National Park Service
U.S. Department of the Interior

Lassen Volcanic National Park Wildland Fire Management Plan May 2022 (revised)

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES AND FIGURES

CHAPTER 1 - INTRODUCTION

This document defines a program of wildland fire management for Lassen Volcanic National Park. It describes objectives and tasks covering a 10 year timeframe for utilizing manual and mechanical fuels treatment as well as the benefits of fire to achieve desired natural and cultural resource conditions while at the same time, protecting park resources and adjacent lands and values at risk from the negative impacts of fire. Elements have been identified to ensure that firefighter and public safety are not compromised.

1.1 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 106,170 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 St. 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 500,000 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, backpacking, camping, picnicking, and hiking. Seventy-four percent of the park is congressionally designated wilderness.

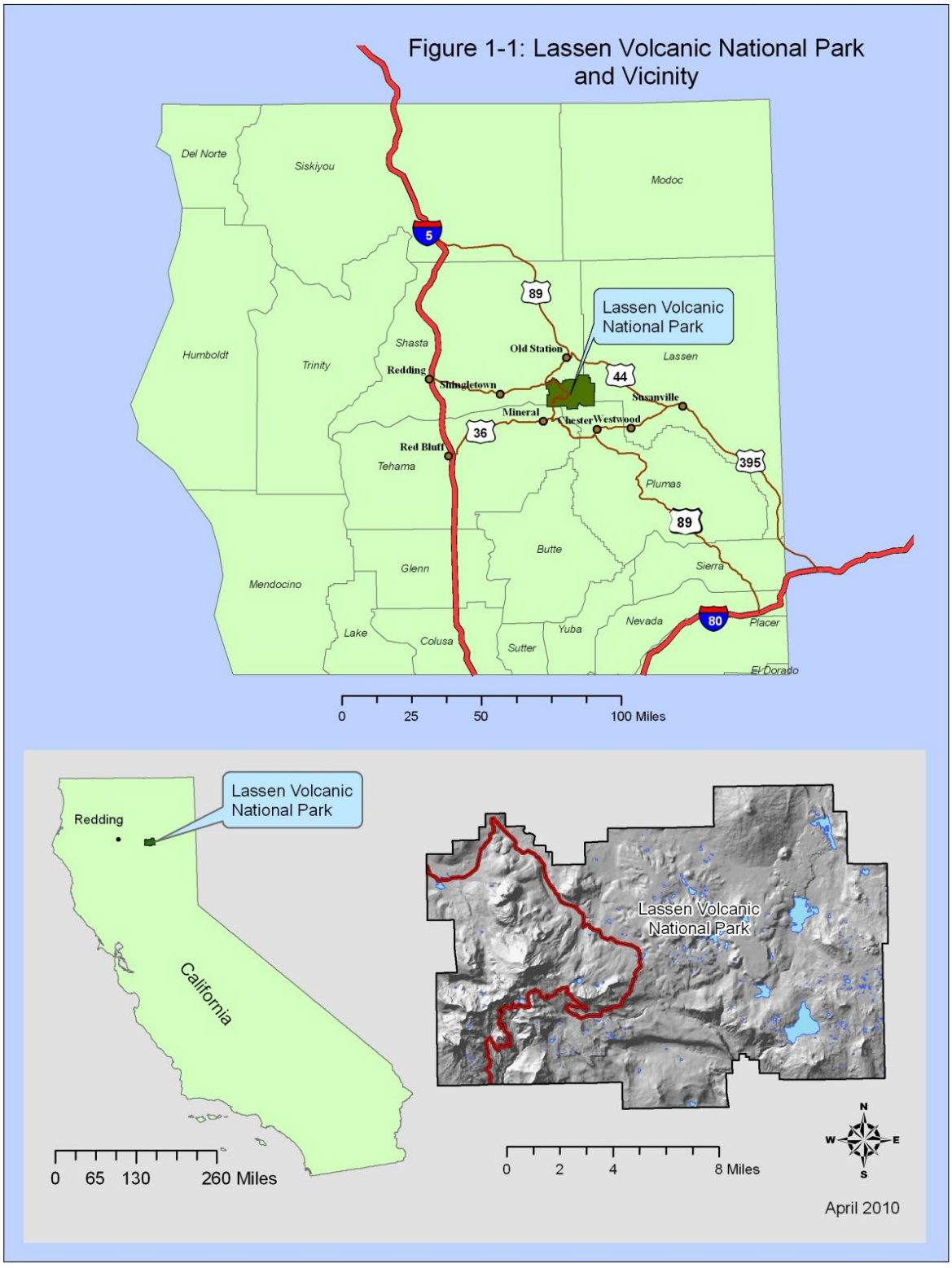


Figure 1 – Vicinity Map

1.2 Purpose and Need for this Plan

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 (SNEP 1996, Agee 1993, Agee et. al. 1978, Kilgore 1973). Virtually all vegetation communities show evidence of fire dependence or tolerance (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, recurring fires that burned every 4 to 29 years (median fire return intervals) depending on elevation (Taylor 2000, Skinner 2009). At the same time wildfire 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 (EA) to document the environmental consequences of 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. In 2004 an EA was completed to document environmental consequences of proposed actions for the 2005 Fire Management Plan. The Finding of No Significant Impact (FONSI) for the EA was signed on 5/29/2005. This plan conforms to that analysis of management activities which were assessed in the EA and approved in the FONSI. In addition, an amendment to the current EA was added which expands the proposed acres to be mechanically treated within the park. The FONSI and Categorical Exclusion (CE) for the amendment can be found in appendix D and D.1.

This plan will implement wildland fire management policies and help achieve resource management and fire management goals as defined in: 1) NPS Management Polices (2006); 2) Lassen Volcanic National Park General Management Plan (GMP 2003); 3) Lassen Volcanic National Park Resource Management Plan (1999b); 4) Federal Wildland Fire Management Policy and Program Review (2001); 5) The National Fire Plan and 6) A 10-Year Comprehensive Strategy (*A collaborative Approach for Reducing Wildland Risks to Communities and the Environment)*.

1.3 Compliance

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.
- 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 United States Fish & Wildlife Service (USFWS) or National Marine & Fisheries Study (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.

1.4 Legal Authorities for this Plan

The management of NPS programs is guided by the Constitution, public laws, treaties, proclamations, Executive Orders, regulations, and directives of the Secretary of the Interior and the Assistant Secretary for Fish and Wildlife and Parks.

NPS policy guidelines, planning documents, and action plans, such as this Fire Management Plan, must be consistent with these higher authorities, and with appropriate delegations of authority. Authority to implement this plan is found in 16 USC 1 through 4 (National Park Service Organic Act), and delegations of authority found in Part 245 of the Department of the Interior Manual.

CHAPTER 2 - POLICY, LAND MANAGEMENT PLANNING AND PARTNERSHIPS

2.1 Fire policy

NPS *Management Policies* (DOI 2006) is the basic Service-wide policy document of the National Park Service. It is the highest of three levels of guidance documents in the NPS Directives System. The Directives System is designed to provide NPS management and staff with information on NPS policy and required and/or recommended actions, as well as any other information that will help them manage parks and programs effectively.

The *Management Policies* section on fire management recognizes that:

"Naturally ignited fire, including the smoke it produces, is part of many of the natural systems that are being sustained in parks. Such natural systems contain plant and animal communities that are characterized as fire-adapted or fire-dependent. They require periodic episodes of fire to retain their ecological integrity and in the human-caused absence of fire they can experience undesirable impacts that diminish their integrity-such as unnatural successional trends, loss of habitat for fire-adapted plant and animal species, or vulnerability to unnaturally intense wildland fire. Other park natural systems are characterized by a natural absence or very low frequency of fire. These systems are at risk of losing their ecological integrity when the natural fire regime is subjected to human interference."

Management Policies also directs that:

Fires that burn natural on landscaped vegetation in parks are called wildland fires. Wildland fires occur from both natural and human sources of ignition. Wildfires may contribute to or hinder the achievement of park management objectives, and management response to each wildland fire is determined by whether or not the fire occurs within prescription as identified in the park's fire management plan. The use of Wildland fire is the management of either planned or unplanned fire to meet objectives specified in Land/Resource Management Plans Prescribed fire is a wildland fire originating from a planned ignition to meet specific objectives identified in a written, approved, prescribed fire plan for which NEPA requirements(where applicable) have been met prior to ignition.

The program of action outlined in this plan is in accordance with direction provided in the current version of *Management Policies*.

The mission of Lassen Volcanic National Park is ""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...." The Act of Congress which established Lassen Volcanic National Park (39 Stat. 442) August 9, 1916, recognized the significance of the area's cultural and natural resources by stating that the Park is: "...dedicated and set apart forever as

a public (park) or pleasure ground for the benefit of the people…and…for the preservation of the natural objects within said park…." This act, like the 1916 Organic Act, did not specify any one feature or ecosystem of Lassen Volcanic National Park as being the most important. Rather, it recognized that all these resources are of value. Therefore, the purpose of Lassen Volcanic National Park is to preserve all aspects of its history and ecological environment, including natural processes, i.e. fire, and to provide for visitor use, unimpaired for future generations.

The program of action outlined in this plan is in accordance with the mission and the establishment purposes of Lassen Volcanic National Park.

2.2 Land/Resource Management Planning (LMP)

Lassen Volcanic National Park's General Management Plan (GMP) was completed in June of 2003. Desired Future Conditions identified in the GMP will guide subsequent updates of this fire management plan. Goals identified in the existing plan (DOI 1975) are:

Conservation of Natural Resources

> To conserve the park's natural resources free from the adverse influences of man while allowing those types of use and development that do not significantly impair park resources.

Research Programs

> To secure adequate information, through research or other means, to facilitate protection of park resources and management of visitor activities in ways that minimize impacts on the park's environment.

Interpretation

> To foster an understanding and appreciation of the sequence of geological forces that created Lassen Volcanic National Park and how these forces affect the environment and ecological communities and provide information assistance appropriate for the safe and enjoyable use of the park resources without impairment of those resources.

Environmental Awareness

> To promote environmental awareness by encouraging the utilization of the park resources by schools and other groups for environmental study areas and cooperate with them in both off-site and on-site program assistance.

Cultural Resources

To identify, inventory, evaluate, preserve, monitor, and interpret the park's cultural resources in a manner consistent with the requirements of historic preservation law and National Park Service policies.

The Park's Resource Management Plan (RMP) identifies several resource management objectives that can be linked directly to the use and management of fire (DOI 1999):

- Restore and maintain the natural terrestrial, aquatic, and atmospheric ecosystem conditions and processes to the degree that is physically possible and politically practical so they may operate unimpaired from human influences.
- Maintain or restore indigenous flora, fauna, and natural communities to the extent possible, to achieve species diversity and community structure equivalent to pre-Columbian times or post-Columbian conditions which would have been created by natural events and processes.
- Protect rare species by measures aimed at preserving habitat and preventing extirpation but which minimize adverse influences on other indigenous species.
- Work cooperatively with other agencies to minimize, mitigate or prevent resource damaging human influences resulting from activities inside and outside of the park boundary.
- Protect, to the degree practical, and when it is not detrimental to park resources, the visiting public from known resource hazards by reducing hazards and/or to advise the public of potential risks.

In areas designated as "cultural zones", identify and preserve or restore elements of the landscape (historic landscape plantings, walkways and historic structures) to give an accurate representation of the historic period.

