality rules and regulations.
- As all prescribed fires and wildland fire use (WFU) fires are unique, a Smoke Management Plan (SMP) will be completed for each project. Smoke Management Plans will include "Management Action Points" that will trigger smoke mitigation actions. Examples of management action points include: predicted weather, fire moving into heavier fuel loading, smoke impacts to communities, and confirmed complaints. Examples of smoke mitigations for prescribed fires include waiting for good air dispersion, using firing techniques that allow for better dispersion, having check lines in place to hold the fire in place should conditions deteriorate, finish ignitions early in the day to promote burn- out of fuels prior to evening inversions. Examples of smoke mitigations for WFU include checking part or all of the fire spread, advancing fire spread on days of good dispersion, applying water to cool the edges of the fire through the use of hoselays or helicopters.
- The park must obtain a burn permit prior to prescribed fires.
- Affects to Air Quality are considered as a part of the WFU go/no- go decision.

2.7 Comparison of Alternatives

Table 2- 10 summarizes how the three alternatives compare in ability to meet the goals and objectives.

Table 2- 10. Summary of Ability to Achieve Goals and Objectives by Alternative.

	Alternative 1 (No Action) Implement 1993 Fire Management Plan	**Alternative 2 Wilderness Values Emphasis**	**Alternative 3 (Proposed Action) Ecosystem Restoration Emphasis**
Project Goals & Objectives			
Ensure that firefighter and public safety is the first priority in every fire management activity.	Yes. Firefighter and public safety is the first priority.	Yes. Firefighter and public safety is the first priority.	Yes. Firefighter and public safety is the first priority.
Restore and maintain natural fire regimes to the maximum extent practicable so natural ecosystems can operate essentially unimpaired by human interference. Objective: Treat 15% of the parks burnable landscape, under prescription, over the next five years.	**No.** 12,750 acres (12%) would be restored using prescribed fire over the next 5 years. An additional 5,000 acres could be restored with wildland fire use, but this number is dependent upon un-predictable natural fire ignitions.	**No.** Only 4,6000 acres (4%) would be restored using prescribed fire over the next 5 years. An additional 10,500 acres could be restored with wildland fire use, but this number is dependent upon un-predictable natural fire ignitions.	Yes. 19,350 acres (18%) would be restored using prescribed fire over the next 5 years. An additional 10,500 acres could be restored with wildland fire use, but this number is dependt upon un-predictable nature fire ignitions.
Protect Cultural Resources from adverse influences of wildland fires, fire suppression, prescribed fires, and manual/ mechanical treatments.	Yes. No loss of known cultural resources can be achieved.	Yes. No loss of known cultural resources can be achieved.	Yes. No loss of known cultural resources can be achieved.
Protect sensitive Natural Resources from adverse influences of wildland fires, fire suppression, prescribed fires, and manual/mechanical treatments.	Yes. No net loss of sensitive natural resource values can be achieved.	Yes. No net loss of sensitive natural resource values can be achieved.	Yes. No net loss of sensitive natural resource values can be achieved.
Reduce fuels in developed areas, urban interface boundaries, and cultural/historic	**No.** There is no use of manual or mechanical treatments; therefore, fuels will not be reduced	**No.** There is no use of mechanical treatments; therefore, fuels will not be reduced around all	Yes. Developed areas will be manually and mechanically treated so that at 90th percentile

zones to a level where at 90th percentile weather conditions, average flame lengths would be 4 feet or less.	around any developed areas and they will remain at risk.	developed areas and 150 acres will remain at risk.	weather conditions, average flame lengths would be 4 feet or less.
Maintain preparedness for fire response.	Yes. An extended attack wildland fire organization and a complex prescribed burn organization composed of LVNP personnel serving in at least 50% of the critical overhead positions can be maintained.	Yes. An extended attack wildland fire organization and a complex prescribed burn organization composed of LVNP personnel serving in at least 50% of the critical overhead positions can be maintained.	Yes. An extended attack wildland fire organization and a complex prescribed burn organization composed of LVNP personnel serving in at least 50% of the critical overhead positions can be maintained.
Maximize the efficiency of the fire management program by coordinating with other park divisions and neighboring agencies.	Yes. Maximum efficiency can be achieved.	Yes. Maximum efficiency can be achieved.	Yes. Maximum efficiency can be achieved.
Evaluate the costs and benefits of alternative fire management strategies to ensure the financial costs are commensurate with protection or enhancement of resource values.	Yes. Balanced budgets can be maintained and target treatment costs can be met.	Yes. Balanced budgets can be maintained and target treatment costs can be met.	Yes. Balanced budgets can be maintained and target treatment costs can be met.
Integrate fire management with all other aspects of park management and operations.	Yes. Fire management activities will receive collective input, review, and support from all Divisions.	Yes. Fire management activities will receive collective input, review, and support from all Divisions.	Yes. Fire management activities will receive collective input, review, and support from all Divisions.

Table 2- 11 summarizes how the three alternatives compare in response to impact topics.

Table 2- 11. Summary of Impact Topics by Alternative

	Alternative 1 (No Action) Implement 1993 Fire Management Plan	**Alternative 2 Wilderness Values Emphasis**	**Alternative 3 (Proposed Action) Ecosystem Restoration Emphasis**
Impact Topics			
Soils	Minor short- term soil erosion and compaction impacts from prescribed fire activities; benefits to soil development and soil nitrification from prescribed fire and wildland fire use.	Minor short- term soil erosion and compaction impacts from manual thinning and prescribed fire activities; benefits to soil development and soil nitrification from prescribed fire and wildland fire use.	Minor short- term soil erosion and compaction impacts from manual and mechanical thinning and prescribed fire activities; benefits to soil development and soil nitrification from prescribed fire and wildland fire use.
Water Resources	Minor short- term indirect surface water resource impacts (turbidity); no impact on wetlands or fragile environments.	Minor short- term indirect surface water resource impacts (turbidity); no impact on wetlands or fragile environments.	Minor short- term indirect surface water resource impacts (turbidity); no impact on wetlands or fragile environments.
Vegetation	Short- term changes in plant species composition and/or structure from prescribed fire and wildland fire use activities; In the long- term, natural fire regimes are restored; native plant and fire- tolerant species are favored; and overall plant habitat and diversity would be improved.	Short- term changes in plant species composition and/or structure from thinning, prescribed fire and wildland fire use activities; In the long- term, natural fire regimes are restored; native plant and fire- tolerant species are favored; and overall plant habitat and diversity would be improved.	Short- term changes in plant species composition and/or structure from thinning, prescribed fire and wildland fire use activities; In the long- term, natural fire regimes are restored; native plant and fire- tolerant species are favored; and overall plant habitat and diversity would be improved more greatly than in alternatives 1 and 2 because of the increased acreage that would be treated.
Wildlife	Prescribed fire and wildland fire use activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat; general wildlife habitat improved in the long- term with restoration of natural fire regimes and suppression of unwanted wildfires.	Thinning, prescribed fire, and wildland fire use activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat; general wildlife habitat improved in the long- term with restoration of natural fire regimes and suppression of unwanted wildfires.	Thinning, prescribed fire, and wildland fire use activities would temporarily displace some wildlife species; isolated mortality of individuals likely; very minor short- term impact on sensitive species habitat; general wildlife habitat improved in the long- term with restoration of natural fire regimes and suppression of unwanted wildfires.
Air Quality	Minor and temporary effects from prescribed	Minor and temporary effects from prescribed	Minor and temporary effects from prescribed

	fires, wildland fire use; minor smoke impacts on sensitive wildlife receptors.	fires, wildland fire use and slash pile burning; minor smoke impacts on sensitive wildlife receptors.	fires, wildland fire use and slash pile burning; minor smoke impacts on sensitive wildlife receptors.
Noise	Minor noise impacts to fire crews and the public; minor noise impacts to sensitive wildlife receptors and wilderness.	Minor noise impacts to thinning crews and fire crews, as well as the public; minor noise impacts to sensitive wildlife receptors and wilderness.	Minor noise impacts to thinning crews and fire crews, as well as the public; minor noise impacts to sensitive wildlife receptors and wilderness.
Visitor Use and Experience	Minor and short- term impacts during prescribed fire and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista); wildland fire use would result in minor and longer term visual impacts from smoke emissions.	Minor and short- term impacts during manual thinning, prescribed fire and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista); wildland fire use would result in minor and longer term visual impacts from smoke emissions.	Minor and short- term impacts during manual thinning, prescribed fire and wildfire suppression activities (e.g. trail or road closures, presence of work crews in the vista); wildland fire use would result in minor and longer term visual impacts from smoke emissions.
Human Health and Safety	Human health and safety improved by reducing fire danger to the park and adjacent lands; Minor exposure to smoke by workers and the public during prescribed fire, wildland fire use and suppression activities.	Human health and safety improved by reducing fire danger to the park and adjacent lands; Minor exposure to smoke by workers and the public during prescribed fire, wildland fire use and suppression activities. Potential for injury from thinning activities.	Human health and safety improved by reducing fire danger to the park and adjacent lands; Minor exposure to smoke by workers and the public during prescribed fire, wildland fire use and suppression activities. Potential for injury from thinning activities.
Socio- economics	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.	Very minor effects on local and regional economy; no adverse impact to poor and/or minority populations.
Cultural Resources	No adverse impacts to known cultural resources; impacts to unknown cultural resources are mitigated through pre- treatment inventories and mitigation. Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.	No adverse impacts to known cultural resources; impacts to unknown cultural resources are mitigated through pre- treatment inventories and mitigation. Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.	No adverse impacts to known cultural resources; impacts to unknown cultural resources are mitigated through pre- treatment inventories and mitigation. Use of MIST during fire suppression activities would prevent potential adverse impacts to unrecorded sites.
Wilderness	Minor, local impacts to wilderness resources and values (noise- related).	Minor, local impacts to wilderness resources and values (noise- related).	Minor, local impacts to wilderness resources and values (noise- related).

Chapter 3 – ENVIRONMENTAL ANALYSIS

This chapter summarizes the existing environmental conditions and the probable environmental consequences (effects) of implementing the action and No Action alternatives. This chapter also provides the scientific and analytical basis for comparing the alternatives. The probable environmental effects are quantified where possible; where not possible, qualitative descriptions are provided.

3.1 Soils

3.1.1 Affected Environment

Geologic Resources

Lassen Volcanic National Park is made up of parts of three volcanic centers that were active at different times. The Dittmar Volcanic Center is the oldest, followed by the more recent Maidu and most recent Lassen. The Lassen Volcanic Center is most significant because most of what is now parkland is contained within it and because it is most recent.

Within the park is a diverse array of volcanic resources including composite volcanoes, shield volcanoes, plug dome volcanoes, tephra cones, lava flows and active geothermal areas. Lassen Peak is one of the largest plug dome volcanoes in the world. At 10,457 feet in elevation, it is the highest point in the park and lies at the southern end of the still-active Cascade Mountain Range. The mountain dominates the park landscape. The well- documented eruptions of Lassen Peak from 1914 to 1917 and the extensive system of geothermal areas in the park illustrate the fact that volcanic activity continues as a dynamic force today.

The park has one of the most extensive systems of active geothermal features that can be found anywhere in the Cascade Mountain Range. Geothermal activity is surface representation of heat at depth, indicating the presence of hot magma and rocks a short distance below the earth's surface. Water from rain and melted snow seeps through porous volcanic soils and eventually contacts rocks heated to high temperature by this magma chamber. Under intense pressure this heated water rises back toward the surface and then escapes as steam, boiling water, or bubbling mud.

The geologic formation of the Lassen area is almost entirely volcanic; sedimentary evidence is virtually absent. The oldest rock formations are andesite and basaltic lava flows that cover the eastern portions of the park and form a low, broad plateau. Approximately 50,000 years ago, Mount Tehama erosionally breached, leaving a circle of rugged peaks, which form many prominent features along the southwest section of the park.

Although Lassen is the most dominant peak on the flank of eroded Mt. Tehama, other peaks, including Brokeoff Mountain, Mount Diller, Pilot Pinnacle, and Mount Conard, are highly visible. The Sulphur Works thermal area was the main vent of Mount Tehama. Other major volcanic features within what is now the park were being formed at the time Tehama eroded. These include three cinder cones: Hat Mountain, Crater Butte, and Fairfield Peak; and four shield volcanoes: Raker Peak, Prospect Peak, Sifford Mountain, and Mount Harkness. About 27,000 years ago a dacitic plug dome was extruded from the flanks of Mount Tehama and formed Lassen Peak. Volcanic explosions, which preceded and coincided with the formation of Lassen Peak, formed several cinder and ash cones and scattered thick layers of ash and pumice over the surrounding area.

The resulting features of these geologic events have been reshaped by periods of glaciation, which occurred during the Great Wisconsin Era approximately 10,000 years ago. Smaller glaciers persisted until a fairly recent time at higher elevations. A number of the major water courses and valleys are glacial products.

Twelve hundred years ago, six steep, rough- sided dacitic plugs were formed on the flank of Lassen Peak; these plugs are now called Chaos Crags. Between three hundred and 1,200 years ago a rockfall avalanche from these plugs created the Chaos Jumbles and caused the formation of Manzanita Lake. Cinder Cone and the Fantastic Lava Beds are fairly recent volcanic features that also came into existence approximately three hundred years ago.

The most significant recent volcanic event in the park is the eruption of Lassen Peak between 1914 and 1917. Smoke was observed as late as 1921. Several significant events occurred during this period. Among them was the May 19, 1915 eruption during which lava spilled over the northeast and southwest rims of the summit and created an avalanche mudflow which devastated an area a quarter mile wide and 18 miles long. On May 22, 1915, three days later, a fast- moving cloud of superheated gas and debris covered the same area, burning and searing the remaining vegetation and the debris left by the preceding mudflow.

Earthquakes generally precede a volcanic eruption and for this reason they are monitored by the United States Geologic Survey's Volcanic Hazard Program. Nine seismometers located in and near the park provide a continuous record of seismic activity. Primary purposes of this monitoring are to 1) provide early warning of a forthcoming volcanic eruption and 2) learn more about earthquake and volcanic phenomena based on "background" levels of seismicity.

Lassen Volcanic National Park's geologic features have been the subject of research and study, beginning in 1914 with the renewed eruptions of Lassen Peak and continuing today with seismic monitoring and geothermal monitoring. The United States Geological Survey has mapped the entire park and delineated the volcanic history of the area and the chemical characteristics of the surficial thermal features. A detailed geologic map of the park is also nearing completion by the United States Geological Survey.

Soil Resources

The soils within Lassen Volcanic National Park are generally rocky, shallow, rapidly drained and strongly acidic. They are almost exclusively volcanic in origin. Depths vary from several feet in limited lower elevation meadows to thin or nonexistent in the higher elevations. The distribution of many herbs, shrubs, and trees in the park and throughout the Cascade Range follows geologic formations and soil properties as much as climatic factors. In the vicinity of Chaos Jumbles, for example, there are three distinct overlapping rockfall avalanches, each with soil of a different texture and composition and each with a different vegetative cover. Because of their rock porous nature, the soils are rather resistant to erosion. Erosion does occur in conjunction with some heavily used trails. Detailed soil information comes from a few small development projects and is site specific. A comprehensive soil survey has never been completed for the entire park, though efforts are underway to begin a park-wide soil survey by the Natural Resource Conservation Service in 2005.

3.1.2 Environmental Consequences

Soil is an integral component of terrestrial ecosystems. Fire interactions with soil are significant because most fires spread by combustion of organic matter that is in contact with or part of the soil. Fire creates physical, chemical, and biological changes that may be either desirable or detrimental in the context of long-term soil productivity. Fire may cause changes in organic horizons, water repellency, infiltration capacity, porosity, structure, temperature, hydrologic properties, and various erosion processes. Fire generally increases the potential for accelerating erosion through its effects on vegetation, organic matter, and the physical properties (including limiting water infiltration) of the soil.

All fire, whether natural or human-caused, changes the cycling of nutrients and the biotic and physical characteristics of soils. The magnitude and longevity of these effects depend on many factors including fire regime, severity of a particular fire, vegetation and soil type, topography, season of burning, and pre- and post-fire weather conditions.

Fire impacts to soils are greatly dependent on fire severity. Most fires result in low to moderate severity. As a result, the soil structure remains relatively intact, with incomplete burning of litter and duff layers. Seed banks often remain viable and are released as a result of the increased flush of nutrients, light and water. High severity fires result in greater soil impacts but these impacts are dependent on the soil type, vegetation community, slope, aspect, weather and other factors. Soils have evolved and developed under natural fire regimes through the millennia, and as such fire would continue to provide a beneficial role for ecosystem processes.

3.1.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

This alternative allows fire, as an ecosystem process, to resume its natural roll to the fullest practical extent, either through careful application of prescribed fire or wildland fire use, with a 10- year goal to treat up to 35,500 acres within the park. This alternative also includes fire suppression efforts. This alternative does not include manual or mechanical treatments.

In October 1972, Congress designated 75% of the park (78,982 acres) as the Lassen Volcanic Wilderness. The 2003 General Management Plan for Lassen Volcanic National Park proposes an additional 25,000 acres be included for wilderness designation. Parkland proposed for wilderness expansion is currently managed as natural areas with the objective of protecting and conserving the natural resources found within these areas. National Park Service wilderness management policies are based on provisions of the 1916 National Park Service Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. These policies establish consistent service wide direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man- made improvements and the use of motorized vehicles in wilderness. All park management activities proposed within wilderness are subject to review following the minimum requirement concept and decision guidelines.

Wilderness use at Lassen includes such activities as hiking, backpacking, horseback riding, swimming and fishing in the summer, and winter cross country skiing and snowshoeing. The average annual overnight wilderness use in the park is approximately 7,750 person nights per year. There is approximately 150 miles of trail and 15 trail bridges within the park's wilderness. The park includes portions of two Congressionally designated trails, the Nobles Emigrant Trail, a component of the California National Historic Trail, and the border- to- border Pacific Crest National Scenic Trail. There are three historic structures maintained within the wilderness: Mt. Harkness Fire Lookout, and Twin Lakes and Horseshoe Lake patrol cabins.

Potential impacts to soil would be from direct fire effects as described above and from fire holding and suppression activities. Both wildland fire use and prescribed fire would reintroduce fire into areas where fire has been excluded over the last 100 years, which may cause slightly more intense fires due to fuel buildups. Both wildland fire use and prescribed fire actions could reduce vegetative cover in the burned areas. On steep or failure- prone slopes, this loss of vegetation could lead to localized soil erosion. Some areas of heavy fire concentration would affect soil chemical composition from the extreme heat that could be generated. Though overall, the reintroduction and continued use of fire in the park would reestablish natural erosion processes and soil properties. The effects to soil would be minor, short- term and localized.

Wildland fire use, prescribed fires and fire suppression activities would all require the construction of fire lines to confine them either as direct attack or indirectly within predetermined boundaries. Avoidance of steep up and down slope construction, controlling burn intensities; the use of natural boundaries rather than constructed fire lines; and post- fire rehabilitation of firelines would mitigate the potential erosive effects of such fire lines, which would be minor and short- term.

Some fire prep activities include the use of hand piling and burning debris to eliminate fuels while reducing smoke impacts and increasing the controllability of the fire. These activities would combine to increase the local impacts on soils due to the large amount of accumulated fuels and increased temperatures over a smaller site. The size of these impact areas, however, are expected to be relatively small (usually in the range of 10 feet by 10 feet) and could be mitigated by burning the piles when the soils are saturated by fall rains, resulting in very minor, short- term effects to soil.

Due to the lack of manual and mechanical treatments within developed areas under this alternative, more developed areas would become devoid of vegetation and would therefore likely open up to increased foot traffic and associated soil compaction. Repeated heavy machinery entries into the stand as a result of recurring hazard tree removal projects would likely increase soil compaction. There would be some potential for soil displacement from dusting as more area becomes denuded from persistent loss of vegetative cover. The forest floor (duff and litter) and soil organic matter would decompose (due to increased soil temperature and increased biologic activity) in areas of concentrated tree mortality resulting in an increase in erosion, and a decrease in soil biota, plant- available nutrients, and overall hydrologic function. Overall, soil impacts would be localized and represent a small amount of the soils in the area, and thus would be minor in intensity.

3.1.2.2 Alternative 2 – Wilderness Values Emphasis

This alternative responds to the importance of protecting wilderness values, by promoting fewer fire management activities within wilderness. This alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow manual fuel treatments. The 10- year fire treatment goal of 31,200 acres is similar to Alternative 1 (35,500 acres), though the emphasis would shift to wildland fire use with fewer prescribed fire units.

Impacts to soil resources would be similar to those described under Alternative 1, with the addition of manual fuels treatments being implemented at specific sites within the park. Manual fuels treatment is the use of hand tools or hand operated power tools. This treatment is used to clear or prune herbaceous and woody species to effectively reduce hazardous accumulations of wildland fuels and to create defensible space near structures. Material cut or gathered through manual treatment would either be cast back on site or be disposed of by piling and burning. Little or no soil impacts are expected from manual thinning treatments. Hazard fuel reduction work using chainsaws is not expected to disturb soils. There would be very minor, short- term and localized effects to soil from pile burning activities, though these impacts could be mitigated by burning when soils are saturated by fall rains. Heavy equipment would not be used under this alternative.