This fire management plan is a detailed program of action to implement fire management policies and resource management objectives outlined in higher authority policies and plans (i.e. *Management Policies*, GMP, RMP). It has been developed to:

- Identify and protect values at risk through the appropriate response to Wildland fire events;
- Take special precautions to preserve and perpetuate sensitive, rare, threatened, or endangered plant/animal species;
- Expand the prescribed burning program to all ecosystems where fire exclusion has created unnatural fuel loadings;
- Quantify fire behavior and efforts through monitoring and evaluations of all fires in order to refine prescriptions to achieve objectives;
- Research the role of fire in the park's fire-adapted ecosystems. This effort will include monitoring ecological effects of the use of Wildland fire (includes prescribed fires), as well as acquisition of information on fuel accumulations, forest insects and diseases, vegetation dynamics and other topics important to fire management and planning;
- Implement a public information program that includes prevention, education, and interpretation, and ensures that socioeconomic considerations are included with ecological concerns when informing the visitor;

- Comply with air pollution control regulations and smoke management concerns as required by the Clean Air Act and in cooperation with all county smoke agencies;
- Maintain an active fire prevention program to reduce the incidence of human-caused wildfires;
- Prevent fire spread onto adjacent public and private lands by containing all fires within the park boundary; however, wildfires managed for resource objectives may be permitted to spread outside or inside of the park from adjacent, compatible fire management areas within the jurisdiction of involved agencies as allowed by Interagency Agreements.

This plan will help meet objectives of the GMP and RMP through an adaptive management framework that includes planning, research, interdisciplinary objective setting, execution, effects monitoring, evaluation, and recommendations for change.

2.3 Partnerships

This plan was developed from 2001-2004 with an amendment in 2010 this included internal and external interdisciplinary input, and reviewed by appropriate subject matter experts in collaboration with adjacent communities, interest groups, state and federal agencies. Since 2010, annual reviews have been performed and updates have occurred as needed.

CHAPTER 3 - FIRE MANAGEMENT UNIT CHARACTERISTICS

National Park Service wildland fire management activities are essential to the protection of human life, personal property and irreplaceable natural and cultural resources. Additionally, the use of fire as a management tool has become essential to successful completion of the NPS mission. The complex nature of implementing fire management activities requires highly qualified personnel and a structured planning process. The following sections identify available wildland fire management strategies that may be utilized during the life of this planning document. Included here are discussions of general fire management considerations, specific fire management objectives, strategies, and an approach for each of the park's Fire Management Units (FMU).

3.1 Area-wide Management Considerations

As part of the NPS wildland fire management program, Lassen Volcanic National Park embraces the goals established in the 10-Year Comprehensive Strategy (USDA and DOI 2001) which identifies the need to: 1) improve fire prevention and suppression; 2) reduce hazardous fuels; 3) restore fire adapted ecosystems; and 4) promote community assistance.

The Park will administer its wildland fire program in a manner that will:

- Achieve maximum overall benefits and minimize damages of Wildland fire within the framework of land use objectives and resource management plans, while giving primary consideration to firefighter and public safety.
- Educate employees and the public about the scope and effect of wildland fire management, including fuels treatments, resource protection, prevention, hazard/risk assessment, mitigation and rehabilitation, and fire's role in ecosystem management.
- Stabilize and prevent further degradation of natural and cultural resources lost and/or damaged by impacts of wildland fires and/or fire management activities.
- Maintain the highest standards of professional and technical expertise in planning and safely implementing an effective wildland fire management program.
- Integrate fire management with all other aspects of park management.
- Manage wildland fire incidents in accordance with accepted interagency standards, using appropriate management strategies and tactics and maximize efficiencies realized through interagency coordination and cooperation.
- Scientifically manage wildland fire using best available technology as an essential ecological process to restore, preserve, or maintain ecosystems and use resource information gained through inventory and monitoring to evaluate and improve the program.
- Protect life and property and accomplish resource management objectives, including restoration of the natural role of fire in fire-dependent ecosystems.
- Effectively integrate the preservation of wilderness including the application of "minimum requirement" management techniques into all activities impacting this resource.

All wildland fires occurring in the park will be classified as either wildfires (unplanned ignition) or prescribed fires (planned ignition). Selected strategies will consider firefighter and public safety as the first priority then resource values to be protected. This plan will make available a full range of strategic and tactical options, as described in Section 4.1.2

A systematic decision making process will be used to determine the most appropriate management option for all unplanned ignitions, and planned prescribed fires that are no longer meeting resource management objectives. The full range of strategies will be considered, but any methods used to suppress wildland fires should minimize impacts of the suppression action and the fire, commensurate with public and firefighter safety, effective control and resource values to be protected.

3.1.1 Wildland Fire Management Goals

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) and 2009 Guidance for Implementation of Wildland Fire Policy. Fire management action must also comply with laws such as the National Park Service Organic Act, National Environmental Policy Act (NEPA), 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 2003), Natural and Cultural Resource Management Plan (NPS 1999), and previous fire management plans also provide specific direction regarding park-specific resources and stewardship goals.

Within the framework of larger agency policy and environmental law, the park's staff has identified the following goals for the fire management program. Each goal is further refined through associated objectives, which aid managers in measuring the success of fire management actions. An adaptive approach will allow the park fire program to refine prescriptions and fire applications to assure desired outcomes are achieved.

Fire Management Goals

1. Ensure that firefighter and public safety are the first priority in every fire management activity.

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 fire regimes to the maximum extent practicable so park ecosystems exhibit a high degree of health and function.

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 the park's undeveloped landscapes by implementing fire regimes compatible with contemporary conditions and ecological goals.
- Promote species and habitat 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 (Fire Return Interval Departure) values.
- Reduce the introduction, abundance, and spread of non-native plant species, through applying the Best Management Practices (Appendix R) to fire activities and following up with aggressive post-fire treatment.
- 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 the park 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.
- Research effects of fire on non-native plant communities.
- Develop a resource advisor guide for the park and assure resource advisors are assigned to all incidents.

3. Protect Cultural Resources (including prehistoric sites, ethnographic resources, cultural landscapes, and historic districts and structures) from adverse influences of wildland fires (planned and unplanned ignitions), and manual/mechanical treatments.

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 inventories and develop treatment recommendations.
- Complete structure assessments and develop mitigations.
- Develop fire management projects designed to create fire safe landscapes surrounding important sites.

4. Protect Sensitive Park Resources from adverse influences of wildland fires and manual/ mechanical treatments.

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

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

Strategies:

- Assure review of all fire planning documents by Natural Resource staff and the network Fire Ecologist.
- Complete surveys and update inventories for sensitive species.
- Complete surveys for sensitive habitats such as wetlands and riparian areas
- Complete surveys for nonnative plant species.

- Develop project specific mitigation actions for sensitive species, sensitive habitats, and nonnative plants identified during pre-project surveys.
- Complete habitat assessments for species such as spotted owls and Cascades frogs, developing wildfire mitigation strategies.

5. Reduce hazardous accumulations of fuels near structures, roadways, wildland-urban interface areas, and cultural resources such as historic structures.

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:

- Use manual and mechanical treatments to reduce hazard fuels in areas directly adjacent to park facilities.
- Use prescribed fire and manual/mechanical hazard fuel reduction in strategic locations to reduce the threat of wildfire spreading outside the park boundaries.
- Apply manual/mechanical hazard fuel reduction adjacent to targeted significant cultural and historic sites to enhance protection from fire damage.
- Monitor the effects of prescribed fire and manual/mechanical 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.

Desired Outcome: Lassen Volcanic National Park 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 wildfire organization and a complex prescribed burn organization composed of park 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 park 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.

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 park staff on wildfires to a five year average of 900 shifts per year. Complete joint wildfire management agreement/plan with United States Forest Service (USFS) to fully integrate the use of wildland fire across agency boundary's.

Strategies:

- Coordinate preparedness and fuels management activities with the following entities: CalFire (Tehama-Glenn and Shasta Unit), United States Forest Service (Lassen National Forest) and the Bureau of Land Management (NOD).
- Support the Susanville Interagency Emergency Command Center (SIFC).
- Status available resources with SIFC 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 across unit boundaries with USFS and CalFire.
- Support the park's Natural Resource Management Division with staffing and financial resources needed to conduct pre and post project survey efforts.
- Support National Park Networks 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.

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

Five Year Objective: Maintain balanced budgets and target treatment costs at less than $200 per acre over the next five years.

Strategies:

- Follow cost containment guidelines for all fire management activities.

- Utilize NPS network 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 activities with all other aspects of park management and operations.

Desired Outcome: Fire Management actions are fully integrated with all park functions and the Fire Management Division supports overall goals and objectives of the park.

Five Year Objective: Park fire management activities receive collective input, review and support from 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 the Klamath Network fire ecologist.
- Collaborate with park natural resource management staff during the planning, implementation and post-burn monitoring phases of prescribed fire and other management treatments.
- Coordinate fire program outreach with park interpretation staff.
- Request dedicated staff time from cultural resource staff to assist with project compliance and review.
- Keep all park employees informed of current and up and coming fire management activities.

3.1.2 Wildland Fire Management Options

A wildland fire or portions of a wildland fire may be concurrently managed for one or more objectives. Those objectives, and the ability of a fire to meet those objectives, can change as the fire spreads across the landscape, encountering new fuels, weather, social conditions and governmental jurisdictions.

Wildfire Suppression

The suppression of select wildfire events is an integral part of land management and a significant part of all National Park Service programs. The decision to take suppression action on fires or parts of fires is influenced by the safety of firefighter and public, values at risk, incident specific conditions and the availability of firefighting resources. All firefighting will be implemented in a manner providing the highest protection for life and property while minimizing the impacts of management actions commensurate with the values at risk.

The magnitude of wildfire response varies tremendously between incidents and should be matched to the current and predicted fire behavior. Tactics include but are not limited to the construction of fire-line with crews or mechanical equipment, the delivery of water with aircraft or engines, and the use of firing operations. All tactics and strategies are aimed at safely and efficiently extinguishing or confining fire spread.

Depending on the size and complexity of the fire event, an appropriate organization of overhead and firefighting resources will be deployed. Some combination of tactical options will be selected by fire managers, depending on the anticipated consequences and management objectives for the area threatened. Wildfires evolving beyond the initial action will follow current national direction and utilize decision support processes and analysis that help determine and document decisions regarding the management of individual ignitions. These processes may include the Wildland Fire Decision Support System (WFDSS) and analysis tools such as Farsite, RERAP, and FSPRO. Initial action on human caused wildfires originating in the park, ignitions occurring in the Boundary Fire Management Unit (FMU), and ignitions that threaten valued resources will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

Use of Wildland Fire

Use of Wildland fire is the management of either planned or unplanned ignitions to achieve land and resource management goals. Preference will be given for natural ignitions to be managed in meeting the role of fire as an ecological process. The decision support process encourages strategies to manage fire to restore and maintain the natural fire regime where safe and possible. Each ignition is assessed relative to its location and specific parameters of topography, weather, fuel types, projected fire spread and resource risk. Selected fires or parts of fires which have resource based objectives are monitored closely and suppression actions implemented when effects are no longer deemed beneficial The decision to use wildfire for benefit to the resource is dependent on but not limited to desirable weather conditions, public and firefighter safety, as well as the availability of resources.

Prescribed Fire

Prescribed fire is the use of planned ignitions to achieve specific goals and objectives. Projects may be targeted at reducing the threat of catastrophic fire, achieving desired vegetation patterns, or creating specific landscape conditions. In all cases, prescribed fire should be implemented based on clearly articulated objectives and supported through careful monitoring.

Prescribed fire applications occur at varying spatial scales based on operational constraints and ecological needs. Prescribed fire plans, outlining specific conditions under which projects can be implemented, are required for all planned ignitions. Standards for plan

development and review are outlined in Chapter 7 of RM 18 and The Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide.

Prescribed fire is an option for all the identified FMUs in the park. Still the highest priority burn units tend to occur in low-elevation forests where the historic fire regime included short return intervals and the dominant vegetation appears well adapted to low-intensity fire. Fire frequencies within this portion of the landscape may have departed from historical frequencies by one or more return intervals, representing the Fire Regime Condition Class (FRCC) values of 2 and 3. Appropriately targeted prescribed fire will aid in moving these stands toward desired conditions.