Due to the lack of mechanical treatments within developed areas under this alternative, some areas would become devoid of vegetation and would therefore likely open up to increased foot traffic and associated soil compaction. These impacts would be similar to those described under Alternative 1. However, the extent of the areas that would be negatively impacted would be less than under Alternative 1, because Alternative 2 allows for manual treatments, while Alternative 1 does not. Soil impacts would be localized and represent a small amount of the soils in the area, and thus would be minor in intensity.

3.1.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

Alternative 3 would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow for manual and mechanical fuel treatments. In addition, this alternative responds to the importance of reducing hazardous fuels, and restoring natural fire regimes and forest structures through the accelerated use of prescribed fire. The 10- year fire treatment goal for this alternative is 60,850 acres, with a greatly increased emphasis towards prescribed fires.

Impacts to soil resources would be similar to those described under Alternatives 1 and 2, with a slightly higher potential for increased soil erosion due to more park acreage being treated with prescribed fire. This alternative also introduces the use of mechanical fuels treatment at specific developed sites within the park. Mechanical treatment has the same goal as manual treatment; to reduce hazardous accumulations of wildland fuels thus creating a defensible space near structures. It also would serve to improve the health of the forest in developed areas. Mechanical treatments would use heavy equipment (such as a boom truck and front end loader) to move large boles, with the restriction that the equipment would not be driven outside of existing road corridors or used outside of developed areas. Material cut or gathered through mechanical treatment would either be cast back on site, be disposed of by piling and burning or depending on the size, quantity and location, may be chipped and removed from the site or sold. There would be very minor, short- term and localized effects to soil from pile burning activities

Soils in this area are very well drained and are characterized by their ability to rapidly absorb water and their permeability. All mechanical treatments would be done in the fall when soils are dry, so no loss of porosity (due to soil compaction) is expected to occur. Furthermore, almost all heavy equipment use would occur in areas where an organic litter layer is already present offering further protection from compaction. Compactive forces would be minimized by using a rubber tired skidder and confined by designating skid trails. Surface erosion is not expected to occur because of a combination of factors including the flatness of the terrain, the porosity of the soil, and the occurrence of a residual overstory and organic litter layer to intercept post- project incoming precipitation. In many areas soils and vegetation are already impacted to a degree by various human and natural activities. These already- impacted areas would be targeted for log decks. Soils in the area are susceptible to dust conditions and dust abatement would be included to minimize dust from tree felling activities. Upon completion of trees felling, site rehab would be accomplished by hand raking all tire tracks and skid trails. Soils in the areas used for log decks would be rehabbed with scarification, mulched, and planted with species native to the immediate area. These actions would reduce loss of soils and potential erosion of bare soils, resulting only in a short- term, minor, adverse effect on soils. There would also be a minor short- term (2- 5 years) adverse effect to soil nutrition because of slash removal.

3.1.2.4 Conclusion

The implementation of any of the alternatives would not significantly impact soil resources because only minor (depending upon fire size and fire intensity) and short-term increases in the amount of erosion are expected. Mitigation features designed into the plan (Section 2.6.2) would help limit any compaction due to the use of heavy equipment and limit unnatural erosion produced after a fire event. Implementation of any of the three alternatives would not impair soil or geologic resources or values that are necessary to fulfill specific purposes identified in the enabling legislation of the park.

3.2 Water Resources including Wetlands

3.2.1 Affected Environment

Lassen Volcanic National Park contains portions of five drainage basins. Four of the drainage basins (nearly the entire park) drain into the Sacramento River and eventually to the Pacific Ocean. A small area on the eastside of the park drains into the landlocked Eagle Lake drainage basin. The northern half of the park is the Hat Creek drainage, which ultimately feeds into the northern Sacramento River system via the Pit River. The western and southern portions of the park also drain to the Sacramento River via three main channels: the southeast portion of the park drains via the Upper North Fork of the Feather River, which is dammed approximately 18 miles outside the park at Lake Almanor; and the west and southwest portions of the park drain into Battle Creek and Mill Creek, respectively. Mill Creek currently has no dams blocking anadromous fish and is one of a very few stream courses remaining in California to have its biologic integrity preserved from its origin in northern California to the Sacramento River.

The park contains over 200 lakes and ponds and 15 perennial streams. Inventory data on aquatic life in these water bodies is very limited. Some lakes have been significantly modified by past programs of stocking non- native sport fish, which was halted in 1992. A thorough fisheries inventory was completed during the summer of 2004 and a report will be completed in 2005.

Some of the natural drainage systems in the park have been altered. The most obvious of these are Manzanita and Reflection Lakes. Manzanita Lake was created from the Chaos Crags rockfall avalanche 300 years ago and was enlarged with a dam in 1911 for a small hydropower operation. Water was also diverted from Manzanita Creek to Reflection Lake, originally a closed basin lake, to provide water- generated power and to improve fish production. Natural drainage patterns in Warner Valley's Drakesbad Meadow were also altered by early ranchers to more evenly distribute water in the meadow for livestock grazing. Dream Lake dam was also built in Warner Valley in the 1930's as part of the Drakesbad Guest Ranch prior to park ownership in the late 1950's.

Water quality is generally considered to be excellent because Lassen Volcanic National Park occupies "high ground" (top of the watershed) and there is no development upstream to impact park waters. Water quality data has been sporadically collected over the years, including some data from the park's hydrothermal areas at Sulphur Works, Bumpass Hell and Devil's Kitchen. Surface water from a total of six sources (Butte Lake, Manzanita Creek, Lost Creek, East Fork Hat Creek, Forest Creek, and Martin Creek) and two springs (Drakesbad Springs and Warner Valley Springs) is treated to provide drinking water for park visitors and staff. Drinking water is monitored daily to assure a safe supply for human use. Periodic sampling and testing is also performed in park waters where existing sewage systems or human use levels are such that contamination is a possibility. Broad based chemical analysis and testing for herbicides and pesticides has been conducted in five watersheds (Forest Creek, North Fork of Hat Creek, Lost Creek, Manzanita Creek and Flat Iron Ridge Spring) over the last twelve years. No pesticides have ever been detected in any of the park's watersheds. A level I water quality inventory will be completed for the park by the US Geological Survey during the fall of 2004.

Wetlands are a critical resource in the park supporting a high diversity of species. National Wetlands Inventory (NWI) maps were produced in 1989 for the park and surrounding National Forest lands, though these maps have never been digitized or ground truthed for their accuracy. Based on several rough estimates for vegetation types, wet meadow and riparian/alder zones total over 2,000 acres in the park. Of this acreage, several wet meadow wetland complexes are significant in size, including Drakesbad Meadow, Kings Creek Meadow and Dersch Meadows. Drakesbad Meadow in Warner Valley was identified as a fen in 2000 because it has organic soils more than 40 cm thick. At approximately 90 acres, this spring- fed complex is the largest wetland in the Park. Fens occur throughout the Rocky Mountains but there are very few reports of peatlands occurring in California, Oregon or Washington. The rarity of fens in the Sierra Nevada and Cascade Mountain ranges is likely due to the dry summer climate of these regions, and wetland water tables that decline during the summer result in increased organic matter decomposition rates. However, a few locations have perennial spring complexes creating saturated soils where fens have developed. Because fens are rare, they most likely support unique biodiversity elements and deserve the utmost in protection. There are hundreds of smaller wetlands throughout the park; many are associated with lakes and ponds that can be found throughout the park's wilderness.

Riparian systems, embedded within a matrix of communities experiencing frequent fire, are also likely to burn on some regular periodicity (Thornburgh 1995). Although fire regimes may differ from upland vegetation and fire return intervals may be considerably longer, riparian communities within the park have a demonstrated history of reoccurring fire events. As a result, these communities are not as fire sensitive as once thought and have played a critical role in landscape fire regimes (Skinner and Chang 1996, Skinner 2002 , Taylor and Skinner 1998). Like in any community, fires of inappropriate severity can result in negative impacts. Prescribed fire treatments will be managed to minimize fire impacts, carefully considering seasonality, frequency and severity. Excluding fire from these vegetation types may only increase the magnitude of unplanned events and lengthen the post- fire period of recovery.

3.2.2 Environmental Consequences – Water Quality

Water quality can be affected both by fires and by fire management activities. Small fires and fires of low intensity would be expected to have very little effect on water quality. Fires that become large (because they escape initial attack or because they are managed as wildland fire use actions), could have minor and short- term effects on water quality in a sub- drainage or drainage due to increased ash and woody debris deposited into waterways. This type of deposition could increase turbidity downstream from the fire. Loss of vegetation could lead to increased erosion and sediment loading in surface water resources in the park. These effects are considered normal and natural in wildland fire use regimes. These naturally occurring, short- term, minor effects would not be expected to cause long- term detrimental effects to water quality.

3.2.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

This alternative allows fire, as an ecosystem process, to resume its natural roll to the fullest practical extent, either through careful application of prescribed fire or wildland fire use, with a 10- year goal to treat up to 35,500 acres within the park. This alternative also includes fire suppression efforts. This alternative does not include manual or mechanical treatments. Generally, ecological effects of fire on water quality would be negligible to minor. Depending on its location, severity and extent, a fire, would result in the same range and type of impacts as described above. These impacts include background erosion of burned areas into water, changes in water temperature, water chemistry and other properties.

Potential impacts to water quality would be from direct fire effects as described above and from fire holding and suppression activities. Both wildland fire use and prescribed fire would reintroduce fire into areas where fire has been excluded over the last 100 years, which may cause slightly more intense fires due to fuel buildups. Both wildland fire use and prescribed fire actions could reduce vegetative cover in the burned areas. On steep or failure- prone slopes, this loss of vegetation could lead to localized soil erosion resulting in increased sedimentation loads into water bodies. Overall, the reintroduction and continued use of fire in the park would reestablish natural processes and the effects to water quality would be minor, short- term and localized.

Wildland fire use, prescribed fires and fire suppression activities would all require the construction of fire lines to confine them either as direct attack or indirectly within predetermined boundaries. Fire line construction may result in soil erosion, increased sedimentation, and alteration of spatial drainage patterns. The risk of this impact is greater along steep- sloped banks that are adjacent to streams. These potential impacts would be greatly reduced by using the mitigation measures identified in Section 2.6.2. Controlling burn intensities; the use of natural boundaries rather than constructed fire lines; and post- fire rehabilitation of firelines would also mitigate the potential for water quality impacts. Through the use of these mitigation measures, impacts to water quality would be minor, short- term and localized.

3.2.2.2 Alternative 2 – Wilderness Values Emphasis

This alternative responds to the importance of protecting wilderness values, by promoting fewer fire management activities within wilderness. This alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow manual fuel treatments. The 10- year fire treatment goal of 31,200 acres is similar to Alternative 1 (35,500 acres), though the emphasis would shift to wildland fire use with fewer prescribed fire units.

Impacts to water quality would be similar to those described under Alternative 1, with the addition of manual fuels treatments being implemented at specific development sites within the park. Manual fuels treatment is the use of hand tools or hand operated power tools. Manual fuel treatment areas would have site- specific plans that would include priorities to protect sensitive water resource areas (such as stream banks and riparian zones). Impacts to water quality would therefore be minor. Heavy equipment would not be used under this alternative.

3.2.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

Alternative 3 would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow for manual and mechanical fuel treatments. In addition, this alternative responds to the importance of reducing hazardous fuels, and restoring natural fire regimes and forest structures through the accelerated use of prescribed fire. The 10- year fire treatment goal for this alternative is over 60,850 acres, with a greatly increased emphasis towards prescribed fires.

This strategy would result in a moderate increase (over Alternatives 1 and 2) in the extent of park landscape that would be burned as a result of an increase in the number of acres that would be subjected to prescribed fire activities. Overall, there would be a minor increase in the scope and degree of ecological impacts to water quality, as described above under Alternatives 1 and 2. Through the use of mitigation measures described in Section 2.6.2, impacts to water quality would, however, remain minor, short- term and localized.

This alternative also introduces the use of mechanical fuels treatment at specific development sites within the park. Mechanical treatment has the same goal as manual treatment with the goal to reduce hazardous accumulations of wildland fuels thus creating a defensible space near structures. Mechanical treatments would use heavy equipment (such as a boom truck and front end loader) to move large boles, with the restriction that the equipment would not be driven outside of existing road corridors or used outside of developed areas. Material cut or gathered through mechanical treatment would either be cast back on site, be disposed of by piling and burning or depending on the size, quantity and location, may be chipped and removed from the site or sold. Mechanical fuel treatment areas would have site- specific plans that would include priorities to protect sensitive water resource areas (such as stream banks and riparian zones). Impacts to water quality would therefore be minor, short- term and localized.

3.2.2.4 Conclusion

The implementation of any of the alternatives would not significantly impact water resources because all effects are short- term or produce minor amounts of sediment, and because mitigation features designed into the plan help limit the amount of sediment that could reach a water body. Effects would be indistinguishable from the annual hydrologic variation due to climate variability and natural processes. Implementation of these fire management strategies would not impair water resources or values that are necessary to fulfill specific purposes identified in the enabling legislation of the park.

3.2.3 Environmental Consequences – Wetlands

The majority of the areas that constitute wetlands in Lassen Volcanic National Park are too wet to carry a continuous fire front that could result in adverse or beneficial effects to wetland plant communities. Wetlands, like other park plant communities, have developed under the park's natural fire regime. Fire can benefit the long- term presence of wetlands by maintaining open water systems, delaying succession, and increasing nutrient cycling.

3.2.3.1 Alternatives 1, 2 and 3

Under all three alternatives wetlands would likely be used as naturally occurring fire breaks during wildland fire use and prescribed fire use. Under these management strategies, park wetlands would only be minimally affected by fire, having a natural ability to withstand fire due to high fuel moisture levels and (very often) standing water. Fire line construction would be avoided in wetlands. Using indirect attack outside the wetland area for fire suppression would reduce or eliminate wetland impacts. Through the use of mitigation measures described in Section 2.6.2, there would be negligible impacts to wetlands under any of the three alternatives. The use of manual and/or mechanical fuel treatments (Alternatives 2 and 3) would not result in any impacts to wetlands.

3.2.3.2 Conclusion

The implementation of any of the alternatives would not significantly impact wetlands nor would these strategies impair wetlands or values that are necessary to fulfill specific purposes identified in the enabling legislation of the park.

3.3 Vegetation

3.3.1 Affected Environment

Lassen Volcanic National Park covers approximately 500 km² of the southernmost peaks of the Cascade Mountain range. Elevation in the park varies from 1616 m at Warner Valley to 3187 m on Lassen Peak. Most of the park below 2400 m is forested, with the distribution of conifer species being affected by elevation (Parker 1991). Red fir *(Abies magnifica)* and lodgepole pine *(Pinus contorta var. murrayana)* dominate upper elevations (2100 to 2400 m), whereas white fir (*A. concolor)* and Jeffrey pine (*P. jeffreyi)* are most abundant at lower elevations (<2100 m). Limited stands of mountain hemlock *(Tsuga mertensiana)* occur along the treeline >2400 m. Table 3- 1 summarizes the distribution of common tree species by the forest types found in the park.

Other minor vegetation communities occurring in the park include (1) montane chaparral and (2) seasonally wet habitats located in valley meadows and along streams and lake margins (White et al 1995). See Figure 3- 1 for a generalized vegetation map of the park.

Table 3- 1 Forest tree species of Lassen Volcanic National Park.

Tree Species	Forest Types				
	Jeffrey Pine	White Fir	Lodgepole Pine	Red Fir	Mountain Hemlock
Pinus ponderosa	#				
Calocedrus decurrens	#				
Pinus lambertiana	#	#			
Pinus Jeffreyi	M	#			
Abies concolor	#	M	#	#	
Pinus contorta			M	#	
Abies magnifica		#	#	M	#
Pinus monticola		#		#	#
Tsuga mertensiana			#	#	M
Pinus albicaulis					#

"M" = Major species present, "#" = Minor species present

Native Vegetation

Wet Meadows (1,504 ac)

Herbaceous communities are scattered throughout the park and range from densely vegetated, wet meadows near seeps streams and lakes that contain primarily monocotyledonous species including sedges *(Carex spp.)*, *Agrostis thuberiana, Deschampsia caespitosa*, and *Muhlenbergia filformis* (Taylor 1990b); to less densely vegetated areas composed of mostly broad- leaved dicotyledonous species such as satin lupine *(Lupinus obtusilobus),* mule ears *(Wyethia mollis), Artemisia douglasiana,* and *Alnus* *tenuifolia* that occur on steep slopes or in larger gaps within forested areas (Pinder et al. 1997).

Montane Chaparral (9,139 ac)

Pinder et al. (1997) found that most chaparral species in the park occur below 2300 m on relatively xeric sites (e.g. warmer aspects and steeper slopes). These scattered shrub fields are dominated by manzanita (*Arctostaphylos patula)*, snowbrush ceanothus *(Ceanothus* velutinus), and bush chinquapin *(Castanopsis sempervirens)*.

Fire is a dominant natural force in the montane chaparral environment where fire frequency ranges from 10-50 years. The various shrub species that occupy montane chaparral sites have several strategies for adapting to a fire-prone environment. Greenleaf manzanita for example, regenerates after fire by resprouting. Snowbrush ceanothus is a prolific seed producer and can regenerate from seed or resprouts depending on fire frequency and severity (Keeley and Keeley 1993).

Mixed Conifer (30,223 ac)

Jeffrey pine and white fir forest types are found below 6234' usually in a mix, although on individual sites either species may be strongly dominant in terms of basal area and/or stem density. Other minor cohorts include ponderosa and sugar pines *(Pinus ponderosa and P. lambertiana)*, with occasional occurrences of incense cedar *(Calocedrus decurrens)*, red fir and western white pine *(Pinus monticola)*. The soils associated with these forest types have significantly higher pH values and greater exchangeable basic cation content (potassium, calcium, and magnesium) than most other Lassen Park forest types (Parker 1991).

The mixed-conifer forests within Lassen Park have experienced significant ecological change since fire suppression efforts began in the early 1900s. Fire exclusion has allowed a major increase in white fir density and the chances of stand-replacement fire, characteristic of high-severity fire regimes, are much greater now than historically. During the last several years many large conifer trees have died in many of the campgrounds causing a substantial and abnormal increase in the number of hazardous trees. A green tree failure in Lost Creek Campground prompted the park to close the campground during all of 2002 to facilitate tree removal and to allow evaluation by U.S. Forest Service scientists. The evaluation concluded that a combination of root disease in fir trees and abnormally high densities of young fir trees (due to past fire suppression) have created unsustainable campground forests that, without management intervention, would continue to experience high rates of tree death.

Historically, fires tended to be of low intensity, rarely scorching the crowns of older, mature trees. Fires tended to be small, frequent, and patchy, in that they consumed too little fuel to scar trees. The historical mean fire return interval is 16-30 years (range 9-38 yrs). Fire is linked with other disturbance factors in pine-dominated forests, most notably post-fire insect attack. Scorched trees are more likely to be successfully attacked by western pine beetle *(Dendroctonus brevicomis)*, mountain pine beetle *(D. ponderosae)*, red turpentine beetle *(D. valens)*, or pine engraver beetles *(Ips spp.)*.

Reduction in tree vigor during drought is also associated with insect attack. Fire may help control dwarf mistletoe infestation by pruning dead branches and consuming tree crowns that have low hanging brooms.

Lodgepole Pine (2,398 ac)

Lodgepole pine stands occur between 6334' and 7546' and are most common on flat, valley bottom sites or lower slopes, often in margins of meadows and lakes. In this forest type, lodgepole pine is strongly dominant, with red and white fir and mountain hemlock occurring as minor associates.

Lodgepole pine forests have a mixed- severity fire regime. Most stands show an origin from a more widespread stand replacement- type fire and most have a patchy history of fire occurrence and spread. The mean fire return interval is 47 years (range 28- 54 yrs), with areas bordering higher productivity forest on the low end of the range. Strong winds are likely associated with the rare stand replacement fire in the lodgepole pine type. Mature lodgepole pines are quite resistant to fire damage. Under most conditions, these forests will act as natural fuel breaks, where fire suppression, if desired, would be relatively easy.

Red Fir (36,365 ac)

Red fir is the most widespread forest type in the park and is a common upper montane forest type throughout the Sierra Nevada and southern Cascade ranges. In the park, red fir forest is found between 6562' - 27874' on upland flats and sloping terrain surrounding sedge meadows and lodgepole pine forests. In this forest type, red fir is dominant in terms of basal area and/or stem density. It is most often found in association with western white pine and lesser amounts of lodgepole and Jeffrey pines, white fir and mountain hemlock.

Red fir ecosystems have a classic mixed- severity fire regime. Red fir, when mature, is relatively fire tolerant. A range of fire frequencies of 4- 127 years (mean 41 yrs) combined with a range of fire intensities leads to a patchy mosaic of different age structures across landscapes of this type. Within Lassen Park, typical large fire sizes in red fir forests have been about 400 acres. Small patches of low, moderate, and high- severity fire typically occur, with high- severity fire often covering less than one- third of the landscape. Old-growth stands of red fir are least likely to burn with high severity. Although there has probably been some increase in older patches, it is unclear from the literature if red fir stands in Lassen Park have been affected substantially by fire exclusion over the past 80-100 years (Taylor and Halpern 1991, Taylor 2000).

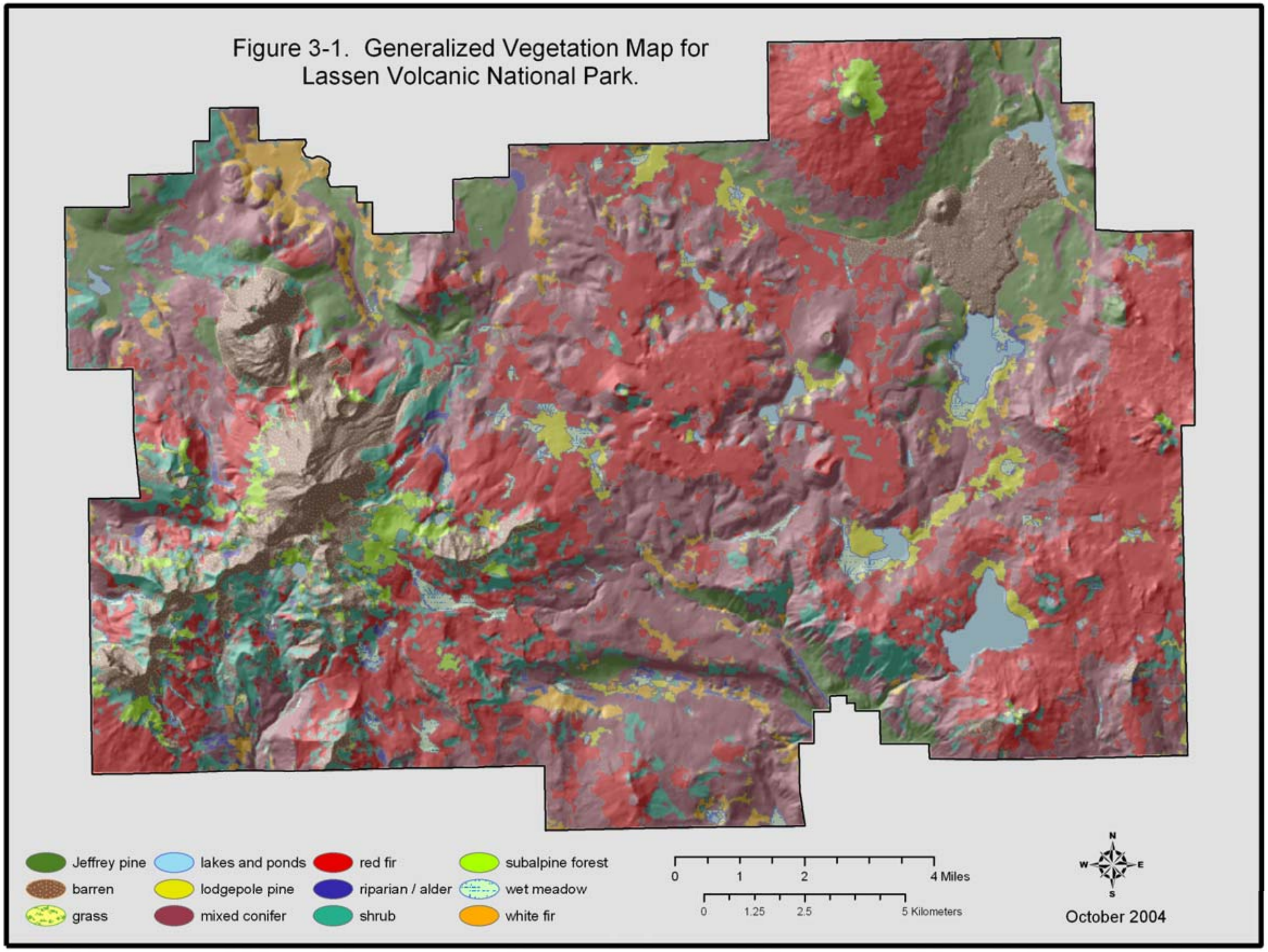
Stand development patterns in red fir forests are complex because red fir is not only fire- tolerant but is also shade- tolerant. It does well with or without disturbance. Several stand development patterns are common. If a stand replacement fire occurs, scattered mature red fir trees usually survive to provide a seed source for slow, recolonization by red fir and other species. In moderate- severity patches, some red fir dominants remain and provide seed for colonization by red fir, which does well in these partially shaded conditions, creating a multiple age class stand. In low- severity patches, understory trees are killed but little growing space is opened for regeneration, and red fir reproduces slowly in small gaps where sun flecks occur.

Mountain Hemlock (2,359 ac)

Mountain hemlock stands occur from 7874' to 8530' elevation, generally on middle to upper slopes of Lassen Peak and nearby mountains (Taylor 1990). Mountain hemlock occurs with red fir and western white pine at lower elevations and with white bark pine *(Pinus albicaulis)* at treeline. Mountain hemlock is usually found on nutrient- poor sites with coarser textured soils than red fir dominated sites (Taylor 1990).

Mountain hemlock are thin- barked species susceptible to fire damage, so fires, regardless of fire intensity, are often of stand replacement severity. At lower elevations, the presence of red fir and western white pine may denote a more mixed- severity fire regime. Almost a century of fire exclusion has had little impact on the behavior of fires today in mountain hemlock forests. However, near tree line mountain hemlock forests have increased in density since the mid 1800s because of climate change (Taylor 1995).

Figure 3-1. Generalized Vegetation Map for Lassen Volcanic National Park.



Natural Fire Regimes

Effective management of fire in a specific ecosystem is aided by classification of the fire regimes of that ecosystem. Fire regimes can be classified through the characteristics of the fire or the effects produced on the landscape by the fire. Fire frequency, fire periodicity, fire intensity, size of fire, pattern on the landscape, season of burn, and depth of burn have all been used to describe such fire regimes. Each of these factors relates to their effect(s) on the plant community of the impact area, which varies considerably. Fire severity is another key component to consider in fire management planning. Fire severity is a qualitative measure of the immediate effects of fires on the ecosystem. It relates to the extent of mortality and survival of plant and animal life both aboveground and belowground and to loss of organic matter. It is determined by the amount and duration of heat released aboveground and belowground (Brown and Smith, 2000). The following classification scheme from Brown and Smith (2000) can be applied to Lassen Volcanic National Park:

Understory fire regime - Fires of this type apply to forests and woodlands. These fires are generally non-lethal to the dominant vegetation and do not significantly alter the structure of the dominant vegetation. It has been estimated that at least 80 percent of the aboveground vegetation survives fires of this regime.

Mixed severity fire regime - Fires of this type apply to forests and woodlands. These fires cause selective mortality in dominant vegetation, depending on the species, or may vary between understory and stand-replacement.

Stand-replacement fire regime - Fires of this type apply to forests, woodlands, shrublands, and grasslands. These fires kill aboveground parts of the dominant vegetation, which changes its structure significantly. It has been estimated that at least 80 percent of the dominant vegetation is either consumed or dies from fires.

Nonfire regime – These regimes have little or no occurrence of natural fire. Fires of this type apply to areas with little or no combustible vegetation.

Ecosystems can also be placed into categories related to the presence or absence of fire and its influence:

Fire independent ecosystems – Those ecosystems virtually free from fire. Species possess no adaptations to fire; when fire occurs, the effects are long-lasting and recovery is slow.

Fire dependent ecosystems – Fire is common and fuel conditions are conducive to fire spread. Plant species are adapted to fire and require it for survival and continuance. Post-fire recovery is immediate and fire exclusion is unnatural.

Fire-initiated ecosystems – Fire is infrequent and catastrophic. It both terminates and initiates long-lived species. These ecosystems are common in temperate and boreal regions, and include some pioneer species that are shade intolerant. These pioneer species die out and are replaced by other species if the fire interval is too long. Initial re-vegetation is rapid but post-fire recovery period is lengthy, up to hundreds of years.

Examples of fire- initiated systems at Lassen Park include the lodgepole pine and mountain hemlock forest types.

Fire- maintained ecosystems – Fire is frequent (1 to 25 years), usually as surface fires. Intensity is light and crown fires are uncommon. Fire decreases fuel buildups and controls plant succession, often keeping out invading species. Fire favors faster growing trees with thicker bark while the fire intolerant species are selected out. The exclusion of fire from these types leads to fuel buildup and vegetative change, with fire intolerant species becoming more abundant. Examples of fire- maintained systems at Lassen Park include the montane chaparral, Jeffrey pine and white fir forest types.

Descriptions from the Interagency Fire Regime Condition Classification (FRCC) system are included as a cross- reference. More information on the Interagency FRCC system can be found at < http://www.frcc.gov >.

Figure 3- 2 shows the relative abundance and distribution of historical fire regimes found within the park.

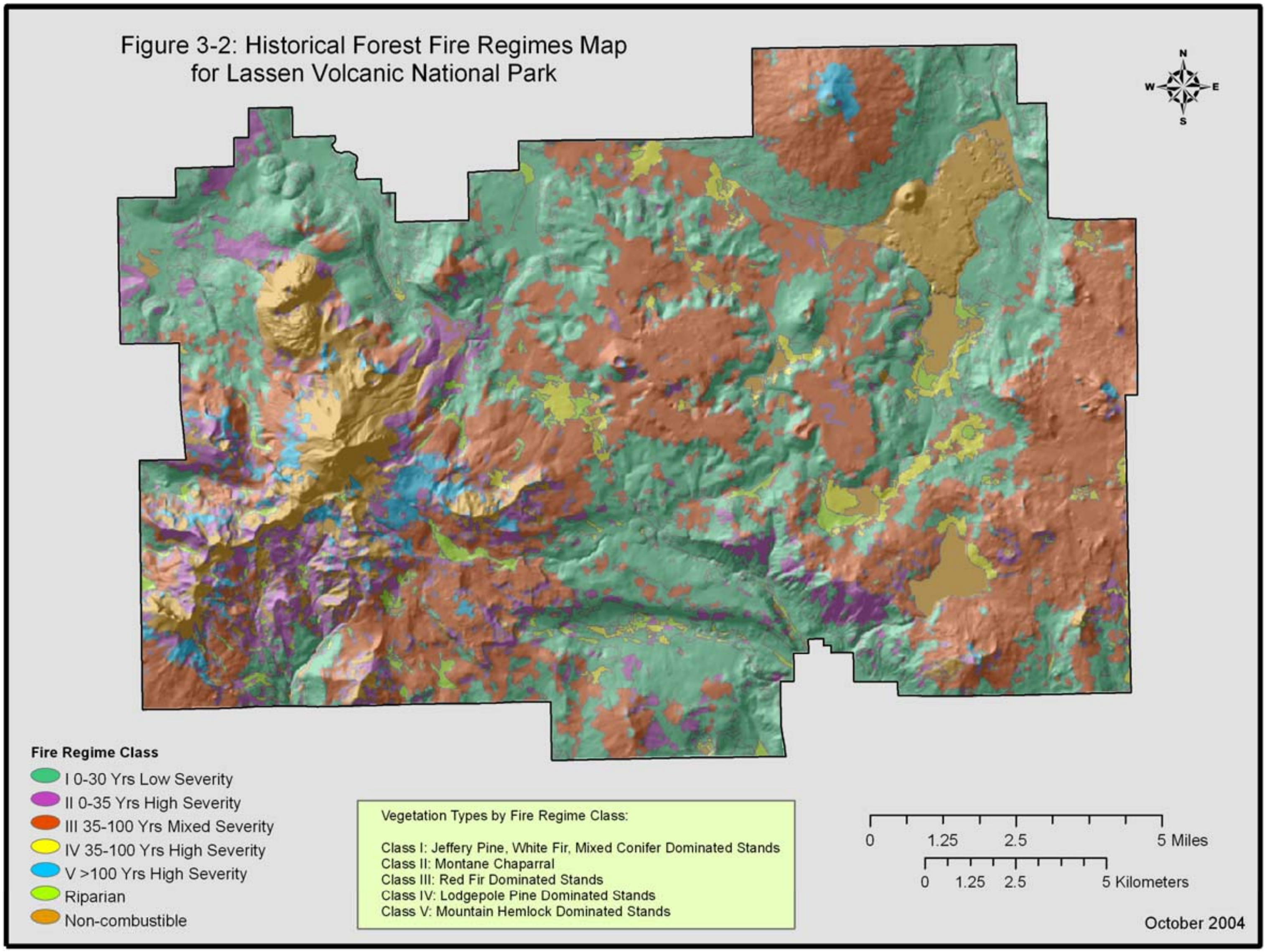


Figure 3-2: Historical Forest Fire Regimes Map
for Lassen Volcanic National Park
N
W
E
S
Fire Regime Class
I 0-30 Yrs Low Severity
II 0-35 Yrs High Severity
III 35-100 Yrs Mixed Severity
IV 35-100 Yrs High Severity
V >100 Yrs High Severity
Riparian
Non-combustible
Vegetation Types by Fire Regime Class:
Class I: Jeffery Pine, White Fir, Mixed Conifer Dominated Stands
Class II: Montane Chaparral
Class III: Red Fir Dominated Stands
Class IV: Lodgepole Pine Dominated Stands
Class V: Mountain Hemlock Dominated Stands
0
1.25
2.5
5 Miles
0
1.25
2.5
5 Kilometers
October 2004

Non-Native Vegetation

According to surveys completed in 2002, Lassen Volcanic National Park has been invaded by at least 49 species of non- native vascular plants. These non- native populations are found throughout the park on approximately 10,000 acres (9% of land base) and are associated with areas that have experienced some form of site disturbance whether natural (e.g. soil erosion, intense fire) or human- caused (e.g. facility, trail and road construction) (Koenig 2004). The most wide- spread species include common plantain *(Plantago major)*, dandelion *(Taraxacum officinale)*, and Kentucky bluegrass *(Poa pratensis ssp. pratensis)*.

The park has focused eradication efforts over the last 2- 3 years on 10 species that show promise for control. These target species include: wooly mullein *(Verbascum thapsus)*, bull thistle *(Cirsium vulgare)*, Klamathweed *(Hypericum perforatum)*, bulbous bluegrass *(Poa bulbosa),* smooth brome *(Bromus inermis),* and Jerusalum oak *(Chenopodium botrys)*.

Rare & Sensitive Plants

Fire plays a role in the management and conservation of many rare and sensitive plant species. Fire helps maintain open habitat, encourages sexual and vegetative reproduction, and affects competing or associated plant species. Although fire may injure or kill individual plants, long- term effects on species may be beneficial.

There are no federally listed threatened and endangered plants that occur in Lassen Volcanic National Park. There are no state listed threatened or endangered plants either. The park is home to 24 special status species being tracked by park botanists and the California Native Plant Society (Koenig 2004). These species are associated with aquatic or alpine habitats and because of the limited available fuels, are not subject to burning.

3.3.2 Environmental Consequences

Vegetation impacts were qualitatively assessed using literature reviews and quantitatively assessed by acres impacted.

3.3.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

Under this alternative, 25,500 acres would be treated with prescribed fire and up to 10,000 acres would be managed with wildland fire use to benefit natural resources. Generally, hazard fuel treatments would result in the removal of shrubs and trees, and would help restore conditions such that natural fire could be returned to those treated areas in the future. Restoring natural fire regimes within the park through the use of wildland and prescribed fire would benefit the plant communities (chaparral, and pine- dominated mixed- conifer forests) whose health and biologic diversity rely on the presence of fire. Over time, restoring natural fire regimes would result in an increase of fire- tolerant species, while those fire- intolerant vegetative species would decrease.

The overall benefits of fire include reduction of duff material, recycling of nutrients, reduction of accumulating fuels, pruning of trees which reduce ladder fuels into the canopy, and vegetative regeneration through sprouting and fire- stimulated germination (Brown and Smith 2000).

Native Vegetation

Montane Chaparral

Greenleaf manzanita is very susceptible to fire due to its stand density, presence of volatile materials in its leaves, low moisture content of foliage during summer, and the persistence of its dead branches and stems. This shrub forms stands that are conducive to very rapid and extensive fire spread due to its physical and chemical characteristics (FEIS 2004a).

Greenleaf manzanita is often one of the first plants to become established on disturbed sites, especially after fire. When this plant occurs in locations susceptible to frequent fires, it has the ability to regenerate quickly, allowing it to perpetually dominate a site. On sites where fire is excluded for long periods of time, greenleaf manzanita may provide a better microclimate for some tree seedlings than would exist on harsh sites in full sunlight, and it may enhance soil conditions through the addition of organic material. This allows for the relatively slow but sure establishment of the seedlings of some species of pine (FEIS 2004a).

Snowbrush ceanothus has dormant, ground- stored seed that requires heat treatment to germinate. Snowbrush ceanothus is promoted by fire, regenerating from seed stimulated by fire. Where its seeds are present in the soil, snowbrush ceanothus may dominate early seral growth following a "medium or hot" fire. Snowbrush ceanothus also sprouts vigorously from the root crown after fire. Resprouting may be an adaptation to recurring fires, allowing for rapid growth and recovery. Fire creates conditions more favorable for snowbrush ceanothus growth by removing the overstory. Snowbrush ceanothus shows a marked increase in burned forest areas due to heat scarification of seed, sprouting, and increased light. As a nitrogen fixer, snowbrush ceanothus plays an important role in nitrogen re- accumulation following fire (FEIS 2004b).

A combination of manual fuel treatments, prescribed fire and wildland fire use in montane chaparral would help maintain the high- severity fire regime of this fire-adapted vegetation type.

Jeffrey Pine and White Fir

Jeffrey pine and white fir forests have been significantly affected by fire exclusion. These open, mixed conifer forests have been choked by white fir regeneration and, to some extent, lodgepole pine. Fire hazard has significantly increased in white fir communities, and these changed stand conditions have led to increased stand susceptibility to bark beetles. Density management (thinning) and understory burning are recommended to reduce fuel buildup, reduce stand susceptibility to insects and diseases, and reduce the probability of soil damage and erosion resulting from wildfire.

Sugar pine, as a component of mixed- conifer forests, is a species of management concern. With the encroachment of white fir, sugar pine densities have declined. While somewhat shade- tolerant, sugar pine can be damaged by fire when young (Thomas and Agee 1986); while at maturity it is generally very resistant to low- to moderate- severity fires that recur at 15- 25 year intervals. Mature trees have a thick, fire- resistant bark and open canopy that retards aerial spread. Sugar pine, along with western white pine and whitebark pine are susceptible to the introduced white pine blister rust and would continue to be at risk throughout their respective ranges. The use of prescribed fire would facilitate the reduction of competing species (e.g. white fir) and create openings for sugar pine regeneration.

Hazardous fuels reduction through prescribed fires and wildland fire use would help reduce fuel loadings in these forest types to their pre- suppression levels, thus reducing the chance of stand- replacement fires. These actions would also help return the low-severity fire regime to these forests, which is essential to the health of pine species in general. Suppression activities in these mixed conifer forests could be beneficial if the forests contain heavy fuel loadings and ladder fuels that could result in stand replacement fires.

Without any manual or mechanical treatments within the developed areas, stand density and stocking levels would remain above maximum carrying capacity and tree and stand vigor would continue to decline. High mortality rates to large trees would continue so that the old- growth stand component is greatly reduced. Spread of root disease and other pathogens would be expected. The current successional trajectory of pine to fir would continue. Risks to campground forests and developments from crown fire would increase as live and dead fuel loads increase. The no- action alternative would contribute a minor, long- term adverse impact to Jeffrey pine and white fir forests.

Lodgepole Pine

The application of manual fuel treatments and wildland fire use would create natural fuel breaks in and adjacent to this forest type and help maintain its high- severity fire regime.

Red Fir

Fire effects to red fir forests are complex because red fir is not only fire- tolerant but is also shade- tolerant. It does well with or without disturbance. Several stand development patterns are common. If a stand replacement fire occurs, scattered mature red fir trees usually survive to provide a seed source for slow, recolonization by red fir and other species. In moderate- severity patches, some red fir dominants remain and provide seed for colonization by red fir, which does well in these partially shaded conditions, creating a multiple age class stand. In low- severity patches, understory trees are killed but little growing space is opened for regeneration, and red fir reproduces slowly in small gaps where sunflecks occur.

A combination of manual fuel treatments, prescribed fire and wildland fire use would help maintain the mixed- severity fire regime, which would in turn improve the diversity of habitats typical in this forest community.

Mountain Hemlock

Fire injury makes mountain hemlock very susceptible to insects and disease. Mountain hemlock is particularly susceptible to laminated root rot *(Phellinus weirii)*. This fungus spreads from infection centers along tree roots, killing infected trees in an expanding radial pattern. Active infection centers within mountain hemlock stands have been measured as large as 100 acres. These root rot pockets are characterized by numerous snags in various stages of decay with older- aged snags and downed woody debris at the center of spread.

Fire may play an important role in breaking up *Phellinus* centers, by creating conditions more suitable for the *Phellinus*- resistant lodgepole pine. The pine may then competitively exclude mountain hemlock from the site until the *Phellinus* inoculum is present only in large isolated stumps, remnants of the former stand that have not fully decayed. Dickman and Cook (1989) suggest three possible interactions between fire and fungus that depend on fire- return interval: 1) a fire- return interval of 200 years or less, resulting in dominance by lodgepole pine and disfavoring *Phellinus*; 2) a fire- return interval of 600 years, which may foster mountain hemlock stands infected with *Phellinus*, mixed with other stands dominated by lodgepole pine, much like the present landscape; and 3) absence of fire as a disturbance agent which disfavors lodgepole pine and increases the role of *Phellinus*, creating a forest landscape much different than the one seen today.