Non-Fire Applications

A significant portion of the risk associated with the management of fire is related to the amount and arrangement of organic fuels. In some cases, significant risk can be mitigated by reducing or changing the amount and arrangement of fuels on the landscape. Non-fire applications can be broadly characterized in two groups: Manual and Mechanical treatments. In all cases, the focus of the treatments is to alter the arrangement of fuels and reduce the likelihood that fire will transition from surface fire spread to crown fire.

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 will 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.

Mechanical treatments include the use of larger mechanized equipment such as front end loaders, tub grinders, rubber tired skidders, feller bunchers and other large equipment in order to move and process larger material. Mechanical treatments are only considered for developed and non-wilderness areas of the park that are experiencing unnatural build up of hazardous fuels and ecosystem or forest health decline. In some areas, stands of old growth mixed conifer are experiencing insect and disease damage which is killing many large trees. For ecosystem, forest health and the safety of visitors, larger trees, as well as dense pole size thickets, need to be removed.

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

The park landscape has been divided into two Fire Management Units (FMU) based on location relative to jurisdictional boundaries, management designations and desired outcomes. As the name implies, the Boundary FMU follows the north, west and south boundaries of the park, along with Mineral Headquarters. The Use of Wildland Fire FMU is made up of the interior portion of the park and is closely aligned with designated wilderness. The long term treatment strategies for each of the FMU's are described in Table 3-1. The two units are very similar in terms of vegetation patterns, fuel loading and topography. The distinction between the two units lies in the degree to which various treatment strategies can be effectively utilized. Prescribed fire and manual/mechanical treatments are the focus along the park boundary in an effort to create a zone in which fire spread can be more easily managed. Based on a Fire Return Interval Departure (FRID) analysis, this also appears to be the area of the park with the highest need for fire applications. Successful implementation of fuels treatments within the Boundary FMU will also allow the park staff to take advantage of the use of Wildland fire by utilizing ignitions to achieve resource objectives within the Use of Wildland Fire FMU. All available treatment types are proposed in each FMU, with the exception of mechanical treatments which are not possible in designated wilderness. This landscape management approach should result in improved ecological conditions and increased program efficiency.

Table 3-1 Fire Management Unit Descriptions

Fire Management Unit (FMU)	Total Acres in FMU	Non-Burnable Acres	Proportion of FMU to be Treated over 10 Years	Long-term Treatment Schedule Summary			
				Use of Wildland Fire	Prescribed Fire	Manual Treatments	Mech. Treatments
Boundary	32,160	284	81%	1,000	18,000	800	6432
Use of Wildland Fire	74,349	8068	46%	20,000	14,000	200	550
Total	106,509	8352	57%	21,000	32,000	1000	6982*

Proportion of Park Area Treated by Each Fire Management Strategy	20%	30%	<2%	7%

Yearly amounts may vary according to weather and other planning/implementation considerations.*Acres proposed for treatment, actual treatment acres may be less due to implementation considerations.

Features Common to all Fire Management Units

Fire Season

The typical fire season for the park occurs between July 10 and October 15 of each year. This is based on a historical fire weather analysis with data collected from the Manzanita Lake and the Chester Remote Area Weather Station (RAWS) and individual fire incident reports dating back to 1961. The highest incidence of lightening occurs during this time period, along with the highest mean daytime temperatures and lowest mean daytime relative humidity's. Before and after these dates, fuel moistures and persistent snow-pack reduce the burning indices to near zero.

Fuel Characteristics

Within the timber litter fuel complex, most of the park's fuel types would fall under Fire Behavior Prediction System (FBPS) fuel model 8 (1978 National Fire Danger Rating System (NFDRS) fuel model H) consisting of closed canopy stands of short-needle conifer; and FBPS fuel model 10 (1978 NFDRS fuel model G) which is short-needle conifer stands with heavy accumulations of dead/down material. Many of these stands are dominated by Lodgepole pine (*Pinus contorta*) and within stands of this nature the surface fuels often burn more readily then typical fuel model 10 examples. There is a smaller component of FBPS fuel model 9 (1978 NFDRS fuel model U) where there are stands dominated by Jeffrey pine (*Pinus Jeffreyi)*. The remainder of the landscape is captured in FBPS fuel models 2 (1978 NFDRS fuel model C) for the open pine stands with grass understory and FBPS fuel model 5 (1978 NFDRS fuel model F) for areas of low shrub cover dominated by pinemat manzanita (*Arctostaphylos nevadensis)* or more developed montane chaparral including Greenleaf manzanita (*Arctostaphylos patula)*, snowbrush ceanothus *(Ceanothus velutinus*), and bush chinquapin *(Castanopsis sempervirens)*. Significant areas in the park have a low occurrence of surface fuels. Past disturbance and edaphic conditions can result in open stands of large diameter trees with little ability to sustain surface fire spread.

Management Considerations

Lassen Volcanic National Park is managed for wilderness values. All fire management activities within proposed and designated wilderness will employ the lowest impact approach based upon a Minimum Requirement Analysis. All fire management activities within the designated or proposed wilderness will follow established Minimum Impact Suppression Tactics (MIST) guidelines.

Access to most back country areas of the park are limited to existing paved roads within the front country and some improved gravel roads on the adjoining National Forest. Approximately 160 miles of recreational trails and former fire patrol roads occur in the wilderness and backcountry, forming a network from which fires can be accessed and

managed. Within wilderness boundaries former fire patrol roads may only be accessed by foot.

Water sources are very limited in the park and are generally associated with a few large lakes. A list of approved water source and dip sites can be seen in figure 4.1. Current restrictions are limited to double dipping. Aviation resources should not dip out of more than one water source during the same mission. All potential new water sources must be approved by the Resource Advisor.

For some portions of the park, smoke impacts to local communities could be a concern. Smoke management plans will be developed for all prescribed fires and conditions monitored closely. Undesirable smoke impacts could warrant a change in management objectives on unplanned ignitions as well as aggressive management action on planned prescribed fires.

Specific Fire Management Objectives (i.e. resource target conditions)

Lassen Volcanic National Park covers approximately 311 square miles of the southernmost peaks of the Cascade Mountain range. Elevation in the park varies from 5302ft at Warner Valley to 10,456ft on Lassen Peak. Most of the park below 7874ft is forested, with the distribution of conifer species being strongly correlated with elevation (Parker 1991). Red fir *(Abies magnifica)* and lodgepole pine *(Pinus contorta var. murrayana)* dominate upper elevations (6890ft to 7874ft), whereas white fir (*A. concolor)* and Jeffrey pine (*P. jeffreyi)* are most abundant on lower slopes (<6890ft). Distribution of these tree species vary considerably within individual forest types. Lodgepole pine can occur in nearly pure stands on the lower 1/3 of slopes. Stands dominated by mature white fir are also represented and are likely the result of specific disturbance histories. Limited stands of mountain hemlock *(Tsuga mertensiana)* occur along the treeline above7874ft. Table 3-2 summarizes the distribution of common tree species by forest types found in the park.

Other minor vegetation communities occur in the park. Montane chaparral, in scattered stands, can be found at lower elevations and drier aspects. Dispersed within forest communities, low stands of pinemat manzanita connect individual stands of red fir and lodgepole pine. Seasonally wet meadows are also common in valley bottoms, along streams and lake margins (White et al 1995). See Figure 3.1 for a generalized vegetation map of the park.

Table 3-2 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	#			
Populus tremuloides	#	#	#		
Abies concolor	#	M	#	#	
Pinus contorta			M	#	
Abies magnifica		#	#	M	#
Pinus monticola		#		#	#
Tsuga mertensiana			#	#	M
Pinus albicaulis					#

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

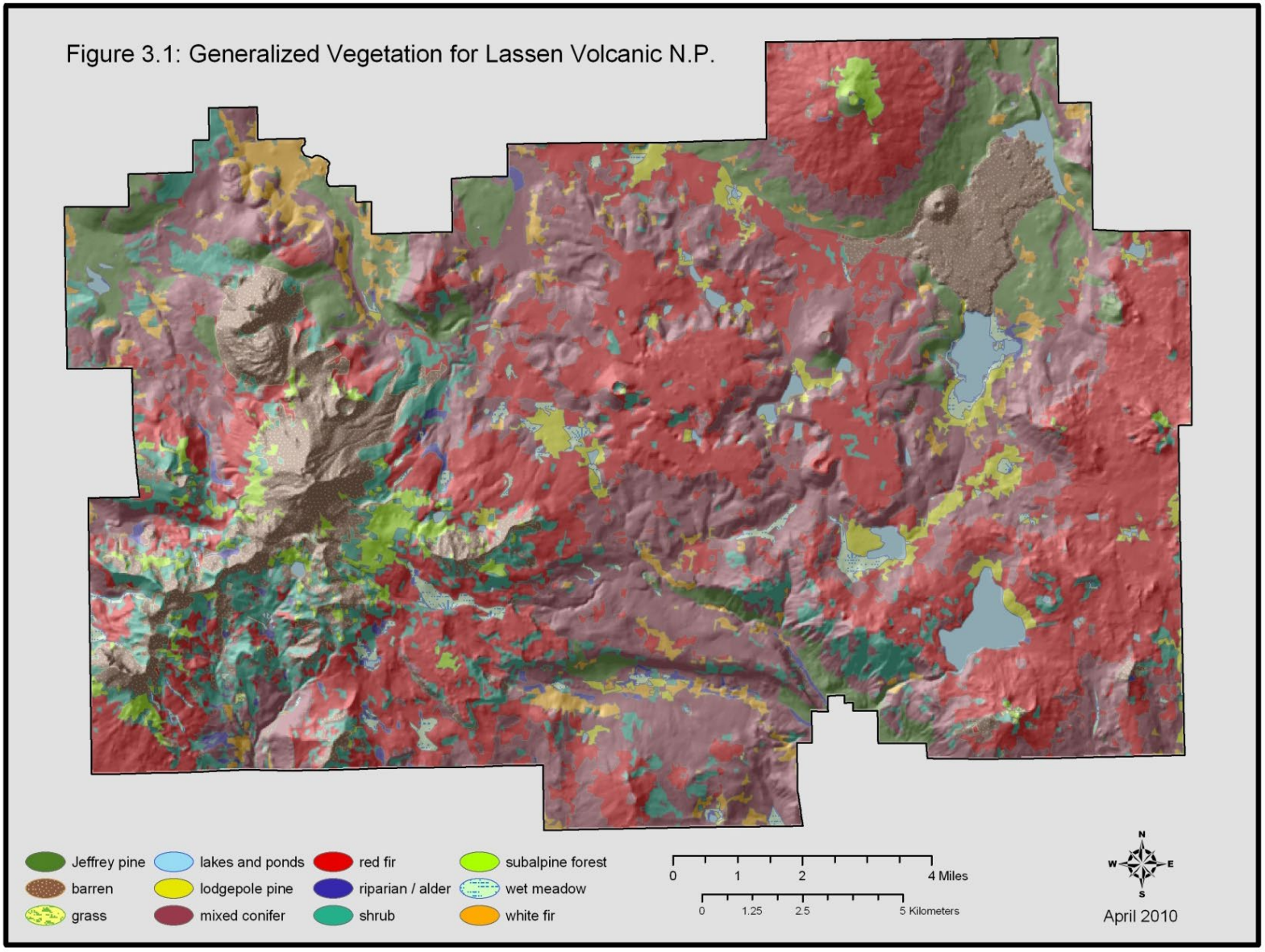


Figure 2 – Generalized Vegetation

Table 3-3 summarizes target conditions in terms of fuel reductions and forest structure for each of the dominant vegetation types. It is important to note that targets will change as management of these areas moves from restoration to maintenance conditions. For additional information, see the FMP chapter on Monitoring and Evaluation (Chapter 5) or Appendix F which describes the wildland fire monitoring program in detail.

Table 3-3 Resource Target Conditions by Vegetation Types

FMU Identifier (Vegetation Type)	**Fuel Reduction Goal [restoration phase]**	**Stand Density by diameter class and species composition [restoration phase]**	**Fuel Load Distribution (% of landscape) [maintenance phase]**	**Gap/Patch Size Distribution (% of landscape) [maintenance phase]**
Jeffrey Pine	60-90% total fuel reduction	20-50 TPA > 12" dbh < 400 TPA 2-6" dbh (5-50% pine,0-70% shrub, 0-25% grass/sedge)	20-40% 5-30 tons/acre 20-50% 30-60 tons/acre 5-20% >60 tons/acre	75-95%: .25-2.5 ac 5-25%: 2.5-25 ac <1%: 25-247 ac
White Fir	60-90% total fuel reduction	30-80 TPA > 12" dbh < 600 TPA 2-6" dbh (30-70% fir 0-20% pine 0-20% other)	1-25% 5-30 tons/acre 30-70% 30-60 tons/acre 5-20% >60 tons/acre	70-95%: .25-10 ac 5-30%: 12-25 ac < 1%: 25-247 ac
Lodgepole Pine	0-35% total fuel reduction	Unknown density (40-90% pine,0-50% hemlock, 0-10% fir)	Not yet developed	80-99%: 2.5-10 ac 1-20%: 12-741 ac

				<1%: > 741 ac
Red Fir	35-55% total fuel reduction	Unknown density (15-60% fir, 0-30% pine 0-10% hemlock)	Not yet developed	80-99%: .25-247 ac 1-20%: 247-4942 ac <1%: > 4942 ac
Red Fir/Western White Pine	35-55% total fuel reduction	Unknown density (15-60% fir, 0-30% pine 0-10% hemlock)	Not yet developed	80-99%: .25-247 ac 1-20%: 247-4942 ac <1%: > 4942 ac
Mountain Hemlock	0% total fuel reduction	Unknown density (15-60% hemlock, 0-40% fir 0-10% pine)	Not yet developed	80-99%: .25-247 ha 1-20%: 247-4942 ac <1%: > 4942 ac
Aspen	The target in aspen is more regeneration and reinvigoration of stands, not canopy reduction or structural changes	Unknown density	Not yet developed	Not yet developed

Information used to develop the target conditions included research data (where available), historic photos, written records, and expert opinion. These target conditions are an attempt to describe an ecologically desirable landscape as well as providing metrics for defining management success. They reflect our best ecological intuition, but were clearly developed in the context of imperfect knowledge. With the aid of monitoring data and new research, targets will be periodically reviewed and revised when necessary. The fire management program will be reviewed annually and treatments assessed to determine if the landscape is progressing toward these desired future conditions.

Native Vegetation

Wet and Dry Meadows (900 ac)

Herbaceous communities are scattered throughout the park and range from densely vegetated, wet meadows of monocotyledonous species including sedges *(Carex spp.),* and perennial grasses (*Agrostis thurberiana, Deschampsia caespitosa,* and *Muhlenbergia filformis)* (Taylor 1990b); to steep slopes or larger gaps within forested areas composed of mostly broad-leaved dicotyledonous species such as satin lupine *(Lupinus obtusilobus),* mule ears *(Wyethia mollis),* and *Artemisia douglasiana. Alnus tenuifolia* (thinleaf alder) is a tall riparian shrub that is incidental to meadows *(*Pinder et al. 1997).

These communities do burn, infrequently, but are generally resistant to fire spread. During fire season, many of these vegetation types sustain high fuel moisture and may act as effective fire breaks. In the case of broad-leaved herbaceous communities, fuel loads are low and exist in a discontinuous arrangement. There appears to be little need for management ignited fires in these community types.

Montane Chaparral (2,000 ac)

Pinder et al. (1997) found that most chaparral species in the park occur below 7544ft on relatively xeric sites (e.g. warmer aspects and steeper slopes). These scattered shrub fields tend to be small in size and are generally dominated by greenleaf manzanita (*Arctostaphylos patula)*, snowbrush ceanothus *(Ceanothus velutinus*), and bush chinquapin *(Castanopsis sempervirens).*

Fire is an important disturbance in the montane chaparral communities with return intervals ranging from 10-75 years. Mean Fire Return Intervals (FRIs) tend towards the higher end of this range. Fire events tend to burn with high severity and generally require an alignment of strong winds and low relative humidity's (RH). Chaparral shrub species tend to have well developed fire adaptations. Greenleaf manzanita for example, is both a facultative sprouter and seeder. Many members of the *Ceanothus* genus are obligate seeders requiring several fire specific cues to elicit germination. Facultative sprouting is also common among other shrub species from this community (Keeley and Keeley 1993).

Although fire plays an important role in regeneration of chaparral, these communities can also persist for long periods in the absence of fire events (Keeley and Fotheringham 2001). The distribution of montane chaparral within the park, as well as its limited spatial extent, reduces the need for extensive prescribed fire treatments. Some chaparral communities are included within larger burn blocks within the Boundary FMU and will be treated with prescribed fire.

Jeffrey Pine and White Fir (23,000 ac)

Jeffrey pine and white fir forest types are found below 6233ft with varied composition, although either species may be strongly dominant on individual sites. 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 other forest types in the park (Parker 1991).

The mixed-conifer forests within the park have experienced significant ecological change with alterations in fire regimes since the early 1900s. Fire exclusion has initiated a significant increase in shade tolerant white fir. This increase density of understory trees has made high-severity fire events more likely. Pre-settlement fire regimes, in this vegetation type, were characterized by frequent, low severity events of limited spatial extent. The historical mean fire return interval is 16-30 years (range 9-38 yrs) (Taylor 2000). Alterations in forest structure now increase the chance of fires transitioning from surface spread to crown fire. The resulting high severity fires may have significant impacts on recovery and initiate type conversion to some other plant assemblages or understories dominated by non-native herbaceous species.

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 be helpful in the control of dwarf mistletoe infestation by pruning dead branches and consuming low hanging brooms.

The mixed conifer forests of the park are a high priority for prescribed fire and manual/mechanical fuels treatments. Fire applications here are focused on returning stands to target structural conditions and improving composition of dominant tree species. Much of this forest type occurs in the Boundary FMU and is currently captured in prescribed fire units. Treatments here will be evaluated and adapted to assure stand conditions are improving and negative impacts (i.e. mortality of mature trees) do not exceed acceptable levels.

Lodgepole Pine (14,000 ac)

Lodgepole pine stands occur between 6234ft and 7546ft and are most common on flat, valley bottom sites or lower slopes, often in margins of meadows and lakes or on nutrient-poor, excessively well drained soils. In this forest type, lodgepole pine is strongly dominant, with red and white fir and mountain hemlock occurring as a minor associate. Climax stands of lodgepole pine do appear to exist within the park boundary, though many stands may be seral in nature. In these stands, given long enough fire free intervals, lodgepole may be replaced by red fir and mountain hemlock (Agee 1993).

Lodgepole pine forests, in the park, are characterized by a mixed-severity fire regime. A combination of low, moderate and high severity fires occur in space and time. Most stands originated from more wide spread stand replacement-type fires. In Oregon, Stuart (1984) documented a fire free interval of 60 years and located one stand that had been fire free for 350 years. Shorter fire return intervals have been documented in the park, with a range of 28-54 years (Taylor 2000). FRI may be strongly correlated with site factors and stands bordering higher productivity forests may experience more frequent fires.

Most Lodgepole pine stands appear to have multiple age classes (Stuart et al 1989) generated from fire events or mountain pine beetle attacks. Many stands appear to follow a disturbance pattern of insects, fire and fungal pathogens. Strong winds are likely associated with the rare stand replacement fire in the Lodgepole pine type. Mature Lodgepole pines seem quite resistant to fire damage.

Within the park, Lodgepole pine occurs in a matrix of other forest types, primarily red fir and red fir/western white pine stands. Prescribed fire is planned for many of these areas to reduce fuel loads and the density of small diameter white fir. Burning in pure Lodgepole pine is often difficult due to the lack of fine, surface fuels. Much of the fire spread in these stands occurs through log to log burning and occurs over long periods of time. Slow mixed intensity fire behavior in these stands makes them excellent candidates for meeting resource objectives through the use of Wildland fire.

Red Fir (49,000 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 forests are found between 6522-7874ft 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. Trees often grow to large diameters and occur in relatively high densities given the size of the individuals. It is most often found in association with western white pine and, to a lesser degree, with lodgepole and Jeffrey pines, white fir and mountain hemlock.

Red fir forests have a moderate severity fire regime, with fire frequencies and intensities intermediate to those of other Pacific Northwest forests (Agee 1983). Mature red fir appears relatively fire tolerant. Determining fire return intervals for these forest types is difficult. Many scars are grown over and true fir tends to rot easily. Many fires burn with low intensities leaving little scarring. Still, a range of fire frequencies of 4-127 years (mean 41 yrs) appears in the literature. Within Lassen Volcanic National 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 the park have been affected substantially by fire exclusion over the past 80-100 years (Taylor and Halpern 1991, Taylor 2000). Recent fires managed for resource objectives have exhibited a complex mosaic of severity with low intensity fire dominating most of the burn area.

Wind is another important disturbance factor in red fir forest (Taylor and Halpern 1991). Due to the small scale of wind throw, there appears to be little interaction between these events and fire. Kilgore (1971) did note increased intensities in stands with down, heavy fuels.

Stand development patterns in red fir forests are complex. Red fir is both fire-tolerant and shade-tolerant. These stands seem to be persistent 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 re-colonization by red fir and other species. These stands tend to have high levels of tree diversity. In moderate-severity patches, many mature red firs remain and seedlings do well in the resulting partially shaded conditions. These post fire stands tend to be more diversely structured with multiple age classes represented. In low-severity patches, understory trees are killed but little growing space is opened for regeneration. Red fir reproduces slowly in small gaps where sun flecks occur.

Most red fir forests do not appear to be experiencing major alterations in structure and composition due to fire management policy. Although some stands may be approaching twice the average fire return interval, these same stands show fire-free intervals longer than those resulting from fire exclusion. Due to minor alterations in fire regime, these stands are excellent use of wildland fire candidates. The variable severity of fire regimes in red fir suggest most fires will behave within controllable levels. High-severity runs will likely remain small, due to the patchy mosaic of fuels in this landscape. Given the stochastic nature of this forest type, no central tendency of stand age, structure or composition would remain stable. Supporting as much use of wildland fire as is safely possible should be the goal for this vegetation type.

Mountain Hemlock (7,000 ac)

Mountain hemlock stands occur from 7874 to 8530ft 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 is a thin-barked species susceptible to fire damage. Most fire events, regardless of intensity, result in stand replacement. 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 fire behavior in mountain hemlock forests. However, near treeline, mountain hemlock forests have increased in density since the mid 1800's due to climate change (Taylor 1995).

Little active fire management is needed in these forest types and no focus prescribed fire or fuels treatment is planned. Taking advantage of the use of Wildland fire is certainly a possibility, though most fires occurring at this elevation remain small and possess little potential for large fire growth.

Aspen (500 ac)

Small stands of aspen (*Populus tremuloides*) occur throughout the park at elevations up to 7,900 feet. Many became established as the result of disturbance, whether volcanic eruption, landslide, or fire. Aspen tends to become established in open areas with moist, but not wet, soils, often adjacent to seeps, springs, and streams. This species is unique among the forest trees in the park in that it reproduces primarily by suckering from an underground root system. The absence of fire allows conifers (primarily white fir) to encroach upon aspen stands, and, within the park, this has resulted in a decrease in the recruitment of young trees (decreased suckering), a decline in herbaceous understory species richness, and increased litter depth.