Although infrequent and unpredictable, fires have been an important force in shaping mountain hemlock forests especially where they intermingle with subalpine meadows and whitebark pine woodlands. A wildland fire use strategy may offer the most in meeting resource management objectives in this forest type, presuming that an assessment of the expected fire behavior and associated values at risk are conducted for each fire event.

Non-Native Vegetation

Fire can create favorable sites for non- native plant species to become established and flourish. If exotic plants already grow in or near areas that are candidates for prescribed fire, a potential problem exists. Aggressive exotic species can competitively exclude native vegetation. Severe fires that expose large areas of mineral soil are most apt to be invaded by exotic plants; if exotics are already established, their dominance may be accelerated. Lower severity burns are more resistant to proliferation of exotics because many native species sprout and quickly occupy the site (Brown and Smith 2000).

The introduction and spread of non- native vegetation can be mitigated through pre- and post- fire surveys. Pre- and post- fire monitoring conducted by park staff involves, among other objectives, identifying and mapping the extent of non- native species. Among fire suppression actions, fire lines, camps, or helispots would be highest priority spots for monitoring. Since shading reduces the potential for exotic encroachment, potentially forested terrain is less likely to be a problem than places on the landscape where shrub/herb vegetation is the potential vegetation.

Rare & Sensitive Plants

Most of the 24 special status plant species within Lassen Volcanic National Park are found in environments that are unlikely to burn, so that fire suppression activities rather than fire presence is likely the greater hazard to these plant populations. Thirteen of the species occur in aquatic habitats such as Little Willow Lake. The use of an on- site Resource Advisor and minimum impact suppression tactics (MIST) during fires associated with Little Willow Lake and other aquatic habitats would minimize potential impacts to these species. Another 10 plant species are associated with the steep talus slopes and dry rocky ridges of the park's major peaks. The sparse fuels in these areas make the chances of a fire occurring in this type of habitat fairly remote.

The rare plant most likely to be affected by fire is the short- petaled campion *(Silene invisa)* that occurs in partial- shade along meadow borders, wooded slopes and flats, and stream margins. Individual mortality may occur if fires in an adjacent forest stand moves into meadows or meadow edges populated with this species.

3.3.2.2 Alternative 2 – Wilderness Values Emphasis

Under this alternative, 9,200 acres would be treated with prescribed fire, and up to 21,000 acres would be managed with wildland fire use to benefit natural resources. An additional 1,000 acres is proposed for manual fuel treatments using chainsaws. General vegetation impacts under Alternative 2 would be similar to those described under the No Action Alternative, with some exceptions.

Approximately 16,300 fewer acres of prescribed fire is proposed. An additional 11,000 acres of wildland fire use is proposed. Compared to the No Action Alternative, the amount of vegetation subjected to fire is approximately the same.

Without any mechanical treatments within the developed areas, stand density and stocking levels, while not as high as under Alternative 1, would remain above maximum carrying capacity and tree and stand vigor would continue to decline. High mortality rates to large trees would continue so that the old- growth stand component is greatly reduced. Spread of root disease and other pathogens would be expected. The current successional trajectory of pine to fir would continue. Risks to campground forests and developments from crown fire would increase as live and dead fuel loads increase. The no- action alternative would contribute a minor, long- term adverse impact to Jeffrey pine and white fir forests.

3.3.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

Under this alternative, manual and mechanical fuel treatments, prescribed fire, and wildland fire use would be employed on 60,850 acres. General vegetation impacts under the Proposed Action would be similar to those described under the No Action Alternative and Alternative 2; however, the extensive use of prescribed fire (38,700 ac proposed compared to 25,500 and 9,200 ac for alternatives 1 and 2 respectively) and the ability to employ mechanical treatments (150 ac proposed) as a fire management strategy, would increase the park's ability to reduce hazardous fuels and restore the natural fire regimes to heavily- used visitor areas and the fire- dependent forests near values at risk.

The addition of 150 acres of mechanical fuel treatments would target forest areas near values at risk (not within wilderness) that are also characterized by unnaturally- high fuel loadings. Thinning specific developed areas would reduce current fuel loadings, reduce potential fire severity, improve forest health, and reduce the wildfire hazard near highly-valued resources. By reducing competition around the fine root zone of pines, these trees would be provided with a competitive advantage and would significantly increase their chances of surviving attacks by insects and disease during the next drought. By reducing stocking levels, growth rates, live crowns, and overall stand vigor would increase, and the probability of insect and disease mortality would be reduced. Planted areas and openings created for natural regeneration would provide vigorous Jeffrey and ponderosa pine to replace overstory trees in the future. Vigor and growth rates of existing Jeffrey and ponderosa pines would be improved and these trees would develop into larger trees at a faster rate. Minor, localized, short- term (2- 3 years) adverse effects to residual white fir, but not to pine, as a result of thinning shock.

Prescribed fire, as a management tool, involves significant pre- event planning. Because of this temporal characteristic, fire and resource management staffs would have the opportunity to conduct pre- treatment surveys and to monitor long- term treatment effects to the fuels and vegetation. Incorporating these monitoring results into on- going fire management decisions would be an adaptive use of the information to mitigate any undetected and/or unanticipated effects.

3.3.2.4 Conclusion

Implementation of alternatives 1 and 2 would result in long- term beneficial effects on vegetation. Alternative 3, however, would result in even greater long- term beneficial effects on vegetation. Implementation of any of the alternatives would not impair vegetation resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.4 Wildlife

3.4.1 Affected Environment

Wildlife

Sixty-one species of mammals are known to inhabit Lassen Volcanic National Park. Another three occurred historically but have not been documented recently. Small mammals include the deer mouse, five species of shrew, Allen's and yellow-pine chipmunk, Douglas squirrel, flying squirrel, golden-mantled ground squirrel, yellow-bellied marmot and pika. Small and medium-sized carnivores include the long-tailed weasel, pine marten, raccoon, striped skunk, river otter, bobcat, red fox and coyote. Large mammals include the black bear, black-tailed deer and mountain lion. In addition, seven species of bat occur in the park.

There are approximately 138 species of birds found in the park, with approximately 80 of these known to nest in the park. Raptors include the northern goshawk, Cooper's hawk, red-tailed hawk, sharp-shinned hawk, peregrine falcon, golden eagle, bald eagle, northern saw-whet owl, spotted owl, great horned owl, and northern pygmy owl. Other bird species include the gray jay, Clark's nutcracker, red-breasted sapsucker, common flicker, pileated woodpecker, Steller's jay, Oregon junco, warbling vireo, Audubon's warbler, Wilson's warbler, hermit warbler, fox sparrow, and song sparrow.

Approximately 15 species of reptiles and amphibians occur in the park. Amphibians include the western toad, Pacific tree frog and long-toed salamander. Reptiles include the western terrestrial garter snake, northern alligator lizard, rubber boa and sagebrush lizard.

Four native species of fish occur in the park, including rainbow trout, Tahoe sucker, tui chub and Lahontan redside. In addition there are a number of introduced fish, including brook trout (*Salvelinus fontinalis*) and brown trout (*Salmo trutta*).

In addition, there are a wide variety of known and unknown invertebrates, including insects, spiders and worms.

Threatened, Endangered or Sensitive Wildlife

The Endangered Species Act (ESA) was passed in 1973. The purpose of the act is to conserve the ecosystems in which endangered and threatened species depend and to conserve and recover listed species. Under the law, a species is listed as either "endangered" or "threatened". Endangered means a species is in danger of extinction throughout all or a significant portion of its range. Threatened means a species is likely to become endangered within the foreseeable future. The act mandates that all Federal Agencies are to protect species and preserve their habitats. National Park Service policy

also states that species that are listed by the State will be treated as if they are Federally listed.
There are currently no species that are listed as endangered within Lassen Volcanic National Park. There is one species that is Federally listed as threatened that occurs in the park and that is the bald eagle. The little willow flycatcher, American peregrine falcon and California spotted owl occur in the park and are all listed by the State of California as endangered but are not federally listed. The Sierra Nevada red fox and greater sandhill crane are listed as threatened by the State of California but are not Federally listed. The Sierra Nevada red fox does occur in the park and the greater sandhill crane may occur in the park.

The Cascades frog is a Federal species of special concern that may inhabit lakes and meadows in the park. Numerous amphibian studies have shown this species to be declining throughout the Sierra Nevada and Cascade ranges.

Protection of Sensitive Wildlife Species

Bald Eagle

There is one known bald eagle nest in the park at Snag Lake. This nest was first found in 1980. This nest was monitored until 2001. The nest tree fell down during the winter of 2000/2001 and no new nest has been located. In 2002, there were sightings of bald eagles around Snag Lake and Butte Lake although no nest was found. There were no sightings of bald eagles in the Snag Lake area in 2003. Surveys are currently being conducted to locate a new nest in Snag Lake area.

The following measures would be taken to protect bald eagles and their habitat within the park:

- A limited operating period (LOP) would be placed from January 1st to August 31st (nesting season) around all known bald eagle nest sites. This consists of a half- mile diameter circle around the nest tree.
- Avoid disturbance in the LOP during nesting season (January 1st to August 31st). Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No nest trees or known perch trees would be removed.
- Avoid using Snag Lake as a helicopter dip site (unless approved by Resource Advisor) during fire suppression activities.
- Use of helicopters during fire suppression would be allowed no lower than 1,300 feet (1/4 mile) above the canopy within the LOP.
- After the nesting season, cooler burn prescriptions would be used and some degree of hazard fuel removal could be used to limit the potential for crown fires in nest areas and suitable habitat.
- For prescribed burns implemented after the LOP, construct a fire line around the nest tree a radius of 50 feet and burn out from the fire line to protect the nest tree.

- Park staff will continue to monitor bald eagle populations annually.

California Spotted Owl

There are three known spotted owl pairs within Lassen Volcanic National Park. Two pairs are on Prospect Peak and one pair inhabits the terminal geyser area. Nest trees have been located for all three of these nests. A complete survey of Lassen Volcanic National Park has never been completed. Surveys were initiated in 2002 to survey for spotted owls within Fire Management project areas. Within the next 5- 10 years, these surveys would cover roughly half of the suitable spotted owl habitat within the park. Surveys would be conducted in 2005 and 2006 in areas outside of Fire Management activities to conduct a complete survey of suitable habitat within the park.

The following measures would be taken to protect the California spotted owl and their habitat within the park:

- A limited operating period (LOP) would be placed from March 1st through August 31st (nesting season) around all known spotted owl nest trees. This would consist of a quarter- mile diameter circle around known nest trees.
- Avoid disturbance in the LOP during the nesting season (March 1st to August 31st). Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No nest trees or known perch trees would be removed.
- Use of helicopters during fire suppression would be allowed no lower than 1300 feet (1/4 mile) above the canopy within the LOP.
- After the nesting season, cooler burn prescriptions would be used and some degree of hazard fuel removal could be used to limit the potential for crown fires in nest areas and suitable habitat.
- For prescribed burns implemented after the LOP, construct a fire line around the nest tree a radius of 50 feet and burn out from the fire line to protect the nest tree.
- Park staff will conduct surveys for spotted owls in treatment areas prior to ignition of prescribed fires.

American Peregrine Falcon

There is one peregrine falcon Eire located along the western border of the park. The nest is located on the cliffs of blue lake canyon on the border of Lassen Volcanic National Park and Lassen National Forest. Park Service personnel have been monitoring this site annually since 1997.

The following mitigation measures would be taken to protect peregrine falcons and their eyres in the park:

- A limited operating period (LOP) would be placed from February 1st through July 31st (nesting season) around all known peregrine falcon nest sites. This would consist of a half- mile diameter circle around known nest sites.

- Avoid disturbance during the nesting season (February 1st to July 31st). Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- No known perch trees would be removed.
- Use of helicopters during fire suppression would be allowed no lower than 1300 feet (1/4 mile) above the cliff within the LOP.
- Park staff will continue to monitor peregrine falcon populations annually.

Little Willow Flycatcher

This species is rare in the park. There are three known breeding locations within the park at Sulfur Creek Meadows, Snag Lake, and Warner Valley. They have also been sighted in the Manzanita Lake area during fall migration.

The following mitigation measures would be taken to protect little willow flycatchers within the park.

- Construct fire line around patches of willow or alder where known nest sites occur.
- Park staff will conduct surveys for willow flycatchers in treatment areas prior to ignition of prescribed fires where suitable habitat exists.

Sierra Nevada Red Fox

This species is known to inhabit the park. There are currently no known den sites and most of the sightings have been in developed areas along the Park Highway.

The following mitigation measures would be taken to protect Sierra Nevada red fox and their den sites in the park.

- Construct a fire line around known den sites a radius of 50 feet and burn out from this line to protect the den.
- Avoid controlled burning or manual or mechanical thinning projects if pups are known to be in the area.

Greater Sandhill Crane

There have been no sightings of this species in the park. There is some habitat in Warner Valley, Little Willow Lake and Badger Flat but no cranes have been observed in these areas. The closest known nesting pair is at Willow Lake, which is on National Forest land adjacent to the southern boundary of the park. This species would not be affected by fire management activities.

Cascades Frog

This species has only been documented in three lakes in the park in recent years. A survey in 1991 found only one population in the park at Crumbaugh Lake. A fish and amphibian survey was conducted in the summer of 2004 and there were cascades frogs found in two of the ponds close to Juniper Lake and a possible cascades frog seen in Crags Lake.

The following mitigation measure would be taken to protect the Cascades frog in the park.

- Lakes with current existing populations of Cascades frogs will be avoided as helicopter dip sites and drafting sites. A list of the current populated lakes will be given to the Resource Advisor upon request.

3.4.2 Environmental Consequences

Wildlife impacts were qualitatively assessed using presence/absence determinations, GIS overlays of treatment units and protected species and their habitats, and mitigation measures.

Terrestrial Wildlife

Park ecosystems evolved in response to periodic fire and other disturbance events. As a result, individual species that persist as part of these ecosystems either benefit from fire or are tolerant of it over the long-term, despite possible short-term loss of some individuals and habitat. As such, wildlife populations that currently occur in the park existed here in the presence of fire under historic fire regime conditions. There would be a range of both adverse and beneficial impacts to wildlife, depending on the species affected, and the season, timing, intensity of the fire and the rate of fire spread. These impacts would include alteration of habitat, species composition and population levels (NPS 2002).

The park's fire history shows the largest fire within the park happened in 1918 and consumed approximately 5,000 acres of parkland. Other large fires in the park have ranged from 1,500 to 2,200 acres. In recent decades the majority of fires in the park have been between 1/10 of an acre to one acre in size. The reason these fires have been so small is mainly due to fire suppression efforts. The actual size and number of fires would depend on weather patterns, the location of lightning strikes, and the extent of fire spread before naturally extinguished or suppressed. Factors such as smoke and changes in vegetation also affect wildlife. While some loss or displacement of individual animals would inevitably occur in burned areas there would be long-term benefits to some populations as a result of restoration of fire-created habitat diversity. Wildlife would have a wide variety of reactions to fire, including burrowing, fleeing and flying. Some species, such as terrestrial amphibians, reptiles, insects and small mammals may survive fast-moving, low intensity fires by burrowing or fleeing, while some larger animals would not be able to move out of the fire path in time, becoming disoriented by the fire

(NPS 2002).

Fires often result in a temporary increase in insect- feeding birds. Other species that may increase following fire include scavenger/predators such as ravens. Overall, forage species are often enhanced by an increase in nutrients, resulting in similar increases or benefits to populations dependent on these species. With the nutrient- rich, post- fire flush of herbaceous vegetation increasing browse for deer and other animals, prey-stalking opportunities also would increase. Such populations often increase where suitable habitat has burned. That habitat may be enhanced or expanded. The minor effects of fire on wildlife may be short or long- term depending on vegetation recovery and fire severity (NPS 2002).

Aquatic Wildlife

Direct effects of natural fire (or unplanned human- caused ignitions) on park waters would include changes in water and soil chemistry, water temperature and vegetation associated with water resources. Indirect effects could include changes in fish and amphibian species composition, habitat dynamics, and accumulation of woody debris, water yield, hydrologic processes, erosion patterns, and nutrient cycling. These changes may result in either beneficial or adverse impacts, depending on factors related to fire severity, season, location, vegetation type, and magnitude of burns. Increased sediment yield and water temperatures would tend to be short- lived, unless a fire was of extreme severity. Increases in runoff and nutrient flux would be expected to continue for several years (as many as ten years), particularly after large fires. Although a natural process, large or severe fires could create negative impacts on fisheries if they caused changes in water quality at a time when the fishery was most vulnerable such as spawning periods (NPS 2002).

3.4.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

Under this alternative, the area burned annually would be less than historic fire- return intervals. Over time, the vegetation would continue to become more homogeneous, resulting in wildlife habitat that is less varied.

Wildland Fire Use FMU

This FMU has a total of 74,349 acres, of which 24% would be treated over 10 years. This would include 10,000 acres of wildland fire use and 7,900 acres of prescribed fire. The use of wildland fire would increase landscape heterogeneity and consequently improve overall wildlife biodiversity at the landscape scale over the long run.

In the short term, species inhabiting burned areas could either be killed or displaced (more likely). The duration of the displacement would depend on the fire intensity, individual species habitat requirements, and the overall amount of burned area within the dispersal range of a species. Low intensity fires would retain more habitat features (snags, downed wood, and trees) and allow more rapid recolonization. Those species that prefer or thrive in burned over areas (i.e. woodpeckers, mice, woodrats, and grouse) would more readily make use of burned areas than those that require old forests (i.e. California spotted owl). In addition, those species that benefit from having some degree of habitat edge, and/or a diversity of habitats in their home range (black- tailed deer, and goshawk) would benefit from the fire mosaic. Those species that either disperse poorly or require large amounts of mature forest may be negatively affected if a large portion of a park drainage or region is burned (i.e. California spotted owl) (NPS 2003b).

Fire Suppression FMU

This FMU has a total of 32,023 acres. Fire use as well as manual and mechanical thinning are not permitted in this FMU. Under this FMU 17,600 acres are scheduled for prescribed fire.

Some species of wildlife may be adversely affected by the loss of some types of habitat that were maintained by historic fire regimes. Fire line construction would result in the removal of snags, which are important habitat features for many wildlife species (i.e. bats, swifts, woodpeckers, and marten). Small animals would temporarily lose some habitat as brush, logs, and litter would be reduced down to mineral soil. Fire line construction could also cause temporary disturbance due to the noise associated with the construction. In addition, in larger fire suppression efforts, large numbers of firefighting staff could contribute to mismanagement of food supplies, which could be deemed accessible to bears or corvids in and around the area. The use of bear- proof containers and covered trash receptacles would mitigate potential problems. It is anticipated that there would be a minor affect on wildlife by noise and other disturbances (i.e. helicopters, chainsaws, etc.) distributed throughout the park, and not just in the local suppression area (NPS 2003b).

Because there would be no manual or mechanical thinning in the developed areas, there would be no removal of several of the large trees that would occur under Alternative 3. This would likely result in no short- term negative affects on *Myotis* bats, as alternative 3 would. This alternative would, however, result in a minor long- term adverse affect on *Myotis* bats because of the continued decline in forest health and the increased risk of severe fires, which would result in a less suitable habitat for *Myotis* bats..

Prescribed Fire

The effects of this management strategy on wildlife would be similar to Wildland Fire Use and would also include the generalized ecological effects of fire on wildlife as described above. The actual effects of Prescribed Fire on wildlife would depend on the location, timing, extent and severity of the Prescribed Fire use. Although the effects of the use of Prescribed Fire could be cumulative (in addition to the effects from Wildland Fire Use), it is more likely that the use of Prescribed Fire would substitute for Wildland Fire Use or vice versa. Fire line construction would also occur in this FMU and the effects would be the same as described in the fire suppression section above.

3.4.2.2 Alternative 2 – Wilderness Values Emphasis

This alternative includes suppression of wildland fires, provide for prescribed fires and wildland fire use, and allows for manual fuel treatments. This alternative also responds to the importance of protecting Wilderness values, by promoting fewer fire management activities within Wilderness.

There are two FMU's under this alternative, Boundary and Wildland Fire Use. The Boundary FMU consists of 1,000 acres of fire use; 9,200 acres of prescribed fire; and 1,000 acres of manual fuel treatments. The Wildland Fire Use FMU consists of 20,000 acres of fire use and zero acres of prescribed fire, manual fuel treatments, and mechanical thinning.

Boundary FMU

This FMU consists of 28,009 acres that primarily border the park. Over ten years, approximately 40% of this FMU would be treated.

The effects on wildlife from this FMU are similar to those described in Alternative 1 for Wildland Fire Use and Prescribed Fire.

Manual thinning would be implemented to reduce hazardous fuels. There would be short term negative impacts to wildlife due to noise from thinning activities (chainsaws, personnel, etc) and disturbance of the area. Because of the small amount of thinning that would be conducted (1,000 acres total) the impacts to wildlife would be minimal. The newly- created fuel breaks would have positive impacts by reducing the risk of stand destroying fires that could move through the park. Some thinning would be conducted around developed sites as well. These areas already have disturbance from human activity so the wildlife that occupy these areas are already acclimated to human disturbance.

Because there would be no mechanical thinning in the developed areas, there would be no removal of several of the large trees that would occur under Alternative 3. This would likely result in no short- term negative affects on *Myotis* bats, as could occur under alternative 3. This alternative would, however, result in a minor long- term adverse affect on *Myotis* bats because of the continued decline in forest health and the increased risk of severe fires, which would result in a less suitable habitat for *Myotis* bats..

Wildland Fire Use FMU

This FMU consists of 78,363 acres of which 26% would be treated over ten years. The effects on wildlife from this FMU are similar to those described in Alternative 1 for fire use.

3.4.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

Similar to Alternative 2, this alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow for manual fuel treatments as fire surrogates. In addition, it allows for 150 acres of mechanical thinning in specific developed areas.

There are two FMU's under this Alternative, Boundary and Wildland Fire Use. Under the Boundary FMU there would be 1,000 acres of fire use, 18,000 acres of prescribed fire, 800 acres of manual thinning, and 150 acres of mechanical treatments. There would be more prescribed fire acres in this FMU than under Alternative 2. The Wildland Fire Use FMU consists of 20,000 acres of fire use, 20,700 acres of prescribed fire, and 200 acres of manual thinning. This FMU would have 20,700 more acres of prescribed fire than under Alternative 2.

Boundary FMU

This FMU consists of 29,766 acres of which 62% are scheduled to be treated over the next 10 years. This alternative in the long- term, would provide a greater number and distribution of large, old trees throughout the project area and would result in minor , long- term benefits through enhanced habitat for *Myotis* bats as forest health and structure is restored.

Wildland Fire Use FMU

This FMU consists of 76,606 acres of which 53% are scheduled to be treated over the next 10 years. The affects of this alternative on wildlife are similar to the Wildland Fire Use FMU described in Alternative 1, and the manual thinning effects described under the Boundary FMU in Alternative 2.

3.4.2.4 Conclusion

The implementation of any of the alternatives may have minor impacts on fish and wildlife temporarily or short- term by displacing some individuals and causing isolated mortality of individuals but there would be no impairment. Alternatives 2 and 3 have the potential to improve general wildlife habitat in the long term through restoration of natural fire regimes. Implementation of any of the alternatives would not impair aquatic wildlife resources.

3.5 Noise

The loudest sounds that can be detected comfortably by the human ear have intensities that are 1 trillion (1,000,000,000,000) times larger than those of sounds that can just be detected. Because of this vast range, any attempt to represent the intensity of sound using a linear scale becomes very unwieldy. As a result, a logarithmic unit known as the decibel (dB) is used to represent the intensity of a sound. Such a representation is called a sound level.

Although the dB scale accurately reflects the sound pressure level of a given sound, it does not accurately reflect the sound exposure levels heard by a human observer. The human ear is progressively reduced in sensitivity to sounds in the lower and upper ranges of our audible frequency spectrum. To more accurately assess the loudness of sounds as heard by the human ear, sound levels are measured on the A-weighted decibel (dBA) scale. This sound level scale is progressively reduced in sensitivity to very low and very high-pitched sounds. This method of sound measurement mimics our own sense of hearing, and therefore more accurately assesses the effects of different sound levels on a human observer.

Normal speech has a sound level of approximately 60 dBA. Sound levels above about 120 dBA begin to be felt inside the human ear as discomfort and eventually pain at still higher levels (DOD, 1978). Sound level examples can be found in Table 3-3.

Table 3-3. Common Noise Levels and Their Effects on the Human Ear.

<table>
<tr><th>Source</th><th>Decibel Level (dBA)</th><th>Exposure Concern</th></tr>
<tr><td>Soft Whisper</td><td>30</td><td rowspan="4">Normal safe levels.</td></tr>
<tr><td>Quiet Office</td><td>40</td></tr>
<tr><td>Average Home</td><td>50</td></tr>
<tr><td>Conversational Speech</td><td>60</td></tr>
<tr><td>Busy Traffic</td><td>75</td><td rowspan="3">May affect hearing in some individuals depending on sensitivity, exposure length, etc.</td></tr>
<tr><td>Noisy Restaurant</td><td>80</td></tr>
<tr><td>Average Factory</td><td>80-90</td></tr>
<tr><td>Pneumatic Drill</td><td>100</td><td rowspan="2">Continued exposure to noise over 90 dBA may eventually cause hearing impairment</td></tr>
<tr><td>Automobile Horn</td><td>120</td></tr>
</table>

(DOD, 1978)

To accurately assess the impacts of noise exposure on an entire community, dBA sound levels are commonly expressed with a measure that describes the cumulative effects of noise levels over time. The most commonly employed cumulative noise measure for environmental analysis is the Day-Night Sound Level (Ldn). This measure (expressed in dBA) describes the cumulative noise exposure expected from all major noise sources over a 24-hour period. Using the Ldn system, 10 dB is added to the assessment of sound produced by activities occurring between 10 PM and 7 AM. This addition places greater weight on the noise produced by nighttime activities due to the higher sensitivity of communities to noise during these hours.

Certain facilities, communities, and land uses are more sensitive to a given level of noise than others. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and species of threatened or endangered wildlife. Impacts from noise production are generally assessed with respect to changes in noise levels experienced at sensitive receptors. Different types of sensitive receptors vary in their acceptance of noise disturbance. As a result, noise impacts for different receptors are often assessed using different noise level standards. Recommended land use and associated noise levels are illustrated in Table 3- 4.

Table 3- 4. Recommended Land Use Noise Levels

Land Use Category	Noise Levels (Ldn)			
	Clearly Acceptable	**Normally Acceptable**	**Normally Unacceptable**	**Clearly Unacceptable**
Residential	< 60	60- 65	65- 75	> 75
Commercial, Retail	< 65	65- 75	75- 80	> 85
Commercial, Wholesale	< 70	70- 80	80- 85	> 85
Manufacturing	< 55	55- 70	70- 80	> 80
Agricultural, Animal Breeding	< 60	60- 75	75- 80	> 80
Natural Recreation Areas	< 60	60- 65	65- 75	> 75
Hospitals	< 60	60- 65	65- 75	> 75
Schools	< 60	60- 65	65- 75	> 75
Libraries	< 60	60- 65	65- 75	> 75
Churches	< 60	60- 65	65- 75	> 75
Nursing Homes	< 60	60- 65	65- 75	> 75
Playgrounds	< 55	55- 65	65- 75	> 75

(HUD, 1991)

3.5.1 Affected Environment

There are several potential noise sources associated with fire management activities under the No Action Alternative. These include vehicular traffic, engines, chainsaws, and aircraft. Under the Proposed Action, mechanical equipment would also be employed for fuels reduction efforts in specific developed areas. The dB sound levels from the equipment at a distance of 50' includes the following: Chainsaw (78 dB), Engine/Truck (91 dB), and Wood Chipper (89 dB). In addition, there are several sensitive receptors near or within the treatment areas of the proposed project. These include campgrounds, wilderness areas, and federally listed animal species and their habitat.

3.5.2 Environmental Consequences

Noise levels were quantitatively determined using the Highway Construction Noise Measurement, Prediction, and Mitigation methodology (Federal Highway Administration). Noise impacts were then assessed with respect to the location of sensitive receptors. Noise impacts on a person's wilderness experience were assessed in relation to the presence/absence of people recreating in the proposed wilderness areas.

3.5.2.1 Alternative 1 (No Action) – Continued Implementation of the 1993 Plan

Noise has the potential to impact both humans and wildlife. For humans, noise can affect recreational experiences and the enjoyment of wilderness values. For wildlife, noise may disrupt activities such as hunting, breeding, and nesting. This is of particular concern for Threatened and Endangered Species.

Noise disturbance is one of the primary impacts of both fixed wing aircraft and helicopters. With the use of helicopters, the potential for noise impacts increases, as flight frequency normally increases dramatically and missions expand to include landings.

To reduce the impact of noise from aircraft over- flights, the Aviation Officer would review any fire suppression activities or wildland fire use within three miles of known Threatened and Endangered Species locations. Specific noise mitigations include:

- A limited operating period (LOP) would be placed from March 1st through August 31st around all known T&E nest trees. This would consist of a quarter- mile diameter circle around known nest trees.
- Avoid disturbance within a quarter- mile diameter circle of known nest trees during the LOP. Disturbance includes mechanical thinning operations, controlled burning operations, line - clearing operations using power tools, heavy equipment use and aircraft noise.
- Use of helicopters during fire suppression would be allowed no lower than 1300 feet above the canopy within the quarter- mile diameter circle around the nest tree during the LOP.

3.5.2.2 Alternative 2 – Wilderness Values Emphasis

General noise impacts under Alternative 2 would be similar to those described under the No Action Alternative.

Noise calculations for the thinning sites and sensitive receptor locations were performed using the Federal Highway Administration's Construction Noise Measurement, Prediction, and Mitigation methodology. Noise level calculations were performed assuming that obstructions that may impede the propagation of sound (buildings, vegetation, etc.) were not present, and that the land between the source of the sound and the receiver was flat. Thus the noise level calculations should be considered a "worst-case" measure. Based on the noise modeling calculations, ambient noise levels of 65 dBA would be reached at a distance of approximately 1,500 feet from the source of manual thinning activities. Sound levels would be reduced even further if noise- generating activities occurred within dense vegetation, especially conifer forests. Dense vegetation that is at least 100' in depth would reduce the sound levels by 3 to 7 dBA (NYDEC, 2000). Thus, ambient noise levels of 65 dBA could be reached within 750' of project operations with the previous assumptions.

The park would consider whether the use of chainsaws in wilderness areas would be the "minimum tool" necessary to conduct its hazardous fuels reduction activities. If the use of chainsaws was authorized after completing a minimum requirement assessment, thinning treatments would have the potential to impact trail use in or adjacent to the Manzanita Lake developed area (Stonehenge and Manzanita Lake projects), Nobles Immigrant trail (Raker project) Juniper Lake inholders (Juniper Lake project), and Drakesbad Guest ranch (Boiling and Terminal Boundary projects).

To minimize noise impacts to developed areas and campgrounds, fire management staff would prohibit thinning operations during holidays and other heavily- used periods designated by the superintendent.

3.5.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

General noise impacts under the Proposed Action would be similar to those described under Alternative 2.

3.5.2.4 Conclusion

Following the completion of a "minimum requirements" process that authorized the use of chainsaws in proposed wilderness areas, implementation of any of the alternatives would have minor, short- term impacts to fire crews, the public, and wildlife, but would not impair sensitive receptors or park resources and values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.6 Air Quality

3.6.1 Affected Environment

Lassen Volcanic National Park is in a mandatory Class I air- shed under the Clean Air Act (1977). Class I areas are afforded the highest degree of protection under the Clean Air Act. This designation allows very little additional deterioration of air quality. The Clean Air Act states that park managers have an affirmative responsibility to protect park air quality related values (including visibility, plants, animals, soils, water quality, cultural resources and visitor health) from adverse air pollution impacts. Special visibility protection provisions of the Clean Air Act also apply to Class I areas, including new national rules to prevent and remedy regional haze affecting these areas. Under existing visibility protection regulations, the NPS identified "integral vistas" that are important to the visitor's visual experience in NPS Class I areas, and it is NPS policy to protect these scenic views.

National Ambient Air Quality Standards (NAAQS)

National Ambient Air Quality Standards (NAAQS) must be met. The federal Clean Air Act (as amended in 1990) required the Environmental Protection Agency (EPA) to identify NAAQS to protect public health and welfare. Standards have been set for six pollutants: ozone (O_3), carbon monoxide (CO), Nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than 10 microns (PM_{10}), and lead (Pb). In 1997, EPA promulgated revised NAAQS for ozone and a new NAAQS for particulate matter less than 2.5 microns ($PM_{2.5}$). In the spring of 1999, a U.S. Court of Appeals panel remanded the standard to EPA for further consideration. However, in early 2001, the Supreme Court upheld EPA's authority to set these new, more stringent, standards. The pollutants are called criteria pollutants because the standards satisfy criteria specified in the Clean Air Act. An area where a standard is exceeded more than three times in three years can be considered a non- attainment area, and is subject to more stringent planning and pollution control requirements.

The park is located in Plumas, Lassen, Tehama and Shasta counties, where it is regulated by the Lassen, Shasta, Tehama and Northern Sierra air management districts, within the California Air Resources Board. California Air Quality Standards must be met during all prescribed fire and wildland fire use activities. California Air Quality standards are more stringent than the National Ambient Air Quality Standards (NAAQS). A comparison of applicable examples is as follows:

Pollutant	**California Standard**	**Federal Standard (NAAQS)**
Ozone	0.09 ppm for 1 hour 0.07 ppm for 8 hours	0.12 ppm for 1 hour 0.08 ppm for 8 hours
Particulate Matter PM10	50 Mircrograms/m^3	150 Micrograms/m^3

NPS Air Quality Policy Guidance

A principal park management objective is to manage air quality effects of prescribed burning by working with county and state air resources personnel and using the latest technology to monitor and manage smoke- related effects upon visitors, residents, and employees. In addition to complying with state and local air quality rules and regulations, the NPS also has developed guidance on air quality and smoke management related to wildland and prescribed fires. This guidance is contained in Chapter 14 of the National Park Service Reference Manual18: Wildland Fire Management, which is dated February 1999. Guidance and policies from the EPA also supplement the NPS guidance. These include the Interim Air Quality Policy on Wildland and Prescribed Fires, Federal Wildland Fire Management Policy, and PM_{10} Natural Events Policy. In 1998, the EPA developed an interim policy for addressing public health and welfare impacts caused by wildland and prescribed fires that are managed to achieve resource benefits. Ambient air quality worse than the national ambient air quality standards (NAAQS) for $PM_{2.5}$ and PM_{10} is used as the principal indicator of public health impacts. Visibility impairment is used as the principal indicator of public welfare impacts. This policy complements the Natural Events Policy to address public health impacts caused by wildfires.

In 1988, Lassen Volcanic National Park became part of the National Park Service gaseous pollutant monitoring program as well as the Interagency Monitoring of Protected Visual Environments (IMPROVE) monitoring network. At that time, the idea was to gather data for a baseline measurement of ambient air quality and visibility in the park, about five years worth. An air quality monitoring station was set up and outfitted in an existing building near the helispot at Manzanita Lake. A visibility camera was set up on the ski lifts being operated just inside the southwest entrance.

In 1995, Lassen Volcanic National Park was designated as a trend site for the Northern California mountain area. This means that monitoring would continue at the park indefinitely. At that time, more equipment was installed in order to begin measuring acid dry deposition at the site, as part of the National Dry Deposition Network (NDDN). This same year the visibility camera was removed due to the necessary baseline information having been collected and removal of the ski lifts.

In the summer of 2000, the National Atmospheric Deposition Program (NADP) was started at Lassen Volcanic National Park. This program monitors long- term trends in wet deposition of acid (i.e. acid rain) and would continue indefinitely.

Any impacts to air quality are considered potentially detrimental. Air quality within the park is usually good. Since the beginning of air quality monitoring in 1988, NAAQS have never been exceeded. The ambient ozone measured at the park is near background levels for most of the year. There are elevated levels of ozone in the summer months that are most likely the result of transport from the upper Sacramento Valley. Although these levels are elevated, they are still below NAAQS. Campfires, generators and the operation of motor vehicles and equipment all may cause local, temporary air quality degradation. Because the park is surrounded by developed areas in Plumas, Lassen, Tehama and Shasta counties, stationary and mobile emissions in the region are the major source of air pollution near the park. These include industrial developments, logging, slash burning, mills, etc.

For prescribed fires, there are three principle strategies to manage smoke and reduce air quality effects. They include:

1. Avoidance - This strategy relies on monitoring meteorological conditions when scheduling prescribed fires to prevent smoke from drifting into sensitive receptors, or suspending burning until favorable weather (wind) conditions;

2. Dilution – This strategy ensures proper smoke dispersion in smoke- sensitive areas by controlling the rate of smoke emissions or scheduling prescribed fires when weather systems are unstable, not under conditions when a stable high- pressure area is forming with an associated subsidence inversion. An inversion would trap smoke near the ground; and

3. Emission Reduction – This strategy utilizes techniques to minimize the smoke output per unit area treated. Smoke emission is affected by the number of acres burned at one time, pre- burn fuel loadings, fuel consumption, and the emission factor. Reducing the number of acres that are burned at one time would reduce the amount of emissions generated by that burn. Reducing the fuel before hand, reduces the amount of fuel available. Prescribed burning when fuel moistures are high can reduce fuel consumption. Emission factors can be reduced by pile burning or by using certain firing techniques such as mass ignition.

California's Smoke Management Program addresses potentially harmful smoke impacts from agricultural, forest and range land management burning operations (CEPA 2004a). Established guidelines provide the framework for State and local air district regulators to conduct the program. Elements of the program include: registering and permitting of agricultural and prescribed burns; meteorological and smoke management forecasting; daily burn authorization; and enforcement. Prescribed burning within the Park is subject to the following smoke management guidelines:

> "Before obtaining air district permission to burn, a burner must complete the following planning steps: 1) Register their burn with the air district; 2) Obtain an air district and/or fire agency burn permit; 3) Submit a smoke management plan (SMP) to the air district; and 4) Obtain air district approval of the SMP. The SMP specifies the "smoke prescription," which is a set of air quality, meteorological, and fuel conditions needed before burn ignition may be allowed.
>
> After the air district approves all the burn planning requirements, including the permit and smoke management plan, the burner may begin making the final preparations to carry out the burn. This includes putting into place the resources needed to conduct the burn, notifying the public about the planned timing and specifics of the burn, and obtaining a final air district authorization to burn. The burner may contact the air district up to 96 hours prior to the desired burn time to obtain ARB or air district forecasts of meteorology and air quality needed to safely conduct the burn. The burner would continue to work with the air district

and the ARB until the day of the burn to update the forecast information. Air district authorization to conduct a prescribed burn is provided to the burner no more than 24 hours prior to the burn.

The individual granted authority to burn (burn manager) is responsible for assuring that all conditions in the SMP and burn permit are met throughout the burn. Once the fire has been ignited, burners must make all reasonable efforts to assure the burn stays within its smoke plan prescription. If a burn goes out of its prescription, or adverse smoke impacts are observed, the burn manager would implement smoke mitigation measures as described in the SMP (CEPA 2004b). "

3.6.2 Environmental Consequences

Air quality impacts were qualitatively assessed upon review of National Park Service best management practices to reduce air emissions, California Air Resources Board smoke management program, and the extent of proposed prescribed fire activities under all alternatives.

3.6.2.1 Alternative 1 (No Action) – Continued Implementation of the 1993 Plan

Under the No Action Alternative, approximately 25,500 acres would be treated over the next ten years using prescribed fire, averaging approximately 2,550 acres per year. Prescribed fire could cause air quality impacts on certain days. State and local smoke management guidelines as discussed above would be followed. If weather conditions changed unexpectedly during a prescribed fire and there was a potential for violating air quality standards or for adverse smoke impacts on sensitive receptors, the burn manager would implement a contingency plan, including the option for immediate suppression.

Fires designated as wildfires and on which suppression strategies are employed, are exempt from air quality regulations. In addition to complying with the ARB smoke management guidelines, Park staff would also follow the decision tree of the Fire Management Plan to guide decisions about effects of current fires and whether new ignitions should be classified as management fires or wildfires. There would not be any significant air quality impacts with the use of mitigation measures and adherence to state burning instructions, and in light of the limited number of acres to be burned each year.

Wildland fire use generally occurs over longer periods of time than prescribed fires and is characterized by periods of lesser or greater smoke emissions depending on fuel consumption and rate of spread. Up to 10,000 acres of wildland fire use would generally cause minor degradation in air quality or visibility except for short periods. If the impact of smoke does become significant, several actions may be taken: additional wildland fires may be classified as wildfires and suppressed; the current fire(s) may be suppressed; or the current fire(s) may be allowed to continue with smoke warnings posted for visitors and daily re- evaluations made.

3.6.2.2 Alternative 2 – Wilderness Values Emphasis

Under this alternative, the total number of acres targeted for prescribed burning is 9,200 acres which is considerably less than the 25,500 acres proposed under the No Action alternative. While prescribed fire acreages are lower, proposed acres treated with fire use would increase to 21,000 acres under this alternative (compared to only 10,000 acres under the No Action Alternative). State and local smoke management guidelines would still be followed and mitigation measures would be the same as alternative 1. The total number of acres proposed for burning by wildland fire use and prescribed fire combined (35,500 acres) is similar to the No Action Alternative (30,200 acres).

3.6.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

The general impact to air quality under the Proposed Action is the same as those described in the No Action Alternative with the exception that more total acres would be subject to either wildland fire use or prescribed burning (59,700 acres combined). Smoke production from an additional 24,200 acres (a 68% increase) is anticipated over the 10- year treatment period compared to the No Action Alternative.

3.6.2.4 Conclusion

All of the Alternatives could influence smoke emissions depending on the burning conditions and desired fire behavior parameters. These impacts can be mitigated through proper implementation of established smoke management guidelines. Therefore, the implementation of any of the alternatives would result in minor, short-term effects and would not impair air quality resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the Park or opportunities for enjoyment of the Park, and (3) identified as a goal in the Park's general management plan or other National Park Service planning documents.