Aspen plays a much more important role in the ecology of the park than its limited extent and small occupied area would suggest. Aspen stands are used by many species of wildlife and are important in the life cycles of some, including deer, cavity-nesting and insect-eating birds, and Northern goshawks.

Planned and unplanned fire, as well as manual and mechanical treatments, can potentially play a critical role in maintaining and reinvigorating existing stands of aspen. Many of the stands in the park consist of large trees with no suckering evident. Other stands are clearly suppressed by the growth of conifers that shade out the young trees. The damage sustained by stems when cut or burned stimulates sprouting by the roots to form a new generation of trees.

Rare & Sensitive Plants

The vegetation of Lassen Volcanic National Park (LAVO) is varied and complex. Approximately 800 vascular plant species are thought to occur in the park and about 140 non-vascular plants have been documented from the park. More than fifty plants are formally listed as rare. For many of these species, fire plays a role in the continuity of their habitats by reducing fuel accumulation and providing for open habitat and the encouragement of reproduction. Certain fire events or fire management actions may injure or kill individual plants in the short term while overall long-term effects may be beneficial. Many of LAVO's rare plant species are associated with aquatic or alpine habitats and are relatively unlikely to be directly impacted by fire management activities. The occurrence and distribution of many of LAVO's vascular and non-vascular plants is limited because of a lack of funding for appropriate survey work.

At the present time, LAVO has one federal candidate species, *Pinus albicaulis,* one critically endangered California State listed plant *Panicum acuminatum* var. *thermale*, and more than fifty plant species listed by the California Native Plant Society (CNPS). One moss species is endemic to LAVO (*Haplodontium tehamensis*) as is one vascular plant species (*Castilleja lassenensis*), along with several other species in LAVO which are globally rare (e.g. *Smelowskia ovalis* var. *congesta*). The park has at least two additional mosses that, in California, are only known from LAVO (e.g. *Marsupela sprucei, Tetrodondium brownianum*), detailed below.

Federal listed plant species The Federal Endangered Species Act of 1973, as amended, requires federal agencies to consult with the USFWS before taking actions that could: jeopardize the continued existence of any federally listed plant or animal species or species proposed for listing; or could result in the destruction or adverse modification of critical or proposed critical habitat. At the present time no such species are known to occur within LAVO. However, there is a federal **candidate** plant species; whitebark pine (*Pinus albicaulis*), known from several high elevation areas within the park.

California listed plant species There is one plant species in LAVO that is listed by the state as critically endangered; *Panicum acuminatum* var. *thermale,* known from several of Lassen's hydrothermal areas.

CNPS maintains the most extensive and most current assessments of the conservation status of California's rare, threatened, and endangered plants (ferns, fern allies, gymnosperms, flowering plants). The CNPS also evaluates rarity and endangerment of California's bryophytes (mosses, liverworts, and hornworts http://www.rareplants.cnps.org/glossary.html#status). Presently there are 53 CNPS listed rare species that occur or are very likely to occur in LAVO (Table 1). These species are considered restricted and limited throughout all or a significant portion of their range, and

may represent disjunct populations at the extremes of their range. Within suitable habitat in LAVO, several of these species may have a substantial population.

LAVO Special Status Species Many federal agencies, including NPS units, maintain a formal inventory of so called special status/special interest species within their local management units. Such a unit level special status plant list typically includes two different groups of species:

GROUP I are species that are (or soon could be) rare and would be eventually be formally recognized as such.

- species with distinctly limited and declining distribution in the regions, such as *Salix petrophila* due to regionally declining snowmelt habitat.
- species in taxonomic reevaluation (e.g. *Orobanche californica* ssp. *grayana* is to be described as a separate and as such, rare taxon).
- species in taxonomic dispute, e.g. *Pinus ponderosa* var. *washoensis* is by some authors recognized as distinct taxon *Pinus washoensis,* and as such would deserve listing.
- species proposed for listing yet to be evaluated, e.g. *Polytrichastrum sexangulare, Andraea nivalis*.
- species not yet proposed for listing (e.g. *Marsupella sprucei*) but apparently regionally rare.

GROUP II contains species that are apparently rare or under-recorded within the management unit, but that are more widespread elsewhere in California. For example, the occurrence of *Cercocarpus ledifolius* var. *intermontanus* at Butte Lake is the only known location of the species within LAVO. The population identifies a habitat that is not represented anywhere else in the park. Such unique habitats warrant "heightened management concern" (Natural Resources Management Guidelines; NPS-77), and where "the National Park Service will inventory, monitor, and manage state and locally listed species in a manner similar to its treatment of federally listed species to the greatest extent possible. In addition, the Service will inventory other native species that are of special management concern to parks (such as rare, declining, sensitive, or unique species and their habitats) and will manage them to maintain their natural distribution and abundance" (NPS Management Policies, 2006).

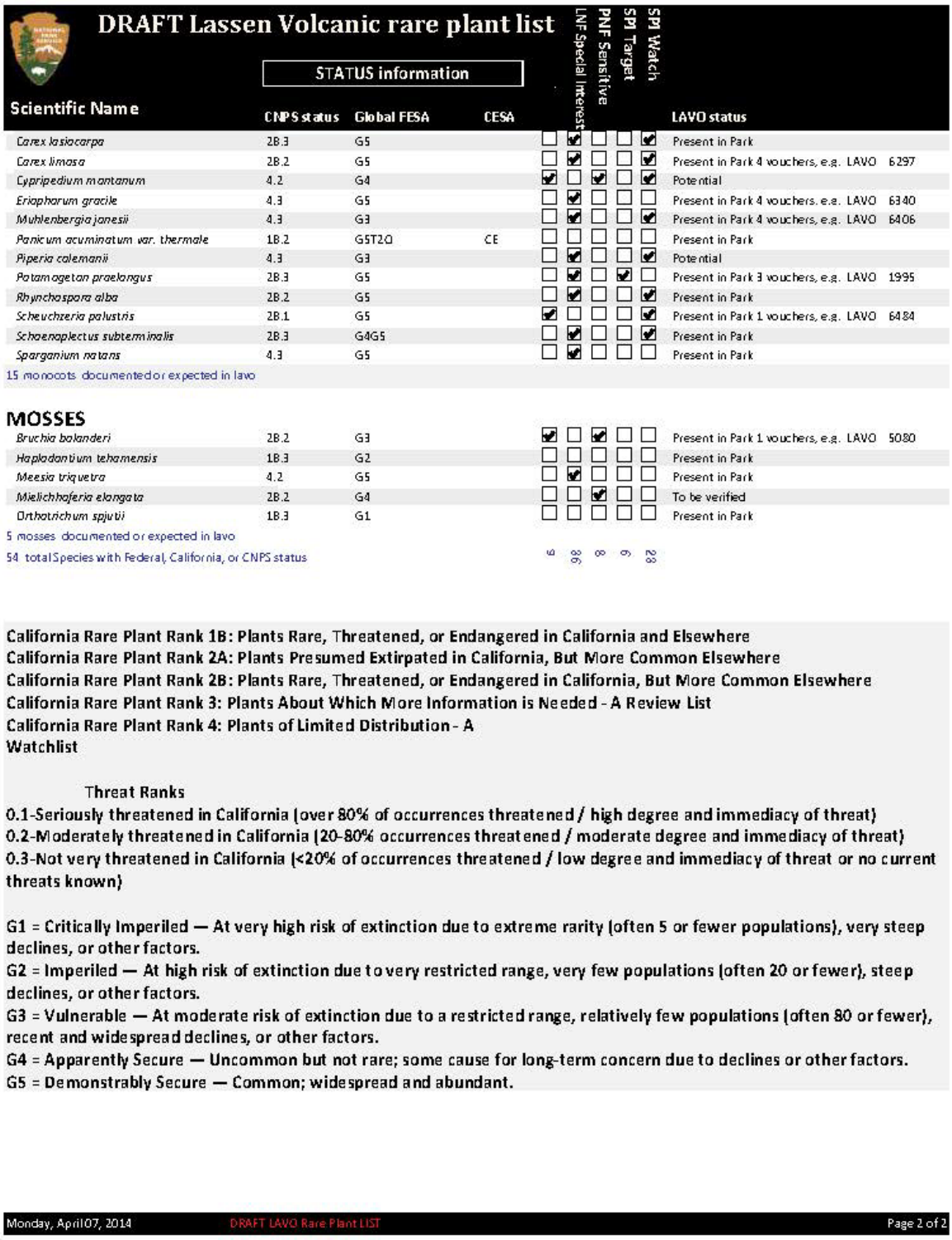
At the present time there are 90 of such 'park rare' species with a limited distribution in Lassen (GROUP I and GROUP II). With detailed inventory work, many of these species are likely to be found too common to warrant management concern, and therefore the list is not specifically included in the FMP beyond the one specifically listed above. As LAVO resource managers update the list, additional species will be added to a vetted "LAVO special status species plant list.

DRAFT Lassen Volcanic rare plant list

STATUS information

Species with Federal, California, or CNPS status

Scientific Name	CNPS status	Global FESA	CESA	LNF Special Interest	PNF Sensitive	SPI Target	SPI Watch	LAVO status
DICOTS								
Arnica fulgens	2B.2	G5		☐	☑	☐	☑	☐ Present in Park
Betula glandulosa	2B.2	G5		☐	☑	☐	☐	☑ Potential
Brasenia schreberi	2B.3	G5		☐	☑	☐	☐	☐ Potential
Campanula scabrella	4.3	G4		☐	☑	☐	☐	☐ Present in Park
Campanula wilkinsiana	1B.2	G2		☐	☐	☐	☐	☑ Potential
Claytonia palustris	4.3	G3		☐	☑	☐	☐	☐ Present in Park
Collomia larsenii	2B.2	G4		☑	☐	☐	☐	☑ Present in Park 1 vouchers, e.g. LAVO 1877
Draba aureola	1B.3	G4		☐	☑	☐	☐	☑ Present in Park 4 vouchers, e.g. LAVO 1798
Drosera anglica	2B.3	G5		☐	☑	☐	☐	☑ Present in Park
Erigeron elegantulus	4.3	G4G5		☐	☑	☐	☐	☐ Present in Park 6 vouchers, e.g. LAVO 6333
Erigeron nivalis	2B.3	G4G5		☐	☑	☐	☑	☐ Present in Park
Eriogonum pyrolifolium var. pyrolifolium	2B.3	G4T4		☐	☑	☐	☐	☐ Present in Park 16 vouchers, e.g. LAVO 1668
Hulsea nana	2B.3	G4		☐	☑	☐	☐	☑ Present in Park 16 vouchers. e.g. LAVO 1967
Lycopus uniflorus	4.3	G5		☐	☑	☐	☐	☐ Present in Park
Lysimachia thyrsiflora	2B.3	G5		☐	☑	☐	☐	☐ Present in Park
Oreostemma elatum	1B.2	G2Q		☑	☐	☑	☑	☐ Historic
Packera indecora	2B.2	G5		☐	☑	☐	☐	☑ Historic
Penstemon cinicola	4.3	G4		☐	☑	☐	☐	☐ Present in Park 6 vouchers, e.g. LAVO 6422
Penstemon heterodoxus var. shastensis	4.3	G5T3		☐	☑	☐	☐	☑ Present in Park 4 vouchers, e.g. LAVO 4626
Phlox muscoides	2B.3	G5?		☐	☑	☐	☐	☑ Present in Park 3 vouchers, e.g. LAVO 6916
Silene suksdorfii	2B.3	G4		☐	☑	☐	☐	☑ Present in Park
Smelowskia ovalis	1B.2	G1		☐	☑	☐	☐	☑ Present in Park 1 vouchers. e.g. LAVO 1810
Stellaria obtusa	4.3	G5		☐	☑	☐	☐	☐ Present in Park
Subularia aquatica ssp. americana	4.3	G5T5		☐	☑	☐	☐	☐ Present in Park
Utricularia intermedia	2B.2	G5		☐	☑	☐	☐	☑ Present in Park 4 vouchers, e.g. LAVO 6518
Utricularia minor	4.2	G5		☐	☐	☐	☐	☐ Present in Park 2 vouchers, e.g. LAVO 6520
Utricularia ochroleuca	2B.2	G4?		☐	☑	☐	☐	☑ Present in Park
27 dicots documented or expected in lavo								
FERNS								
Asplenium septentrionale	2B.3	G4G5		☐	☑	☐	☐	☑ Present in Park 8 vouchers, e.g. LAVO 7007
Botrychium ascendens	2B.3	G3		☑	☐	☑	☐	☐ Observation
Botrychium minganense	2B.2	G4G5		☑	☐	☑	☑	☐ Potential
Botrychium montanum	2B.1	G3		☑	☐	☑	☑	☐ Observation
Botrychium pinnatum	2B.3	G4?		☑	☐	☑	☐	☑ Observation
Polystichum kruckebergii	4.3	G4		☐	☑	☐	☐	☐ Documented
6 ferns documented or expected in lavo								
GYMNOSPERMS								
Pinus albicaulis			FC	☐	☐	☐	☐	☐ Present in Park
1 gymnosperms documented or expected in lavo								
MONOCOTS								
Agrostis humilis	2B.3	G4Q		☐	☐	☐	☐	☐ Present in Park
Allium tribracteatum	1B.2	G2		☐	☐	☐	☐	☐ Present in Park 2 vouchers, e.g. LAVO 6256
Anthoxanthum nitens ssp. nitens	2B.3	G5		☐	☑	☐	☐	☐ Observation



DRAFT Lassen Volcanic rare plant list

STATUS information

Scientific Name	CNPS status	Global FESA	CESA	LNF Special Interest	PNF Sensitive	SPI Target	SPI Watch	LAVO status
Carex lasiocarpa	2B.3	G5		☐	☑	☐	☐	☑ Present in Park
Carex limosa	2B.2	G5		☐	☑	☐	☐	☑ Present in Park 4 vouchers, e.g. LAVO 6297
Cypripedium montanum	4.2	G4		☑	☐	☑	☐	☑ Potential
Eriophorum gracile	4.3	G5		☐	☑	☐	☐	☐ Present in Park 4 vouchers, e.g. LAVO 6340
Muhlenbergia jonesii	4.3	G3		☐	☑	☐	☐	☑ Present in Park 4 vouchers, e.g. LAVO 6406
Panicum acuminatum var. thermale	1B.2	G5T2Q	CE	☐	☐	☐	☐	☐ Present in Park
Piperia colemanii	4.3	G3		☐	☑	☐	☐	☑ Potential
Potamogeton praelongus	2B.3	G5		☐	☑	☐	☑	☐ Present in Park 3 vouchers, e.g. LAVO 1995
Rhynchospora alba	2B.2	G5		☐	☑	☐	☐	☑ Present in Park
Scheuchzeria palustris	2B.1	G5		☑	☐	☐	☐	☑ Present in Park 1 vouchers, e.g. LAVO 6484
Schoenoplectus subterminalis	2B.3	G4G5		☐	☑	☐	☐	☑ Present in Park
Sparganium natans	4.3	G5		☐	☑	☐	☐	☐ Present in Park
15 monocots documented or expected in lavo								

MOSSES

Bruchia bolanderi	2B.2	G3		☑	☐	☑	☐	☐ Present in Park 1 vouchers, e.g. LAVO 5080
Haplodontium tehamensis	1B.3	G2		☐	☐	☐	☐	☐ Present in Park
Meesia triquetra	4.2	G5		☐	☑	☐	☐	☐ Present in Park
Mielichhoferia elongata	2B.2	G4		☐	☐	☑	☐	☐ To be verified
Orthotrichum spjutii	1B.3	G1		☐	☐	☐	☐	☐ Present in Park
5 mosses documented or expected in lavo								
54 total Species with Federal, California, or CNPS status				6	38	8	5	22

California Rare Plant Rank 1B: Plants Rare, Threatened, or Endangered in California and Elsewhere
California Rare Plant Rank 2A: Plants Presumed Extirpated in California, But More Common Elsewhere
California Rare Plant Rank 2B: Plants Rare, Threatened, or Endangered in California, But More Common Elsewhere
California Rare Plant Rank 3: Plants About Which More Information is Needed - A Review List
California Rare Plant Rank 4: Plants of Limited Distribution - A Watchlist

Threat Ranks
0.1-Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat)
0.2-Moderately threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)
0.3-Not very threatened in California (<20% of occurrences threatened / low degree and immediacy of threat or no current threats known)

G1 = Critically Imperiled — At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2 = Imperiled — At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3 = Vulnerable — At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4 = Apparently Secure — Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5 = Demonstrably Secure — Common; widespread and abundant.

Figure 3 – Draft Lassen Volcanic rare plant list

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) (USDI NPS 2007). The most wide-spread species include common plantain *(Plantago major)*, dandelion *(Taraxacum officinale)*, and Kentucky bluegrass *(Poa pratensis ssp. pratensis)*. However, the non-native species with the greatest potential to invade and alter the ecology of wild lands as a result of fire or mechanical treatments include common mullein (*Verbascum thapsus*), bull thistle (*Cirsium vulgare*), cheatgrass (*Bromus tectorum*), Klamathweed (*Hypericum perforatum*), and yellow starthistle (*Centaurea solstitialis*).

Based on the regional fire history, fire plays a role in the management and conservation of park plant communities. Benefits include recycling nutrients, opening the canopy, and encourages propagation from fire-dependent plants. Although fire may injure or kill individual plants, long-term effects on species may be beneficial.

However, the ability of native vegetation to reestablish or regenerate after a burn can be severely altered by the presence of invasive plants. Environmental factors such as high soil nutrients levels, hydrophobic soils, exposed ground mineral soil, and high light conditions can provide a competitive edge to aggressive plants that will displace native species. Deterioration of wildlife habitat, watershed stability, and water quality often follows (Asher et al 2002; Goodwin and Sheley 2001). The degree of weed infestation can be a function of improper preventative measures or survival of pre-existing invasive plant seed banks. The Best Management Practices (Appendix R) were developed as a component of the Weed Management Plan (USDI NPS 2007) to reduce the likelihood of an infestation through education and prevention. The Forest Service and Bureau of Land Management have implemented similar policies (USDA FS 2001; USDI BLM 2006).

Fire effects monitoring data will be used to detect change in species abundance and cover within treatment areas. Monitoring plots maintained by park staff will supplement fire effects data by focusing on weed treatment/no treatment efficacy. Infestations requiring more resources than are available to the Natural Resources Division will trigger review of prescriptions and the possibility of additional research or testing.

Classifying Natural Fire Regimes

Effective management of fire in a specific ecosystem is aided by the characterization of recurring fire events. It is this repeat pattern of fire, as opposed to single fire events, that generates landscape characteristics and target conditions. Capturing the natural range of variability, not the central tendency of fire regimes, is the goal of effective landscape fire management. Fire regimes are most usefully described by components and/or post fire effects. Fire type, frequency, intensity, severity, timing (seasonality), size and pattern, and predictability are key components commonly used to describe the pattern of fire in given ecosystems. A qualitative measure of fire impacts on biotic elements of ecosystems is also commonly used to describe fire regimes. The following classification scheme from Brown and Smith (2000) may be helpful in planning fire management action within the 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 and include both understory burning and dependent crown fire behavior.

- 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 significantly changes stand structure and possibly composition. It has been estimated that at least 80 percent of the dominant vegetation is either consumed or is killed during these fire events. Native, perennial grasslands aren't usually killed by fire, they're stimulated and rejuvenated by them. Fires remove competing woody vegetation and growth-stifling litter.

- Non-fire regime – These regimes have little or no occurrence of natural fire.

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

- Fire independent ecosystems – Those ecosystems are 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 can result in significant changes. An example of fire dependent vegetation in the park is montane chaparral types.

- 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 are commonly replaced during fire free intervals. Initial re-vegetation is rapid

but post-fire recovery occurs over long periods of time. Examples of fire-initiated systems at the park include the lodgepole pine and mountain hemlock forest types.

- Fire-maintained ecosystems – Fire is frequent (1 to 25 year intervals), usually as surface fires. Intensity is light and crown fires are uncommon. Fire decreases fuel buildup and controls plant succession, often keeping out invading species. Fire favors faster growing trees with a high tolerance for fire and post-fire environments. The exclusion of fire from these types leads to fuel buildup and vegetative change, with fire intolerant species becoming more abundant. Fire exclusion may also significantly change the nature of future fire events. Examples of fire-maintained systems at the park include Jeffrey pine and white fir forest types.

The historical fire regime characteristics for the major vegetation types found within the park are summarized in Table 3-3. 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 >.

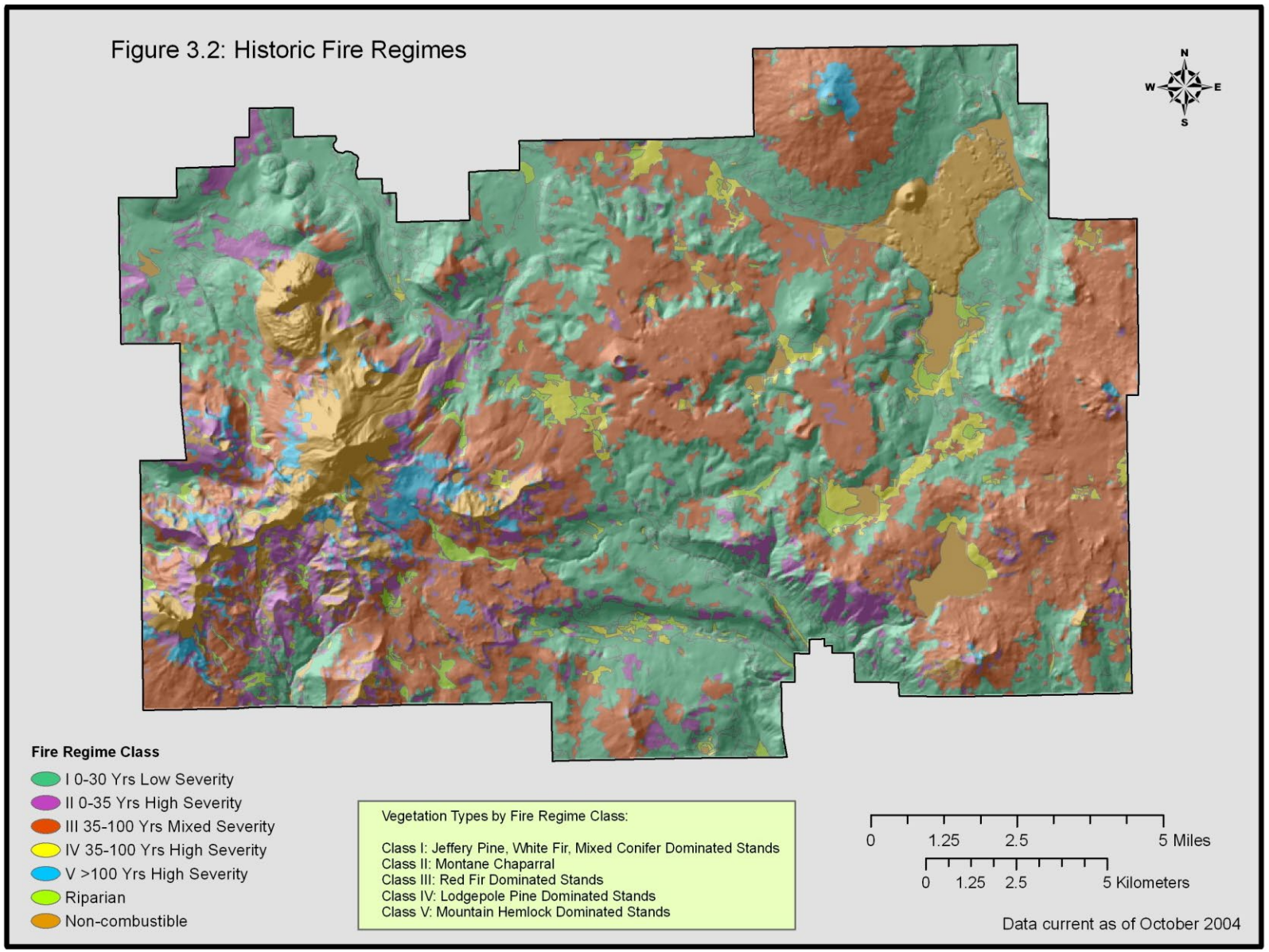


Figure 4 – Historic Fire Regimes

Table 3-4 Historical fire regime characteristics and the Fire Regime Classes used by the Interagency FRCC Guidebook.