3.7 Visitor Use and Experience

3.7.1 Affected Environment

Recreational activities available at Lassen Volcanic National Park include auto touring, hiking, backpacking, camping, climbing, horseback riding, fishing, skiing, snowshoeing, ranger talks, and guided walks/tours. Hunting is prohibited within park boundaries. In total, the park averages approximately 400,000 visitors per year.

The park has over 150 miles of maintained hiking trails including 17 miles of the Pacific Crest trail. Lassen Volcanic National Park maintains eight family and two group campgrounds, which are open from May/June to September/October, depending on weather. Stock use by horses and pack animals is permitted in a few backcountry areas of the park.

Fishing is allowed in all streams and lakes with the exception of Manzanita Creek above Manzanita Lake, Manzanita Lake shore from the boat launch northwest to 150 feet west of the present inlet and 150 feet at the apex of a radius from the center of the inlet, and Butte Lake and Juniper Lake boat launch areas. The park has extensive backcountry skiing as well as snowshoe use in the winter.

Ranger talks, guided walks/talks, and Junior Firefighter programs are scheduled from early June through early September. While some of the activities take place only a few days a week, others run up to 7 days a week. Talks and walks start as early as 10 a.m. and run as late as 10 p.m. They take place in various places across the park: Loomis Museum, Manzanita Lake Amphitheater, and the Discovery Center.

In a 1999 Visitor Use Study, 33% of park visitors responding to a survey said that they planned to camp while visiting the park (NPS 1999b). During Fiscal Year 2004, 13,159 visitor nights (number of campers multiplied by the number of nights stayed) were recorded at Manzanita Lake, which is the park's most heavily used campground (NPS 2004).

3.7.2 Environmental Consequences

Recreation impacts were qualitatively assessed in light of the timing, intensity, and duration of fuel treatment activities as they related to visitor use and experience.

3.7.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

Possible factors impacting recreation include smoke, noise, changes in scenic vistas, and visitor use restrictions.

Smoke from prescribed fires and wildland fire use near developed areas may impact recreation in a number of ways. Park visitors may experience temporary discomfort or decreased visibility if woodland smoke moves into developed areas or near trails. If portions of the park were closed to tourists because of smoke- related health and safety reasons, recreation opportunities would be adversely impacted. Any use restrictions imposed by the park would be temporary, except in the case of severe fires located nearby. Restoration of natural fire regimes to forest stands in the park would lessen the potential for severe fires in some forest types.

If located near developed areas or within view- sheds of the park, prescribed fire and wildland fire use would also have short- term impacts on foreground scenic quality through the killing of small understory trees. Over time, as the areas green up and larger residual trees become more visible, scenic quality would improve above pre- fire levels. Wildland fire use would have effects on background long- distance vistas. However, after the first couple of years, when dead trees brown and shed their foliage, they would add visual texture to an already heavily textured landscape created by the effects of topography, soil, and different species composition and age classes of trees.

Depending on the location of fires in other parts of the park, visitors might be required to make adjustments to activities, such as altering hiking routes. Under normal circumstances, prescribed fire and wildland fire use would not affect visitors' ability to enjoy a full range of recreational activities.

Fire management activities near developed areas, highly frequented trails and in wilderness areas, or during times of special park events or holidays, could impact the recreational experience of some visitors. To minimize these potential noise and visual impacts, the park would not initiate hazardous fuels reduction activities, such as prescribed fire, near developed areas and trails during holidays. In addition, the park would limit, to the extent practicable, fire prevention and hazard fuels reduction efforts near developed areas and trails to periods of low recreation visits, or temporarily prohibit access to certain areas where treatments were being undertaken. In addition, educational/informational materials would be developed and distributed to the wilderness visitor on what to expect during fire management activities including potential noise from chainsaws during line construction, smoke dispersion, safety, helicopter and airplane use, and information on where and when these activities would occur.

Without the manual and mechanical treatments to improve forest health and reduce hazard fuels in the developed areas, continued loss of large centerpiece ponderosa, Jeffrey, and sugar pines would represent a tremendous loss to visitors desiring to experience the aesthetic beauty of old forests with large trees over the long- term. Periodic closure of individual campsites or at times even the entire campground because of hazardous trees would compromise visitor enjoyment of the park. Loss of much of the overstory canopy and associated understory vegetative cover because of unchecked root disease epidemics would result in a poor quality camping experience for many park visitors. Because the campgrounds are part of the experience of many park visitors, the diminished experience associated with the deteriorating campground forests would be a minor, long- term, adverse impact on visitor experience. There would not, on the other hand, be a minor short- term adverse effect due to the noise and activity involved in manual and mechanical thinning that would occur under Alternatives 1 and 2.

3.7.2.2 Alternative 2 – Wilderness Values Emphasis

General impacts to recreation would be similar to those described in the No Action Alternative. This alternative includes fewer prescribed fire projects but includes manual treatments as fire surrogates (1,000 acres proposed). As mentioned above, visitors may be required to make adjustments to activities; however a full range of recreational opportunities would still be able to be enjoyed. There would be impacts from noise and activity associated with manual thinning, but they would be very minor and short- term.

3.7.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

General impacts to recreation would be similar to those described in the No Action Alternative and in Alternative 2. The full range of management options would be employed. Depending on the location of wildland and prescribed fires, and manual and mechanical projects in the park, visitors might be required to make adjustments to activities, such as altering hiking routes. Under normal circumstances, these activities would not affect visitors' ability to enjoy a full range of recreational activities.

The visitor experience would be adversely affected by the dust, fumes, and noise resulting from the preferred alternative, but only in a minor way because the mechanical thinning would take place in the fall when the campgrounds are closed for the season. Short- term adverse effects associated with the transport of logs and chips along the six mile stretch of the park road would likely be a minor adverse impact on a small number of park visitors. Minor short- term adverse effects caused by negative perception of forestry practices would be compensated for by comprehensive interpretive programs aimed at educating visitors about the long- term benefits of forest health management. Healthy campground forests resulting from the project would be a minor, long- term benefit to scenic values which affect the visitor experience. This alternative also reduces the likelihood of a devastating, high- severity fire moving through these areas of high visitor use and thus reduces the potential for a complete loss of an area that is critical to many visitor's experience.

3.7.2.4 Conclusion

The implementation of any of the alternatives would have minor, short- term effects, but would not impair visitor use and experience (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.8 Human Health and Safety

3.8.1 Affected Environment

Lassen Volcanic National Park has a comprehensive fire management program dedicated to ensuring the safety of the public and Park employees. Numerous safety measures are followed to maintain the highest safety standards possible for Park visitors, employees, and residents, and landowners/residents living adjacent to the Park.

Park personnel follow several safety standards and best management practices to minimize their exposure to hazardous equipment and conditions while working. Hazardous conditions include smoke, burning organic material, diurnal fluctuations in temperature and humidity, unsure footing on steep and rocky terrain, insects, and long work periods. Hazardous equipment includes aircraft, motorized vehicles, hand tools, chainsaws and water pumps. Employees regularly review the job hazards identified for each fire fighting position. The job hazard analysis includes a list of potential hazards for each task and provides the proper implementation techniques, personal protective gear, and hazard mitigation measures for every task.

Park personnel are informed of potential threats on a daily basis through a fire activity report. If wildland fires or wildland fire use pose an imminent threat to human health or safety, the Superintendent can close all or a portion of the Park, including trails and roads.

Public information and education pertaining to fire management is presented through normally scheduled activities throughout the year, as well as through focused activities when fires are in progress. Year round activities include distribution of handouts, brochures, and publications pertaining to the wildland fire program. Information on this program is also incorporated into visitor contacts, interpretive talks, and campfire programs.

During planned and un- planned fire activities, informational and educational actions are major components for ensuring that the public is appropriately informed of potential threats. During these periods, handouts specific to the on- going fire may be prepared and distributed to visitors entering the park, or at primary viewing areas. Areas of fire activity are clearly marked with signs at trail heads and along roadways. Visitors obtaining permits for backcountry use are notified of the exact location of fire activity by personnel. Also, nearby residents adjacent to the park are notified if any fire poses a possible threat to burn outside park boundaries. News releases are distributed to the media as directed by the Superintendent.

3.8.2 Environmental Consequences

Human health and safety impacts were qualitatively assessed through determination of activities, equipment and conditions that could result in injury, literature review of type and extent of injury caused by equipment and conditions, and in light of mitigation measures and best management practices.

3.8.2.1 Alternative 1 (No Action) – Continued Implementation of the 1993 Plan

Under the No Action Alternative, impacts to human health and safety would be minor. Factors most likely to adversely impact public and fire- fighter health and safety include accidental spills, injuries from the use of fire- fighting equipment, smoke inhalation, and, in severe cases, injuries from wildland or prescribed fires.

Of chemicals used by fire management staff, accidental spills of fire retardants and foams are the most likely to adversely impact human health & safety. Fire retardants used in controlling or extinguishing fires contain about 85% water, 10% fertilizer, and 5% minor ingredients such as corrosion inhibitors and bactericides. Fire suppressant foams are more than 99% water. The remaining 1% contains surfactants, foaming agents, corrosion inhibitors, and dispersants. These qualified and approved wildland fire chemicals have been tested and meet specific requirements with regard to mammalian toxicity as determined by acute oral and dermal toxicity testing as well as skin and eye irritation tests (USDA 2001). However, they are strong detergents, and can be extremely drying to skin. All currently approved foam concentrates are irritating to the eyes as well. Application of a topical cream or lotion can alleviate the effects of a retardant, and protective goggles can prevent any injury to the eyes when using foams.

Fuel break development and hazard fuels reduction practices pose safety threats to firefighters. Injuries can occur from the use of equipment as well as from traveling overland to targeted areas for fire- fighting or fire prevention efforts. While each of the crew is trained in the use of fire- fighting equipment, accidental injuries may occur from time to time. Fire management operations apply risk management procedures to minimize and mitigate risks to an acceptable level of residual risk, thus maximizing the safety of wildland firefighters.

Smoke inhalation by firefighting crews can also pose a threat to human health & safety. Smoke from wildland fires is composed of hundreds of chemicals in gaseous, liquid, and solid forms. The chief inhalation hazard appears to be carbon monoxide (CO), aldehydes, respirable particulate matter with a median diameter of 2.5 micrometers (PM2.5), and total suspended particulate (TSP). Adverse health effects of smoke exposure begin with acute, instantaneous eye and respiratory irritation and shortness of breath, but can develop into headaches, dizziness, and nausea lasting up to several hours. Based on a recent study of firefighter smoke exposure, most smoke exposures were not considered hazardous, but a small percentage routinely exceeded recommended exposure limits for carbon monoxide and respiratory irritants (USDA 2000a).

Use restrictions applied to areas of prescribed fire or wildland fires would minimize or eliminate human health & safety concerns resulting from smoke exposure and fire injuries. Restrictions during times of high fire danger would prevent accidental ignitions from general public activities, like campfires, and would indirectly benefit human health and safety.

3.8.2.2 Alternative 2 – Wilderness Values Emphasis

The general impacts to human health and safety under alternative 2 would be similar to those described in the No Action Alternative.

3.8.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

The general impacts to human health and safety for Alternative 3 would be similar to those described in the No Action Alternative . Additionally, however, there would be a reduction in hazard trees within developed areas with the inclusion of mechanical treatments that would result in a minor, long- term beneficial effect on human health and safety.

3.8.2.4 Conclusion

The implementation of any of the alternatives would have minor, short- term effects, but would not impair human health and safety resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the Park, (2) key to the natural or cultural integrity of the Park or opportunities for enjoyment of the Park, and (3) identified as a goal in the Park's general management plan or other National Park Service planning documents.

3.9 Cultural Resources

Federal land managing agencies are required to consider the effects proposed actions have on properties listed in, or eligible for inclusion in, the National Register of Historic Places (i.e., Historic Properties), and allow the Advisory Council on Historic Preservation a reasonable opportunity to comment (National Historic Preservation Act, as amended). Agencies are required to consult with Federal, state, local, and tribal governments/organizations, identify historic properties, assess adverse effects to historic properties, and negate, minimize, or mitigate adverse effects to historic properties while engaged in any Federal or federally assisted undertaking (36 CFR Part 800). Requirements for proper management of museum objects are defined in 36 CFR 79.

3.9.1 Affected Environment

Lassen Volcanic National Park contains a diverse and valued suite of cultural resources within its boundaries including archeological resources, ethnographic resources, historic- period structures, and cultural landscapes.

To date, a total of 96 archeological sites are documented at Lassen Volcanic NP. These include prehistoric flaked- stone artifact scatters and habitation sites with midden deposits, historic- period structures, features, and associated artifacts. Prehistoric site density varies within the park as a result of past volcanic activities. Volcanic tephra deposits cover much of the northern half of the park burying signs of early human activities in the park under layers of volcanic ash and lappili. Recorded prehistoric sites are sparse in the northern portion of the park with the many of the documented sites located in the Warner Valley or Sulphur Creek areas in the southern portion of the park. One archeological district listed on the National Register of Historic Places (NRHP) is located within the park. The Sulphur Creek Archeological District contains ten sites and reflects late prehistoric occupation as early as 700 A.D. to approximately 150 years ago (Moffitt and Anderson 1979). Site CA- PLU- 969/H in Warner Valley includes an archeological component that reflects human occupation in the valley extending back 4,200 years (Nilsson et. al. 1996).

At the time of Euroamerican contact the park area was used by members of the Atsugewi, Mountain Maidu, and Yana/Yahi American Indian groups. Detailed ethnographic accounts for these groups (Garth 1978; Johnson 1978; Riddell 1978) and for the park (Schultz 1954) portray seasonal use of the park area by all three groups to exploit seasonally available food resources and to follow mobile game. For an in- depth review of settlement patterns and subsistence strategies, the reader is referred to these publications. Ethnographic resources may include places traditionally used to hunt or gather resources, trails or paths and associated camping sites, and ceremonial locations or places of religious significance. Affiliated American Indian groups still retain strong emotional ties to the Lassen Volcanic area and information pertaining to culturally significant places is confidential. The park is currently conducting a Traditional Use Study that would identify areas of sacred significance.

Historic- period archeological sites in the park include features that related to early emigration to California, homesteading, ranching, early use of the park area for recreation, and park administration and development. The Nobles Emigrant Trail is significant as a 19th century transportation route that served as an avenue of commerce and communication at the regional level, and is listed on the NRHP. The trail continued to be used over the years as a wagon road, then as a service road. Other historic- period features include cabins, corrals, fence lines, old telephone lines, and related historical debris that have been documented in the park as archeological sites or are referenced in literature and historical records. The park Historic Resources Study (2003) provides an in- depth review of the park's history.

Historic- period structures located within the park include facilities related to early recreational facilities, and park administration and development. Lassen Volcanic NP has 84 structures listed on the List of Classified Structures (LCS). These include the facilities at the park headquarters complex, Manzanita Lake, Drakesbad, park fire lookouts and ranger stations, various bridges, signs, trails, and other features. For an in-depth review of these structures and their status, the reader is referred to the LCS. The Horseshoe Lake, Summit Lake, and Warner Valley Ranger Stations, Park Headquarters Complex, Drakesbad Guest Ranch, and Loomis Visitor Center are all listed on the NRHP.

Cultural landscapes are intertwined patterns of natural and constructed features that represent human manipulation and adaptation of the land. Cultural landscapes provide an interesting management challenge since large significant landscape features are easily identified, while they often include small- scale contributing elements that are not so obvious. Currently the park has identified at least five cultural landscapes that relate to historical use of the park, and park administration and development.

3.9.2 Environmental Consequences

Cultural resource impacts were qualitatively assessed through a determination of the potential for adverse effects to cultural resources relative to fire management activities and mitigation measures to be employed during those activities (see Section 2.6.5).

3.9.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

Historic properties including archeological sites and districts, historical structures, ethnographic resources, cultural landscapes, and museum objects are subject to impacts during fire events. Direct impacts include the effects of fire itself on cultural materials and fire management operations such as fire control line construction or crew and equipment staging. Indirect impacts occur when fire and/or associated fire management operations result in changes to the local environment such as increased erosion or increased exposure of artifacts to looting resulting in potential effects to cultural resources.

Direct Impacts

Fire can directly affect historic properties by damaging or altering elements or attributes of cultural materials that make them significant. Surface fires are usually associated with prescribed burns, whereas crown fires occur primarily during wildland fires. Fire intensity and burn severity vary with fuel type and fuel loading and is generally greater under conditions with heavier fuels and fuel loads. While fire intensity and burn severity generally increase with heavier fuel loads, fuel arrangement plays a significant role in fire behavior as the presence or absence of ladder and intermediary fuels would allow or prevent fire from entering the tree crowns or igniting large heavy fuels such as down logs. Ground fires with high burn severity can damage subsurface cultural materials. These sites can be protected during prescribed burns by removing the ladder and intermediary fuels.

ARCHEOLOGICAL RESOURCES: Archeological sites consist of features and artifact assemblages that are generally significant because of their information potential and a few are unique representations of a particular cultural activity. Artifact assemblages consist of cultural materials that may be damaged or destroyed by fire, or the physical characteristics of the materials that have information potential may be altered. Flaked-stone and/or ground-stone artifacts are common at archeological sites in with a prehistoric component. Examples of fire effects on these lithic materials include spalling of ground-stone artifacts and obsidian hydration rind elimination. Obsidian in particular is readily affected by fire with hydration rinds damaged by temperatures exceeding 500° F (Bennett and Kunzman 1985) and possibly affected at temperatures as low as 150° F if exposed for an extended period of time (Deal 2001). Historic-period sites include wooden features and debris that would burn under most fire conditions, while glass, metal, and ceramics are generally only damaged in fires of a fairly high intensity or duration (Haecker 2001). Duration of heating is not as well understood, but in general, the longer an archeological resource is exposed to heat, the greater the likelihood of damage. Fire can completely consume artifacts and features, or alter artifact and feature attributes impacting information potential (e.g., obsidian hydration rind alteration, burning off organic residues, cracking or melting glass, etc.).

HISTORIC STRUCTURES: Historic-period buildings and bridges generally include a wooden component or else the entire structure itself is made of wood that would burn under most fire conditions. Depending on field conditions fuels adjacent to historic-period structures can ignite cultural fabric depending on fuel moisture of the cultural materials, and fire intensity and duration of the fire. Fuels around structures can be moved away from the cultural fabric to prevent ignition, but with sufficient fire intensity and duration cultural fabric may also be ignited by radiant heat released by the fire or by embers carried to the structure by convection.

CULTURAL LANDSCAPES: Vegetation is an important component of landscapes and vegetation composition can be altered on a large scale by fire. Trees and other vegetation planted in habitation areas can be damaged or killed by fire. However, in cultural landscapes with a vegetation component, fire can be applied to replicate and maintain historic scenes. Scenic vistas can be maintained with fire preserving views of the historic period landscape.
ETHNOGRAPHIC RESOURCES: Vegetation was used for food, basketry production, and other purposes by American Indians. These various plant species can be impacted by fire at the level of individual plants, and in large extreme fire events the distribution of these plant resources can be impacted across a landscape. Fire can be beneficial in some instances as some plant species important for basket making benefit from the proper application of fire (Anderson 1999). Archeological sites are also important to American Indians and are considered to be ethnographic resources. Some locations even have spiritual significance and may still be used for ceremonial purposes. The visual and audio impacts from fire events and related fire management activities including the presence of numerous fire personnel can detract from ceremonial activities depending on location and timing.

Operational Impacts

Operational impacts to historic properties can occur during wildland fire suppression or control or when conducting prescribed burns. Fire management activities that occur during wildland fire suppression that may adversely affect historic properties include equipment and personnel staging, construction of fire control lines by hand or with heavy equipment, vegetation- thinning, water drops and use of fire retardants, burning out from control lines or setting backfires, and post- burn mop- up and rehabilitation. Impacts that can occur from prescribed burns include equipment and personnel staging, construction of fire control lines by hand, vegetation thinning, burning out from control lines and igniting the interior of units, and post- burn mop- up and rehabilitation.

ARCHEOLOGICAL RESOURCES: Construction of fire control lines, post- burn mop-up and rehabilitation displaces soil and may damage or disturb the context of cultural materials comprising the archeological assemblage at a given site. This may result in irreversible loss of the information potential and integrity of the site. The scale of impact can vary from a hand- dug “scratch” line to use of bulldozers that can effectively destroy an entire site. Equipment and crew staging can result in some ground disturbance from vehicles, removal of visible artifacts by fire crews, and possibly introduction of invasive plant species on site that would require resource management treatment in the future. Ignition strategies during wildland fire burnouts and prescribed burn implementation determine fire behavior and resulting fire intensity. Burning out from archeological sites or allowing a creeping fire to back through archeological sites reduces fire intensity on the archeological sites. Water and retardant drops can cause soil displacement or induce erosion at the drop point. Additionally, the potential effect of retardants on chemical composition of various cultural materials is not clearly understood.

HISTORIC STRUCTURES:. The weight of water or retardant drops can damage the structural integrity of a historic structure if the full weight of the drop lands on the structure. Once again the potential effect of retardants on chemical composition of various cultural materials is not clearly understood.