Vegetation Type (park acres)	**Mean Fire Return Interval (range)**	**Fire Regime Characteristics**	**Fire Regime Class**	**Fire Frequency & Severity Class**
	(consolidated from fire ecology literature[1])		*(from Hann & Bunnell 2001)*	
Sedge Meadows (886 ac)	Unknown	Infrequent Fire	?	Unknown
Montane Chaparral (2,000 ac)	(10-50)	Fields maintained or cycled by frequent fire; shrubs typically re-sprout and dominate within 5 years	II	0-35 years frequent to less frequent stand replacement
Jeffrey Pine (23,000 ac)	16 years (9-32)	Frequent surface fires Low/Moderate severity	I	0-35 years frequent low severity
White Fir (9,238 ac)	30 years (15-38)	Frequent surface fires Low/Moderate severity	I	0-35 years frequent low severity
Lodgepole Pine (14,000 ac)	47 years (28-54)	Mix of crown/surface fires Mixed severity	IV	35-100 years less frequent stand replacement or mixed severity

Red Fir (49,000 ac)	41 years (4-127)	Mix of crown/surface fires Mixed severity	III	35-100 years less frequent mixed severity
Red Fir/ Western White Pine (33,158 ac)	70 years (26-109)	Mix of crown/surface fires Mixed severity	III	35-100 years less frequent mixed severity
Mountain Hemlock (7,000 ac)	115 years	Mix of crown/surface fires High severity	V	>100 years infrequent stand replacement

[1] (Bekker & Taylor 2001, Taylor 1993, Taylor 1999, Taylor 2000, Taylor & Solem 2001)

3.2 Fire Management Unit – Specific Descriptions

Fire Management Unit-1 BOUNDARY: *(32,160 acres)*

The Boundary FMU consists of discontinuous areas and discrete patches found along the park's north, south, and west boundaries. This FMU includes the Lassen Park Road corridor that bisects the west-central portion of the park.

This FMU is configured, 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 fires occurring in neighboring jurisdictions could spread into the park. Using Wildland fire to meet resource objectives is particularly complex in this FMU, as the adjacent Lassen National Forest may not consider these fires desirable. There is still opportunity to manage wildfire within this FMU and opportunities do exist to allow prescribed fires and some wildfires to cross boundaries.

All fires within this FMU will be evaluated for the appropriate response. Restoring target conditions and reducing fuel loads are the primary management goals for this FMU. The risk of undesirable fire impacts or the chance of a fire leaving the park is sufficient to make suppression the default strategy. Management of wildfires for resource objectives will only be considered in this FMU when:

- The fire has obvious barriers to spread

- Fire movement is into the park's interior and 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 are allowed in this FMU including: wildfire suppression, prescribed fire, use of wildland fire and manual/mechanical treatments. However, prescribed fire and manual/ mechanical treatments will be the primary strategies used for hazard fuels reduction and restoration in this FMU.

Physical and Biotic Characteristics

The boundary of this FMU follows the jurisdictional boundary of the park and contains all the major vegetation types listed in Table 3-4. This FMU is shown in grey on the accompanying FMU map (See Figure 3.3) and comprises 32,160 acres or 30% of the park's total landbase. The northern portion of the Boundary FMU contains more of the parks pure Jeffery pine and mixed conifer stands. This FMU also contains some of the more extensive stands of montane chaparral.

Wildland Fire Management Situation Summary

Prescribed Fire and non-fire applications such as manual/mechanical thinning are the most appropriate management options for this FMU, although limited use of Wildland fire is also a possibility. Fire regimes in this FMU have been significantly altered from their historical range. The risk of losing key ecosystem components, due to inappropriate fire events or transition to certain seral states, is high. Fire frequencies have departed from historic patterns, resulting in possible changes to one or more of the following: fire type, fire size, intensity, severity, and landscape patterns. Some stands in this FMU need aggressive amounts of restoration (manual/mechanical treatments) prior to the reintroduction of fire.

Up to an additional 137 acres adjacent to Mineral Headquarters would be treated with prescribed fire to meet resource management objectives. The primary purpose of prescribed fire in this FMU is to create defensible boundaries which can be used to protect the Mineral HQ area and structures from wildfire events.

Prescribed fire and non-fire applications, such as mechanical/manual thinning, may be desirable options for protecting specific resource values by reducing fuel buildup and modifying forest structure to reduce fire intensities if ignitions do occur.

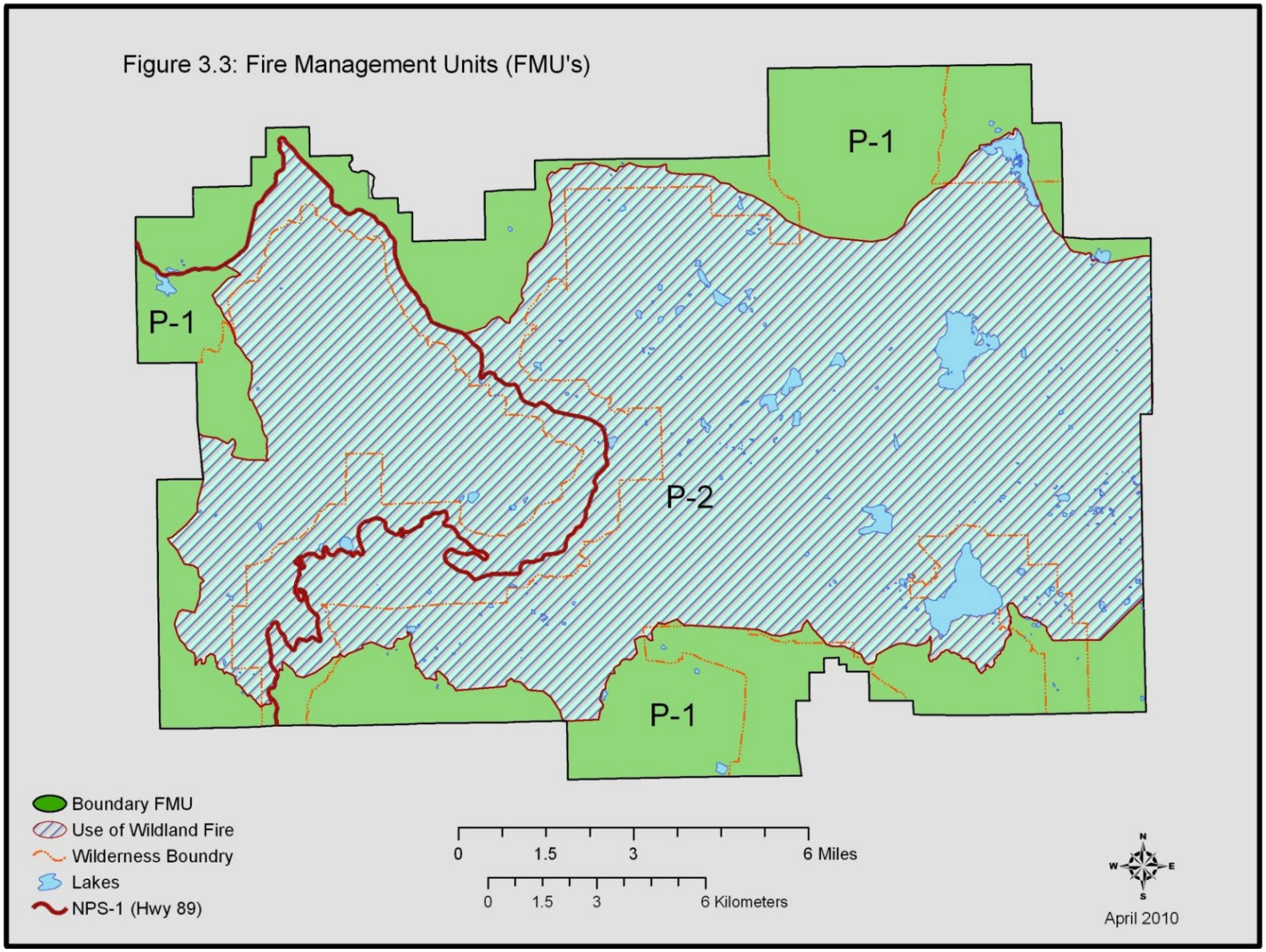


Figure 5 – Fire Management Units

Fire Management Unit-2 USE OF WILDLAND FIRE*(74,349 acres)*

The Use of Wildland Fire FMU is located in the center of the park, interior to the Boundary FMU. Most of this FMU is designated wilderness. The edge of this FMU does align with the eastern boundary of the park and the adjacent Caribou Wilderness in Lassen National Forest.

Physical and Biotic Characteristics

The boundaries of this FMU closely align with designated wilderness within the park and also on the neighboring Lassen National Forest. This FMU is shown in stripes on the accompanying FMU map (See Figure 3.3) and comprises 74,349 acres or 70% of the park's total land base. This FMU contains much of the red fir dominated forest types as well as significant lodgepole pine stands. The Use of Wildland Fire FMU also captures the majority of the non-burnable portions of the park. Most fire regime components in this FMU are within a historical FRI range and the risk of losing key ecosystem components is low.

Wildland Fire Management Situation Summary

The dominate strategy in this FMU focuses on the use of wildland fire ignitions. Within this FMU planned and unplanned ignitions will be used to achieve resource management goals. Incident objectives will identify resource objectives for wildfires managed to achieve resource objectives. Preference will be given for natural ignitions to be managed in meeting the role of fire as an ecological process when under favorable environmental and spatial conditions. If a wildland fire does not continue to meet resource objectives, the appropriate suppression response may be employed on portions of or the entire perimeter.

All naturally occurring wildfires will be evaluated for their potential to accomplish resource objectives through the Wildland Fire Decision Support System (WFDSS) process or other decision support processes and analysis that help determine and document decisions regarding the management of individual ignitions. It is a target of the park to treat up to 27% of the acres in this FMU using managed wildland fire (up to 20,000 acres) over the next 10-year treatment period. This proportion of managed wildland fire takes into account an objective of managing at least one wildfire per season based on historical mean fire sizes of 1100 acres (range 100-3800 acres) as reported by Taylor (2000). Up to 14,000 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 boundaries which can be used to manage naturally occurring wildfires.

Prescribed fire and non-fire applications, such as thinning, may be desirable options for protecting specific resource values by reducing fuel buildup and modifying forest structure to reduce fire intensities if ignitions do occur.