CULTURAL LANDSCAPES: Planned and unplanned fire events all occur on a landscape level. In all instances impacts such as vegetation removal, fire control line construction, and ignition activities impact the landscape. Fire control lines result in visible scars on the landscape and can contribute to erosion. Vegetation removal can be beneficial since the historic scene can be maintained or restored by removing encroaching vegetation. However, care is needed when thinning near historical habitation areas where planted vegetation is part of the cultural landscape.

ETHNOGRAPHIC RESOURCES: Many plants or trees were traditionally used by American Indians and fire management actions such as fire control line construction, vegetation thinning, ignition activities during prescribed fires and wildfire burnouts, and water or retardant drops can impact these plants across the landscape. Individual plants or trees can also be impacted by equipment and crew staging, pile burning, and post-burn mop-up and rehabilitation. Many archeological sites are considered to be ethnographic resources and are subject to impacts from fire management operations as described above. Finally, certain locations hold spiritual significance and can be impacted by any fire management activities either directly at the location, visually by impacting the view-shed, or simply by timing if the fire event occurs during a time when the spiritual site is traditionally used.

Operational impacts of fire management actions on cultural resources would, in most cases, be adverse. However, the degree of impact depends greatly on the nature of the operation and the cultural resource or resources in question. Adverse operational impacts are of particular concern during and after wildland fire events. With proper planning, operations can also be used for beneficial purposes. For example, thinning can effectively remove hazardous fuels from and in the vicinity of cultural resources, as well as restore, enhance or maintain ethnographic resources and cultural landscapes, in cases where the risk of direct impacts is too high.

Indirect Impacts

Indirect impacts are perhaps the most elusive of all, since the impacts may be delayed and incremental. The potential for indirect impacts would relate strongly to the context in which a cultural resource is found, the nature of that resource, and the type and extent of the disturbance activity. In most cases, intense fire behavior and major suppression efforts associated with wildland fires would render cultural resources vulnerable to indirect impacts soon after the event. Indirect impacts may not be as pronounced following managed actions such as prescribed burns or mechanical thinning, but can have, given enough time, equally adverse consequences.

ARCHEOLOGICAL RESOURCES: Indirect impacts occur as a result of fire or operational impacts altering the environment creating the potential of additional impacts. Two key changes in the environment include removal of vegetation and soil displacement. Soil disturbance if not rehabilitated can channel rain runoff resulting in

increased soil erosion that may expose, displace, or destroy archeological features or artifacts. Loss of vegetation may reveal artifacts previously obscured by vegetation and if the site is readily accessible can result in increased collecting of surface artifacts or looting of sites by unscrupulous individuals who dig up archeological sites in search of collectible artifacts. Occasionally trees become weakened and may pose a threat as a hazard tree to archeological sites.
HISTORIC STRUCTURES: Loss of vegetation and soil heating may induce hydrophobicity resulting in sheet wash that may destabilize soils around structures. Soil disturbance near structures can channel water and possibly erode footings and base supports for structures. Occasionally trees may also become weakened and pose a threat as a hazard tree to historic structures.

CULTURAL LANDSCAPES: Sheet wash erosion may also occur as the result of fire if high burn severity results in a slope being denuded of vegetation. Vegetation is often also part of a cultural landscape. Reduced competition for sunlight, water, and nutrients may be beneficial for retained culturally significant vegetation. However, hydrophobicity, soil sterilization, and loss of vegetation may result in sheet- wash erosion and in extreme cases loss of top soil that substantially alter what vegetation can grow.

ETHNOGRAPHIC RESOURCES: Various types of vegetation are used traditionally by American Indians. Impacts that occur on the landscape level also affect vegetation traditionally used by American Indians and all the impacts that occur to cultural landscapes also apply. Archeological resources are also considered to be ethnographic resources and all the impacts to archeological sites also apply.

MUSEUM OBJECTS: Museum objects can also be threatened by such actions, both the physical well being of the objects themselves while in a field context, and the ability to properly catalog and process those objects when considering available funding and staffing for this work. Post- burn assessments are generally needed to determine if there is potential for indirect impacts at archeological sites. In some cases rehabilitation may be needed to stabilize erosion at sites or in extreme cases emergency data recovery excavations are warranted. When artifacts are exposed and in danger of unauthorized collection it may be necessary to have a qualified archeologist document and collect the endangered artifacts, and to curate the artifacts in the park museum collections facility.

Impacts under the no action alternative have the potential to adversely impact cultural resources. Identification of cultural resources, assessment of potential adverse impacts, and development of management actions to minimize, negate, or mitigate identified adverse impacts would be completed prior to implementation of all planned fire management projects (see Section 2.6.5). Management strategies would be reviewed by NPS regional staff or the State Historic Preservation Officer ensuring planned projects are in compliance with the National Historic Preservation Act (NHPA). Implementation of planned fire management projects would reduce the overall potential for catastrophic wildfire that could severely impact cultural resources. Additionally, mitigation measures defined in Section 2.6.5 would ensure impacts to cultural resources during wildfires are minimized.

3.9.2.2 Alternative 2 – Wilderness Values Emphasis

Vegetation thinning usually requires pile burning that can result in an adverse effect on archeological resources if the piles are burned within site perimeters.

Vegetation thinning can result in beneficial or adverse effects to historic properties. When ladder and intermediary fuels are removed from near historic structures the potential for high intensity fire or burn severity is reduced and the result is beneficial. However, when vegetation is burned in piles too close to a historic structure radiant heat or embers carried by convection may impact the structure. Removal of vegetation surrounding a structure may also induce erosion that may ultimately impact the structure

With the exception of the minor impacts mentioned above due to the addition of manual thinning treatments under Alternative 2, impacts to cultural resource under the wilderness value emphasis alternative would be similar to those described in the No Action Alternative. The inclusion of wildland fire use in the Boundary FMU increases the potential for fire impacts on cultural materials during fire events, but the use of manual treatments in these same areas would decrease the total area where moderate or high intensity fire might occur in the FMU. The lack of prescribed fire in the Wildland Fire Use FMU under this alternative increases the potential for impacts to cultural resources in the event of a severe wildfire.

3.9.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

Overall impacts to cultural resources would be lower under the preferred alternative since increased treatment of fuels with prescribed fire, manual and mechanical treatments is proposed. Strategies to protect cultural resources would be implemented for all planned management projects reducing or eliminating impacts to cultural resources. Implementation of fuel management projects would decrease the total area where moderate or high intensity fire may occur, reducing the overall potential for impacts to cultural resources from catastrophic wildfire.

3.9.2.4 Conclusion

All three alternatives could adversely impact unrecorded cultural resource sites depending on incident- specific fire behavior and associated fire suppression tactics. These impacts can be mitigated through proper implementation of minimum impact suppression guidelines and the cultural resource protection- specific mitigation outlined in Section 2.6 *Mitigation Measures*. Therefore, the implementation of any of the alternatives would not impair cultural resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the monument, (2) key to the natural or cultural integrity of the monument or opportunities for enjoyment of the monument, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.10 Park Operations

3.10.1 Affected Environment

The management of wildland fire at Lassen Volcanic National Park is just one of the park operations that all park divisions are committed to managing. This commitment is emphasized in the General Management Plan as well as the Natural and Cultural Resource Management Plan. The park utilizes a system where park operations are prioritized on a daily, weekly, monthly and even a yearly basis. Wildland fire activities, whether they are planned or unplanned, factor prominently in these priorities and affect all park divisions. Park management would take the appropriate management response to all incidents occurring in the park which can include medical emergencies, search and rescue, damage to facilities, or official visits from dignitaries. These as well as all other incidents are managed as park priorities and all divisions are involved to ensure these incidents are handled in a safe and efficient manner.

3.10.2 Environmental Consequences

Park operation impacts were assessed by looking at each fire management tool.

3.10.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

Possible factors impacting park operations include: wildland fire suppression, wildland fire use (WFU), and prescribed fire.

Wildland fire suppression activities are treated as emergency situations commensurate with the management goal of protecting life and property. For this reason, suppression responses may become the park's number one priority at any given time. When suppression becomes the priority, all park Divisions contribute to the management of all fires. Depending on the severity of a given fire, some operational impacts may occur. These impacts include temporary closure of park roads temporary cancellation of interpretation programs, Administrative centers would experience short increases in workloads and may have to re- arrange daily operations, and resource management and ranger staffs would be called upon to be part of the fire organization. In extreme cases, park facilities might need to be evacuated. To the extent possible, all park operations would continue to provide a quality visitor experience, taking into account visitor and employee safety, and efficient response to the fire incident.

Wildland fire use impacts can be similar to suppression initially; however WFU incidents are often longer duration and impacts can be mitigated by augmenting staff and equipment throughout the duration of the fire.

Prescribed fires are planned events. As such, the impacts of such operations are known and evaluated ahead of time. Impacts that occur during these events are anticipated, mitigated, and augmented for any deficiencies.

3.10.2.2 Alternative 2 – Wilderness Values Emphasis

General impacts to park operations would be similar to those described in the No Action Alternative. This alternative includes fewer prescribed fire projects but may include the need for manual treatments as fire surrogates in specific areas.

3.10.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

General impacts to park operations would be similar to those described in the No Action Alternative and in Alternative 2.

3.10.2.4 Conclusion

The implementation of any of the alternatives would not impair park operations (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.11 Socioeconomics

3.11.1 Affected Environment

Lassen Volcanic National Park is located within four counties in northern California; Shasta, Tehama, Plumas and Lassen counties, with a combined population of 273, 947. Education, health and social services, agriculture, forestry, commodity transportation, and retail trade are the major elements of these economies (USCB, 2004).

In addition to the Park, the area is home to several Wilderness areas, Lassen National Forest, and numerous natural amenities and community services which bring visitors to the area each year. Agriculture and timber employment is not expected to increase in the near future, and the counties look to increasing economic diversification to aid economic growth. Tourism is an important part of a growing employment sector that includes the Arts, entertainment, outdoor recreation and tourism (USCB, 2004).

The Park averaged 369,588 recreational visitors per year for the years 1994-2003 (DOI 2004a). Each visitor is required to pay an entrance fee. Single, private, non-commercial vehicles are charged $10; pedestrians, single motorcyclists, and bicyclists are charged $5; and commercial buses are charged anywhere from $25 to $200, depending on capacity. More than 70% of the Park's annual visitation comes during the period June-September (DOI 2004a).

Using the MGM2 model developed by researchers at Michigan State University, it is possible to derive a rough estimate of the economic benefits to the local community due to Park visitation (DOI 2004b). The model uses as inputs the number of annual recreation visits, broken down into local, non-local day use, and overnight visits, including stays at motels and campgrounds, to generate estimates of economic effects on the local community due to the presence of the NPS unit. The following inputs were used to calculate the economic benefits of the Park:

- 75,339 local visits, from the four surrounding counties of Shasta, Tehama, Lassen and Plumas Counties
- 37,670 visitors who stayed overnight in motels
- 113,009 visitors who stayed overnight in campgrounds, RVs, or backcountry camping
- 150,678 non- local day- users (DOI 2004b)

The model uses a nationwide average of party size and length of stay in motels and campgrounds for National Park visitors, as well as average spending per party at a rural National Park, to convert the visitation information to estimates of economic benefits. Using the above inputs it is estimated that Lassen Volcanic National Park brings in approximately $5,400,000 in local wages and 276 jobs for persons involved in the tourism industry.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*, directs federal agencies to identify and address any disproportionately high adverse human health or environmental effects of its projects on minority or low- income populations.

Minority populations constitute approximately 10% of the total population within the four counties surrounding the Park compared to a national average of 25% (USCB 2004). Using the Census Bureau's categories, the largest racial group is Hispanic/Latino (25%), followed by those who said they were of two or more races (4%), and those who said they were some other race (11%). Asian, Black or African American, and Native Hawaiian groups each made up less than 1% of the areas population.

The median household income for Shasta, Tehama, Plumas and Lassen Counties was $45,443 in 1999 (USCB, 2004) compared to the national median income of $41,994 for the same year. In 1999, more than 14.2% of the areas residents were reported to be living in poverty, compared to a national average of 12.4%. Shasta, Tehama and Plumas counties experienced unemployment rates ranging from 7.0 – 9.9% for the 12 month period between February 2003 and January 2004, while Lassen County reported 6- 6.9% unemployment. These unemployment rates are slightly higher than the national average of 6.0% for the same period (USBLS 2004).

3.11.2 Environmental Consequences

Socio- economic impacts were quantitatively assessed using U.S. Census Bureau data on personal income, population data, and poverty measures.

3.11.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

The most probable socioeconomic impact would be the loss of revenues to the Park and local tourism- related businesses as a result of use restrictions, road closures, or partial to complete park closures in response to fire and excessive smoke. Use restrictions and road closures would likely be temporary and infrequent, and of a nature that would not significantly reduce NPS revenues generated from entrance fees or compromise local tourism businesses. A large wildfire that destroyed developed areas within Lassen Volcanic National Park or that resulted in the prolonged closure of part or all of the Park would have significant socioeconomic impacts (e.g. damage and loss of property; temporary and prolonged loss of jobs; and loss of revenues to the Park and surrounding businesses from a decrease in tourism); however, the likelihood of such a fire is small and the implementation of the Fire Management Plan would further reduce the possibility of such an event.

Percentages of minority or socio- economically disadvantaged persons in Shasta, Tehama, Plumas and Lassen Counties are below the national averages for these categories, and the probability of a disproportionate impact to these populations resulting from the implementation of the Fire Management Plan would be minor.

3.11.2.2 Alternative 2 – Wilderness Value Emphasis

General socioeconomic impacts for this Action would be similar to those described in the No Action Alternative. With the added capability of managing natural ignitions and including manual fuels treatment, the probability of a severe wildfire would be further reduced.

3.11.2.3 Alternative 3 – (Proposed Action) – Ecosystem Restoration Emphasis

General socioeconomic impacts for the proposed action would not have significant impact to park revenue, but could benefit the counties surrounding the park. With the inclusion of suppression, prescribed fire, wildland fire use, and manual and mechanical fuel treatments, the opportunity to use a wide variety of vendors is greatly increased. Local motels and restaurants could benefit from temporary fire crews. Other businesses might contract services such as water, portable toilets or even fuel to suppression or fire use fires. Local contractors could also be utilized for mechanical fuel treatment projects. All aspects of this proposed action bring revenue to the local population.

3.11.2.4 Conclusion

The implementation of any of the alternatives would have minor effects on local and regional economies, no adverse effects on poor and/or minority populations, and would not impair socioeconomic resources or values that are (1) necessary to fulfill specific purposes identified in the enabling legislation of the park, (2) key to the natural or cultural integrity of the park or opportunities for enjoyment of the park, and (3) identified as a goal in the park's general management plan or other National Park Service planning documents.

3.12 Wilderness

3.12.1 Affected Environment

In October 1972, Congress designated 75% of the park (78,982 acres) as the Lassen Volcanic Wilderness. The 2002 General Management Plan for Lassen Volcanic National Park proposes up to an additional 25,000 acres be included for wilderness designation. Parkland proposed for wilderness expansion is currently managed as natural areas with the objective of protecting and conserving the natural resources found within these areas. National Park Service wilderness management policies are based on provisions of the 1916 National Park Service Organic Act, the 1964 Wilderness Act, and legislation establishing individual units of the national park system. These policies establish consistent service-wide direction for the preservation, management, and use of wilderness and prohibit the construction of roads, buildings and other man-made improvements and the use of motorized vehicles in wilderness. All park management activities proposed within wilderness are subject to review following the "minimum tool" requirement concept and decision guidelines.

Wilderness use at Lassen Volcanic National Park includes such activities as hiking, backpacking, horseback riding, swimming and fishing in the summer, and winter cross country skiing and snowshoeing. The average annual overnight wilderness use in the park is approximately 7,750 person nights per year. There are approximately 150 miles of trail and 15 trail bridges within the park's wilderness. The park includes portions of two Congressionally designated trails, the Nobles Emigrant Trail, a component of the California National Historic Trail, and the border-to-border Pacific Crest National Scenic Trail. There are three historic structures maintained within the wilderness: Mt. Harkness Fire Lookout, and Twin Lakes and Horseshoe Lake patrol cabins.

3.12.2 Environmental Consequences

Park wilderness values include natural, ecological, geological, cultural, scenic, scientific and recreational opportunities. One of the park's fire management goals is to restore and maintain fire regimes to the maximum extent practicable so natural ecosystems can operate essentially unimpaired by human influence. All three alternatives include Wildland Fire Use within designated wilderness. Wildland fire management activities within designated wilderness would adhere to "minimum tool" requirements of the 1964 Wilderness Act.

All alternatives may result in temporary impacts to wilderness character, particularly related to impacts on wilderness visitors, including the perception of solitude and a primitive, unconfined wilderness experience. These impacts would include the use of aircraft to detect, monitor and manage fires, as well as noise and activity from firefighting staff and equipment during operations. All fire operations in wilderness would consider preservation of wilderness character and experiences in their implementation. Fire management strategies proposed in all three alternatives would follow the mitigation measures identified in Section 2.6.6 for protection of wilderness values, including the implementation of Minimum Impact Suppression Tactics (MIST) in order to minimize or eliminate wilderness impacts. Following significant fire suppression actions, burned area emergency rehabilitation plans may be implemented under the direction of the fire management officer and the recommendations of a resource advisor.

3.12.2.1 Alternative 1 (No Action) – Continued Implementation of 1993 Plan

This alternative allows fire, as an ecosystem process, to resume its natural roll to the fullest practical extent, either through careful application of prescribed fire or wildland fire use within designated wilderness. This alternative also includes fire suppression efforts. This alternative does not include manual or mechanical fuel treatments.

Wildland Fire Use would be employed primarily to restore wilderness character to the park landscape previously affected by human activity (fire exclusion), and would be compatible with wilderness management principles. The restoration of natural fire regimes to forest stands within the park is consistent with the restoration and preservation of wilderness values as described in the Wilderness Act, and would be beneficial and positively impact wilderness character and resources. Wildland Fire Implementation Plans may specify holding actions to limit the size of these fires, utilize natural barriers, and/or protect special resources. Holding actions employ techniques similar to fire suppression actions (described below), and would have similar impacts. The monitoring for wildland fire use actions could involve the use of fixed- wing aircraft and helicopters for overflights. These flights would have minor, short- term impacts to the wilderness from their noise and from the visible use of mechanized equipment.

Prescribed Fire is any fire ignited by management actions to meet specific objectives. This alternative includes several prescribed fire units within designated wilderness. As described in Section 2.2.2 prescribed fire is applied to the landscape (< 4000 acres per treatment unit) under specified environmental conditions (e.g. weather and fuel moisture); and is confined to a predetermined area with a pre- determined range of fire intensity and rate of spread as documented in an approved prescribed fire plan. The fuels to be burned may be in either their natural or modified state (e.g. cut down and scattered or piled). Prescribed Fire activities would involve limited use of portable pumps and/or chainsaws to create firelines and contain a fire. The decision to use chainsaws or pumps would be subject to a minimum requirement assessment. These tools would have minor, short- term, localized impact to wilderness due to the noise involved and the visual impact of using mechanized equipment in wilderness. Visual impacts of prescribed fire handlines would be mitigated by post- fire rehabilitation, which would obliterate the lines and restore the impacted areas. In some cases helicopters may be required for overflights and ignition strategies. These flights would have minor, short- term impacts to the wilderness.

Fire Suppression impacts by firefighters on most small fires (<1 acre) would barely be distinguishable from natural disturbances seen throughout the wilderness. However, fire suppression for moderate and larger fires would include construction of fire lines, use of temporary helispots and camps, and would have a noticeable effect on wilderness values. Some effects include felled or bucked trees, cut brush and bare soil. These impacts would be difficult to fully mitigate during full- scale fire suppression, but would be reduced through the use of Minimum Impact Suppression Tactics and post- fire rehabilitation treatments would reduce the visual and ecological impacts of large fire suppression activities. Impacts would clearly be visible and have a minor, short- term effect.

The use of chainsaws, portable pumps, helicopters and fixed wing aircraft for all fire operations described above are often considered minimum tools on most fires to enhance firefighter safety and expedite control of unwanted fires. However, not all fires would utilize mechanized equipment or power tools. Many would be fought utilizing basic firefighting tools such as shovels and Pulaskis, while other fires would be placed in containment or confinement strategies and would utilize natural boundaries.

3.12.2.2 Alternative 2 – Wilderness Values Emphasis

This alternative responds to the importance of protecting wilderness values, by promoting fewer fire management activities within wilderness. Alternative 2 would only include wildland fire use and suppression of wildland fires within wilderness, and limited manual fuels treatment around the three historic structures that are located within the park's wilderness zone. Managed wildland fire would be the primary tool used to meet resource objectives within wilderness under this alternative. Wildland fire use strategies would be employed when a naturally ignited fire occurs under favorable environmental and spatial conditions, creating specific desirable resource benefits for the life of the fire. If a wildland fire use fire does not continue to meet resource objectives, the appropriate suppression response would be employed.

Impacts to wilderness resources and values would be similar to those described under Alternative 1 for Wildland Fire Use and Fire Suppression, with the exception that Prescribed Fire would not be implemented in wilderness areas. The restoration of natural fire regimes to forest stands within the park is consistent with the restoration and preservation of wilderness values as described in the Wilderness Act, and would be beneficial and positively impact wilderness character and resources. Wildland Fire Implementation Plans may specify holding actions to limit the size of these fires, utilize natural boundaries, and/or protect special resources. Fire holding impacts (for both Wildland Fire Use and Fire Suppression) would include construction of fire lines, use of temporary helispots and camps, and would have a noticeable effect on wilderness values. These impacts would be difficult to fully mitigate during fire management activities, but would be reduced through the use of Minimum Impact Suppression Tactics and post-fire rehabilitation treatments. Impacts would clearly be visible and have a minor, short-term, localized effect. Impacts due to fire management activities would be reduced by not implementing prescribed fires within the park's wilderness. Only the occasional naturally ignited fire would be evaluated and managed for resource benefit.

The three historic structures (ranger cabins and fire lookout) located within designated wilderness (though within the Boundary FMU) under this alternative would receive manual treatment to reduce hazardous accumulations of fuels. Manual treatment is the use of hand tools or hand operated power tools used to cut, clear or prune herbaceous and woody species to effectively reduce hazardous accumulations of wildland fuels and to create defensible space near structures. Some of the hazard fuel reduction work in the wilderness would be accomplished using handtools, but some work could require chainsaws or similar power tools. The decision of what tools to select would be based on a minimum requirement assessment. Power tools would have a minor, short- term, localized, temporary noise and visual impacts effect on wilderness character. No large mechanized equipment would be used in the wilderness.

3.12.2.3 Alternative 3 (Proposed Action) – Ecosystem Restoration Emphasis

This alternative would include suppression of wildland fires, provide for prescribed fires and wildland fire use, and allow for limited manual fuels treatment within designated wilderness. This alternative responds to the importance of reducing hazardous fuels, and restoring natural fire regimes and forest structures through the accelerated use of prescribed fire. It also includes mechanical thinning, but only within specific developed areas, and therefore would not affect the wilderness.

Impacts to wilderness resources and values would be similar to those described under Alternative 1 for Wildland Fire Use, Fire Suppression, and Prescribed Fire, with the addition of limited manual fuels treatment (described under Alternative 2). The restoration of natural fire regimes to forest stands within the park is consistent with the restoration and preservation of wilderness values as described in the Wilderness Act, and would be beneficial and positively impact wilderness character and resources. Fire holding impacts (for Wildland Fire Use, Fire Suppression, and Prescribed Fire) would be difficult to fully mitigate during fire management activities, but would be reduced through the use of Minimum Impact Suppression Tactics and post- fire rehabilitation treatments. Impacts would clearly be visible and have a minor (depending upon the size of the fire), short- term, localized effect to wilderness resources and values as discussed under Alternative 1.

As described under Alternative 2, wilderness backcountry structures would receive manual treatment to reduce hazardous accumulations of fuels to create defensible space near these historic structures. Some of the hazard fuel reduction work in the wilderness would be accomplished using handtools, but some work could require chainsaws or similar power tools. The decision of what tools to select would be based on a minimum requirement assessment. Power tools would have a minor, short- term, localized, temporary noise and visual impacts effect on wilderness character. No large mechanized equipment would be used in the wilderness.

3.12.2.4 Conclusion

Fire management activities would affect wilderness resources in generally beneficial ways, through actions that would maintain plant communities within their natural range of variability, and thus maintain wilderness values, especially in the Wildland Fire Use Fire Management Unit. All alternatives would have minor, short- term, localized, and temporary effects (such as noise, activity, and visual impacts) on the wilderness that are mitigated through the use of a minimum requirement assessment and minimum impact tactics. This mitigation would prevent impairment and preserve wilderness resources and values. The fire management strategies proposed under the three alternatives would not result in impairment to wilderness or values that are necessary to fulfill specific purposes identified in the enabling legislation of the park.

3.13 Cumulative Effects

An analysis of the potential cumulative effects of fire management actions considered the past, present, and reasonably foreseeable future actions on land uses that could add to (intensify) or offset (compensate for) the effects on the resources that may be affected by the Fire Management Plan alternatives. The results of the cumulative effects analysis are summarized in Table 3- 5. A significant cumulative effect for any issue topic is the same "significant" impact that is described in Table 2- 10 in Section 2.5 – *Impact Definitions*.

Table 3- 5. Cumulative Effects Summary.

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Soils	Adverse soil impacts (soil erosion or loss) from past roads, park buildings and improvements, wildland fires and suppression efforts; Beneficial soil impacts from past wildland fires (nitrification of soils)	Prescribed fire and thinning activities would have minor adverse effects on soils (soil erosion and compaction), but beneficial effects as well over the short and long-terms (soil development and soil nitrification)	Suppression efforts of large wildfires could adversely impact soils (compaction, erosion from firebreaks, etc.)	Soils inside of the park would improve over time with soil development and nitrification from prescribed fires; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to soil cumulative impacts, while Alternative 2 would contribute less
Water/ Wetlands	Minor impacts to water resources from past wildfires and suppression efforts	Thinning and prescribed fires would indirectly impact surface water resources (sediment loading and turbidity)	Suppression efforts of large wildfires could adversely impact water resources (sediment loading)	Minor effect on water resources: Fire Management Plan would not result in significant cumulative impacts: All alternatives would contribute similarly to water resource cumulative impacts
Vegetation	Natural fuel loading increased in absence of historic low-severity, high frequency fire regime; native plant habitat and diversity declined; increased infestation of noxious weeds	Thinning and prescribed fire would decrease hazardous fuel loadings; native grass and forb species would be favored; forest stand structure in some areas would return to historic	Thinning and prescribed fire efforts in the adjacent National Forests would reduce fuel loadings and help restore historic fire regimes to forest communities adjacent to the park; wilderness	Habitat and diversity would continue to improve; noxious weeds would continue to decline; fuel loadings would pose a reduced fire danger; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
		conditions; fire regimes would be returned to 12,075 acres	designation limits the ability of the park to reduce hazardous fuel loadings in wilderness areas	Alternative would contribute the most to vegetation cumulative impacts, while Alternative 2 would contribute the least
Wildlife	Fire suppression efforts within the park degraded wildlife habitat and diversity; park building and improvements temporarily affect wildlife species	Thinning and prescribed fire would result in minor, short-term disturbance and displacement with minimal species loss; improved habitat and increased wildlife diversity with restoration of historic fire regimes	Thinning and prescribed fire efforts in adjacent National Forests would help restore historic fire regime to forest communities adjacent to the park and benefit habitat and species diversity	Wildlife habitat and diversity increases; Fire Management Plan does not result in significant cumulative impacts; All alternatives would contribute similarly to wildlife cumulative impacts
Noise	Past development and improvements resulted in short-term noise impacts; vehicular traffic associated with visitation of the park continues to produce sustained and long-term source of noise	Thinning and suppression activities would result in minor noise impacts to sensitive receptors	Traffic associated with visitation of the park continues to produce sustained and long-term source of noise	Noise sources and levels in the park would temporarily increase; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action and Alternative 1 would contribute equally to noise cumulative impacts
Air Quality	Industry and agricultural practices emit pollutants and particulate matter; automobiles, past wildland and prescribed fires contribute to some temporary deterioration in air quality and visibility	Prescribed fire emissions would result in minor, short-term air quality and visibility impacts	Future wildland fires programs would contribute to temporary deterioration in air quality and visibility	Class I air quality standards would not be violated; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to air quality cumulative impacts
Visitor Use and Experience and Park Operations	Establishment of the park, improved roads and trails provided access for recreation opportunities; increased population growth results in increased recreational use; proposed designation of wilderness improves recreational experience	Minor visitor use and experience impacts resulting from thinning and prescribed fire activities	Increased recreation use as population grows	Long-term enhancement of recreation resources and opportunities offsets short-term recreation inconveniences from fuel treatments; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to visitor use and experience cumulative impacts, while Alternative 2 would contribute the least
Human Health & Safety	Past suppression efforts protected park staff and visitors	Thinning and prescribed fire activities might result in very minor impacts; long-term improvement in human health & safety with reduction in fuels	Similar effects as described in Past and Present Actions	Human health and safety would improve over time with thinning and prescribed fire activities; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to human health and safety cumulative impacts
Cultural Resources	Establishment of the park helped protect cultural resources; past suppression efforts may have impacted un-recorded sites	Fuel treatments could result in impacts to un-recorded sites	Similar effects as described in Past and Present Actions	Cultural resources continue to be protected; Fire Management Plan would not result in significant cumulative impacts; the Proposed Action Alternative would contribute the most to cultural resources' cumulative impacts, while Alternatives 2 would contribute the least

Resource	Past and Present Actions	Proposed Actions	Future Actions	Cumulative Effects
Socio-economics	Establishment of the park and visitor use benefits local and regional economies	Very minor effects on local economy	Similar effects as described under Past and Present Actions	Socio-economics would remain relatively unchanged; Fire Management Plan would not result in significant cumulative impacts; All alternatives would contribute similarly to human health and safety cumulative impacts
Wilderness	Past fire suppression in the park prevented wilderness areas from achieving historic fire regime and allowed for hazardous fuel buildup	Fire management activities would not result in significant impacts to wilderness; fire management activities would help reduce fuel loadings in the wilderness and contribute to improved forest health	Fire management activities would help reduce fuel loadings in the wilderness and contribute to improved forest health through the restoration and maintenance of natural fire regimes	Wilderness would not be significantly impacted by proposed fire management activities; the Proposed Action Alternative would contribute the most to wilderness cumulative impacts, while Alternative 2 would contribute the least

Chapter 4 – CONSULTATION AND COORDINATION

4.1 Persons, Organizations, and Agencies Consulted

The following persons, organizations, and agencies were contacted for information and/or assisted in identifying important issues, developing alternatives, or analyzing impacts of this environmental assessment.

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Mary Rasmussen, Fire Ecologist, National Park Service

4.3 Persons, Organizations, and Agencies Who Received This Environmental Assessment

This EA was made available for public review and comment for a 30- day period. A notice announcing its availability was sent out to over 230 interested parties through the Park's mailing list, including federal, state, and municipal agencies, environmental groups, businesses, and individuals. A press release was sent out to several local newspapers and radio stations. Hard copies of the EA were provided to area libraries in Red Bluff, Redding, Chester, and Chico, California. Hard copies were also sent to representatives of 10 local Native American tribes. Hard copies were provided to anyone upon request. During the entire comment period the EA was posted on the park's website at: http://www.nps.gov/lavo.

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APPENDIX A – Species List

Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 040823125840
Database Last Updated: July 19,2004

Quad Lists

RED CINDER (6248)

Listed Species

Fish

Hypomesus transpacificus - delta smelt (T)

Amphibians

Rana aurora draytonii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)

Mammals

Martes pennanti - fisher (C)

Species of Concern

Invertebrates

Desmona bethula - amphibious caddis fly (SC)

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Oncorhynchus (=Salmo) mykiss aquilarum - Eagle Lake rainbow trout (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfin smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Athene cunicularia hypugaea - western burrowing owl (SC)
Baeolophus inornatus - oak titmouse (SLC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California .wolverine (CA)
Lepus americanus tahoensis - Sierra Nevada snowshoe hare (SC)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

MT. HARKNESS (625A)

Listed Species

Invertebrates

Pacifastacus fortis - Shasta crayfish (E)

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus tshawytscha - Central Valley spring- run chinook salmon (T) {NMFS}
Oncorhynchus tshawytscha - winter- run chinook salmon (E) {NMFS}

Amphibians

Rana aurora draytonii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)
Oncorhynchus tshawytscha - Central Valley fall/late fall- run chinook salmon (C) (NMFS)

Mammals

MaTtes pennanti - fisher (C)

Species of Concern

Invertebrates

Desmona bethula - amphibious caddis fly (SC)
Ecclisomyia bilera - King's Creek ecclisomyian caddis fly (SC)
Parapsyche extensa - King's Creek parapsyche caddis fly (SC)

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Baeolophus inornatus - oak titmouse (SLC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)

Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus jlammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC) f
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Lepus americanus tahoensis - Sierra Nevada snowshoe hare (SC)
MaTtes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed rnyotis bat (SC)
Myotis evotis - long- eared rnyotis bat (SC)
Myotis thysanodes - fringed rnyotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

READING PEAK (6258)

Listed Species

Invertebrates

Pacifastacus fortis - Shasta crayfish (E)

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) (NMFS)
Oncorhynchus tsha»ytscha - Central Valley spring- run chinook salmon (T) {NMFS)
Oncorhynchus tsha»ytscha - winter- run chinook salmon (E) {NMFS)

Amphibians

Rana aurora dray ton ii - California red- leggedfrog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)
Oncorhynchus tshawytscha - Central Valley fall/late fall- run chinook salmon (C) {NMFS)

Mammals

Martes pennanti - fisher (C)

Species of Concern

Invertebrates

Desmona bethula - amphibious caddis fly (SC) \
Ecclisomyia bilera - King's Creek ecclisomyian caddis fly (SC)
Parapsyche extensa - King's Creek parapsyche caddis fly (SC)

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Agelaius tricolor - tricolored blackbird (SC)
Baeolophus inornatus - oak titmouse (SLC)
Chaetura vauxi - Vaux's swift (SC)

Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Lepus american~s tahoensis - Sierra Nevada snowshoe hare (SC)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma rnyotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Oreostemma elatum - tall alpine- aster (= Plumas alpine aster) (SLC)
Smelowskia ovalis ssp. congesta - Mt. Lassen (=Lassen Peak) smelowskia (SC)

LASSEN PEAK (626A)

Listed Species

Invertebrates

Pacifastacus fortis - Shasta crayfish (E)

Fish

Hypomesus transpacificus - delta srnelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) {NMFS)
Oncorhynchus tshawytscha - Central Valley spring- run chinook salmon (T) {NMFS)
Oncorhynchus tshawytscha - winter- run chinook salmon (E) {NMFS)

Amphibians

Rana aurora dray ton ii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)
Oncorhynchus tshawytscha - Central Valley fall/late fall- run chinook salmon (C) (NMFS)

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana boylii - foothill yellow- legged frog (SC)
Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Agelaius tricolor - tricolored blackbird (SC)
Baeolophus inornatus - oak titmouse (SLC)
Carduelis lawrencei - Lawrence's goldfmch (SC)
Chaetura vauxi - Vaux's swift (SC)

Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax trai[[ii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Lepus americanus tahoensis - Sierra Nevada snowshoe hare (SC)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC) .
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanode.s: - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yurna myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Botrychium crenulatum - scalloped moonwort (SC)
Smelowskia ovalis ssp. congesta - Mt. Lassen (=Lassen Peak) smelowskia (SC)

MINERAL (6260)

Listed Species

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) (NMFS)
Oncorhynchus tshawytscha - Central Valley spring- run chinook salmon (T) (NMFS)
Oncorhynchus tshawytscha - winter- run chinook salmon (E) (NMFS)

Amphibians

Rana aurora draytonii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)
Oncorhynchus tshawytscha - Central Valley falVlate fall- run chinook salmon (C) (NMFS)

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfin smelt (SC)

Amphibians

Rana boylii - foothill yellow- legged frog (SC)
Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Agelaius tricolor - tricolored blackbird (SC)
Baeolophus inornatus - oak titmouse (SLC)
Carduelis lawrencei - Lawrence's goldfmch (SC)
Chaetura vauxi - Vaux's swift (SC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flammulated owl (SC)

SelasphoruS rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Lepus americanus tahoensis - Sierra Nevada snowshoe hare (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Silene occidentalis ssp. longistipitata - Butte County catchfly (=long- stiped campion) (SC)

BOGARD BUTTES (642C)

Listed Species

Invertebrates

Critical habitat, vernal pool invertebrates (X)

Fish

Hypomesus transpacificus - delta smelt (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Plants

Critical habitat, vernal pool plants (X)

Candidate Species

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Oncorhynchus (=Salmo) mykiss aquilarum - Eagle Lake rainbow trout (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfin smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Baeolophus inornatus - oak titmouse (SLC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otusflammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hununingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii p~l/escens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)

Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Astragalus pulsiferae var. suksdorfii - Suksdorfs rnilk- vetch (SC)

WEST PROSPECT PEAK (643C)

Listed Species

Invertebrates

Critical habitat, vernal pool invertebrates (X)
Pacifastacus fortis - Shasta crayfish (E)

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) (NMFS)

Amphibians

Rana aurora dray ton ii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Plants

Critical habitat, vernal pool plants (X)
Orcuttia tenuis - slender Orcutt grass (T)

Candidate Species

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Agelaius tricolor - tricolored blackbird (SC)
Baeolophus inornatus - oak titmouse (SLC)
Chaetura vauxi - Vaux's swift (SC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Palco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Brachylagus idahoensis - pygmy rabbit (SC)
Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big-eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)

Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Smelowskia ovalis ssp. congesta - Mt. Lassen (=Lassen Peak) smelowskia (SC)

PROSPECT PEAK (6430)

Listed Species

Invertebrates

Pacifastizcus fortis -Shasta crayfish (E)

Fish

Hypomesus transpacificus -del~ smelt (T)

Amphibians

Rana aurora draytonii -California red-legged frog (T)

Birds

Haliaeetus leucocephalus -bald eagle (T)

Candidate Species

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus - Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmoratd marmorata - northwestern pond turtle (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Baeolophus inornatus - oak titmouse (SLC)
Chaetura vauxi - Vaux's swift (SC)
Cinclus mexicanus - American dipper (SLC)
Cypselqides niger - black swift (SC)
Empidonax traillii brewsteri - ıittle willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Grus canadensis tabida - greater sandhill crane (CA)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus flammeolus - flamrnulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC)
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Brachylagus idahoensis - pygmy rabbit (SC)
Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA)
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - srnall- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- legged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

MANZANITA LAKE (644D)

Listed Species

Invertebrates

Pacifastacus fortis - Shasta crayfish (E)

Fish

Hypomesus transpacificus - delta smelt (T)
Oncorhynchus mykiss - Central Valley steelhead (T) (NMFS)
Oncorhynchus tshawytscha - Central Valley spring- ron chinook salmon (T) (NMFS)
Oncorhynchus tshawytscha - winter- ron chinook salmon (E) (NMFS)

Amphibians

Rana aurora dray ton ii - California red- legged frog (T)

Birds

Haliaeetus leucocephalus - bald eagle (T)

Candidate Species

Fish

Acipenser medirostris - green sturgeon (C)
Oncorhynchus tshawytscha - Central Valley faWlate fall- ron chinook salmon (C) (NMFS)

Mammals

Martes pennanti - fisher (C)

Species of Concern

Fish

Cottus asperrimus - rough sculpin (CA)
Lavinia symmetricus mitrulus - Pit roach (SC)
Pogonichthys macrolepidotus ;. Sacramento splittail (SC)
Spirinchus thaleichthys - longfm smelt (SC)

Amphibians

Rana boylii - foothill yellow- legged frog (SC)
Rana cascadae - Cascades frog (SC)

Reptiles

Clemmys marmorata marmorata - northwestern pond turtle (SC)

Birds

Accipiter gentilis - northern goshawk (SC)
Agelaius tricolor - tricolored blackbird (SC)
Baeolophus inornatus - oak titmouse (SLC)
Chaetura vauxi - Vaux's swift (SC)
Cinclus mexicanus - American dipper (SLC)
Cypseloides niger - black swift (SC)
Empidonax traillii brewsteri - little willow flycatcher (CA)
Falco peregrinus anatum - American peregrine falcon (D)
Lanius ludovicianus - loggerhead shrike (SC)
Melanerpes lewis - Lewis' woodpecker (SC)
Numenius americanus - long- billed curlew (SC)
Otus jlammeolus - flammulated owl (SC)
Selasphorus rufus - rufous hummingbird (SC) .
Strix occidentalis occidentalis - California spotted owl (SC)

Mammals

Corynorhinus (=Plecotus) townsendii pallescens - pale Townsend's big- eared bat (SC)
Euderma maculatum - spotted bat (SC)
Gulo gulo luteus - California wolverine (CA) -
Martes americana - American (=pine) marten (SC)
Myotis ciliolabrum - small- footed myotis bat (SC)
Myotis evotis - long- eared myotis bat (SC)
Myotis thysanodes - fringed myotis bat (SC)
Myotis volans - long- Iegged myotis bat (SC)
Myotis yumanensis - Yuma myotis bat (SC)
Vulpes vulpes necator - Sierra Nevada red fox (CA)

Plants

Astragalus pulsiferae var. suksdorfii - Suksdorfs rnilk- vetch (SC)

County Lists

No county species lists requested.

Key:

(E) Endangered - Listed (in the Federal Register) as being in danger of extinction.
(f) Threatened - Listed as likely to become endangered within the foreseeable future.
(P) Proposed - Officially proposed (in the Federal Register) for listing as endangered or threatened.
(NMFS) Species under the Jurisdiction of the National Marine Fisheries Service. Consult with them directly about these species.
Critical Habitat - Area essential to the conservation of a species.

(PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
(C) Candidate - Candidate to become a proposed species.
(CA) Listed by the State of California but not by the Fish & Wildlife Service.
(D) Delisted- Species will be monitored for 5 years.
(SC) Species of Concern/(SLC) Species of Local Concern - Other species of concern to the Sacramento Fish & Wildlife Office.
(X) Critical Habitat designated for this species
Important Information About Your Species List