CHAPTER 4 - WILDLAND FIRE OPERATIONAL GUIDANCE

General Management Considerations

Lassen Volcanic National Park will manage wildland fire commensurate with the fire management goals and objectives outlined in Chapter 3. In order to accomplish these goals and objectives, park management will utilize five primary tools:

1. Preparedness Actions (these actions are usually described within the "suppression" section. Preparedness is felt to be a standalone tool in the park as these actions prepare the fire organization for ALL of the following tools.)
2. Suppression
3. Use of Wildland Fire
4. Prescribed Fire
5. Non-fire Applications (Manual/Mechanical)

These tools give fire managers a variety of options when choosing the *appropriate response* to Wildland fire and to meet program goals and objectives. While all of the tools are allowed in bothFire Management Units, certain tools may be more ecologically or socially acceptable based upon that unit's values, hazards, and risks given the time of year.

This chapter will describe management's response to wildland fire and how Suppression and use of Wildland fire (management tools 2 and 3) are implemented. This chapter will then describe the planned management tools of Prescribed Fire, Mechanical and Manual Treatments (management tools 4 and 5).

4.1 Management of Unplanned Ignitions

Decision support processes and analysis that help determine and document decisions regarding the management of individual ignitions will follow current national direction. All unplanned ignitions will be assessed individually by completing a Complexity Analysis and Organizational Needs Assessment (ONA) which can be found in the Interagency Standards for Fire and Fire Aviation Operations (Red Book) as well as preparing the appropriate support documentation within the Wildland Fire Decision Support System (WFDSS). This process includes data gathering and situation analysis (i.e. internal and external values which are enhanced or require protection, management objectives, safety, climatology and weather, fuel conditions, and fire behavior). The *appropriate response* to a wildfire ranges from monitoring with minimal on-the-ground disturbance to aggressive suppression actions on all perimeters of the fire. The response *and objectives* may vary from fire to fire and even as a fire spreads across the landscape. Objectives are affected by changes in fuels, weather, topography, varying social understanding, tolerance, and involvement of other jurisdictions having different missions and objectives.

When an unplanned fire occurs, mangers will use the following process:

- **Locate the fire**
- **Size-up and determine cause.** Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety. A suppression response to a naturally caused wildfire may be driven by the objective of protecting values at risk while meeting resource objectives specified in the Land/Resource Management Plan. If the fire is naturally caused and falls within the Boundary Fire Management Unit, use of Wildland fire will be considered if the criteria identified under "Fire Management Unit-I Boundary" exist.

- **Complete WFDSS analysis** to support the *appropriate Wildland fire response.* The Fire Size-Up is completed as soon as aerial or on the ground resources provide a confirmation of the fires existence and the required fire size up information. Any trained fire staff that has author/editor rights in the WFDSS application can complete all remaining components. However, if the fire goes beyond the initial action to an extended action the Fire Management Officer, Assistant Fire Management Officer, Duty officer or other Incident Commander will complete, review for accuracy and present supporting WFDSS documentation and analysis to the Park Superintendent.

    - Initial steps in the WFDSS process require input and analysis in Incident Documentation, Situation Documentation, Objectives and Course of Action. The first part of the analysis to be completed is to create a new incident. This allows the author to provide incident documentation which documents the initial and continuing fire situation, and provides required information to complete administrative fire reporting. The second part of the analysis is to describe the situation. The situation provides risk assessment and decision support information to support strategic decisions and the development of a course of action. The objectives tab allows the author to define objectives as stated in Land, Resource, and Fire Management Plans and lists specific management and incident requirements that will frame and influence strategic decisions and tactical implementation. Course of Action defines a specific course of action ranging from pre-planned initial response to an individualized response for a specific situation; Specificity varies with fire complexity and can include a defined planning area, management actions, resource commitments, and cost for the fire duration. When the decision is no longer meeting objectives, it can include a set of actions to be used until a new decision is completed.

Through the initial analysis, a decision will be made to suppress or manage the fire to accomplish resource management objectives. If the fire exceeds, or is going to be managed beyond the initial action into extended attack or for the management of a long term implementation plan, additional decision support process documentation and analysis through WFDSS will be required to support management decisions.

All wildland fires will be managed according to current federal policies. Actions will be consistent with direction provided in RM 18, DO 60 and *Interagency Standards for Fire and Fire Aviation Operations.*

4.1.1 Preparedness

DEFINITION

Preparedness includes all preplanned actions that lead to effective prevention of unwanted fires and the appropriate response to all fire ignitions.

Training

The park will offer the required annual safety training for all wildland firefighters who maintain a red card. At a minimum, annual training will consist of an 8-hour firefighter safety refresher that must include training on fire shelter care and use, a Hazardous Material refresher and First Aid/CPR biannually. Basic firefighter training for all new Wildland firefighters will include S-130/190, L-180, I-100 and IS-700. . Qualifications for all positions will conform to minimum standards established in the *Wildland and Prescribed Fire Qualifications System* publication PMS-310-1. More stringent qualifications may be imposed by the department, agency, or park as needed.

Training needs are identified through individual development plans between each supervisor and employee. Training offered within the park will vary from year to year depending on the needs.

Fitness

All staff involved in firefighting will pass an annual Work Capacity Test (WCT) and receive a physical exam as prescribed in national guidance. Seasonal employees entering on duty must pass the NWCG approved WCT within two weeks unless unusual conditions exist. The annual fitness test has potential for firefighter injury; therefore test execution will follow all required procedures and safeguards.

Fire staff identified as primary firefighters will participate in an ongoing fitness program and may be provided one hour per day for physical training as directed in RM 18.

Fire Prevention

Fire prevention is an important aspect of the parks' preparedness activities. The park will conduct an active fire prevention program including public messages, prevention signing, patrols, inspections, fire use restrictions, and hazard abatement reduction around structures

particularly during periods of very high or extreme fire danger. This program is fully detailed in Chapter 4.4, Prevention, Mitigation and Education.

Fire Readiness

Fire readiness is the year-round organized inventory and assessment of equipment and personnel. The park has developed a summary list of all preparedness activities by month. This comprehensive calendar of preparedness activities is located in the Yearly Readiness Checklist (Appendix M). As part of the readiness program all operations modules and support personnel will be assessed annually through a readiness review and inspection program. Also, mandatory pre- and post-season operations preparedness and review meetings are held each spring and fall.

Weather

The park utilizes three Remote Automated Weather Stations (RAWS) for information and National Fire Danger Rating System (NFDRS) indices calculations. All three of these stations are on Forest Service land and are managed by Lassen National Forest. The park also has a seasonal station that was established on top of Mt Harkness in 2007.

The three stations used are:

- Manzanita Lake Station #040609
- Bogard Station #040703
- Chester Station #040904

Fire Danger Determination

The park Fire Management Officer (FMO), Assistant Fire Management Officer (AFMO), or Fire Program Management Assistant (FPMA) will track NFDRS fire danger indices and plot them against historical averages. The Energy Release Component (ERC), determined using Model G from the Manzanita Lake station, will be used as the main fire danger indicator for the park.

The parks daily staffing levels are driven by the Manzanita Lake station. A complete description of the process used to ascertain the park-wide fire danger and the staffing logic can be found in the *Preparedness Staffing Plan* (Appendix N).

Seasonal (May through October) FireFamily Plus runs for Manzanita Lake are posted in the fire management office as an aid to seasonal comparison of fire danger with past years. Pocket cards are also made available to incoming resources and carried by park fire fighters for the same reason.

Preparedness Staffing Plan

After daily fire weather is processed and existing forecasted fire danger conditions are determined, the park will implement preparedness staffing as appropriate. The parks' *Preparedness Staffing Plan* insures that adequate fire staff is on duty for periods of high to extreme fire danger. The plan, found in Appendix N, sets guidelines to increase or decrease daily work hours, numbers of people on duty, etc. The plan also provides task examples which need to be accomplished as fire danger rises.

In general, the plan calls for the following staffing:

- Staffing Levels 1, 2, and 3: normal tours of duty and number of fire personnel.
- Staffing Level 4 and 5: the fire management officer (FMO) or acting may authorize extended hours and increased staffing for fire crews. The Fire Program Management Assistant will activate a preparedness account to cover the costs.
- The Superintendent, FMO or Acting has the ability to raise the staffing level by one for unusual events, such as holiday weekends, that will increase the potential for wildfire events.

Pre-Attack Plan

A pre-attack plan is a comprehensive compilation of essential fire management information. The pre-attack plan includes pre fire information, draft delegation of authority, interagency agreements, and structural protection needs. It also includes a map of critical fire information such as the location for potential Incident Command Posts (ICP's), helispots, water sources, roads and trails etc. The pre-attack plan is found in Appendix G.

Fire Management Record Keeping

Permanent Park Records
The following will be held as permanent historic resource records:

- Fire reports (DI-1202, supplementary reports, ICS forms).
- Fire weather records.
- Historic records of the park, including photos or maps showing vegetative cover, etc.
- Monthly reports or other records which document fire occurrence or behavior.
- GIS, hand drawn maps or records pertinent to fire management.

4.1.2 Incident Management

Wildfire Suppression

Wildfire suppression is all the work of extinguishing a fire or confining fire spread where the objective is to protect values at risk. Suppression incidents will receive the *appropriate response to Wildland fire* that gives consideration to public and firefighter safety, fire values, hazards, and risks. The entire fire, or only a portion of it, may have its spread checked and extinguished dependent upon affected ecological, cultural, or social values, and hazards. It remains a park fire management goal to address the protection of values and hazards pro-actively, thereby allowing for the use of wildland fire in place of suppression whenever possible. For example, if unnatural fuel loads exist which limit the ability to meet resource objectives it may be necessary to use conservative fuels management techniques initially to restore an area to a natural range of conditions. Once this is done, more areas within the park will be able to support the use of wildland fire rather than require suppression. Each fire may be managed for one or more objectives. Objectives for individual fires, or portions of fires, may move between beneficial and damaging depending on changing circumstances and conditions on the fire. Initial action on human-caused wildfire will be to suppress the fire at the lowest cost with the fewest negative consequences with respect to firefighter and public safety.

All fire management activities in the park will rely on tactics which cause a minimum amount of resource damage while maintaining minimal risk to the safety of the public, firefighters, and other personnel. Tactical tools that are used will be chosen based on the minimum requirement analysis SOP. Superintendent approval is required for off-road use of vehicles, bulldozers, and some mechanized equipment. The Minimum Impact Suppression Tactics (MIST) Guide can be found in (Appendix O).

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.

Range of Potential Fire Behavior

Fire behavior in the park varies from smoldering to running crown fires. Potential fire behavior follows seasonality with low fire behavior expected from spring/early summer, moderate in mid-summer, and the potential exists for very active fire behavior late summer/fall.

Fire behavior under higher fuel moistures, less wind influence and relatively flat terrain could exhibit a smoldering stage, whereas the same fuels under drier, windy conditions will create a flaming fire. The same fuels under drier environmental conditions could lead to isolated torching and possibly some crown fire runs under conditions with very low relative humidity's and with an alignment of slope and wind. All of the parks timbered landscape has the potential to exhibit extreme fire behavior: high rates of spread and independent crown

fires. All of these conditions should be predictable and are within the normal range of variability.

Initial Attack

If potential complexity, climatology and projected fire behavior, natural and cultural resource effects, and relative risk indicators are unacceptable to the agency administrator, the fire will be suppressed. If suppression is warranted, WFDSS support documentation and analysis will be commensurate with the complexity of the incident and serve as documentation of that decision.

The suppression response may vary from dispatching 2 firefighters or numerous crews and aircraft to begin aggressive initial attack. All suppression tactics will be based on current and predicted fire behavior given the hazards and associated threats to values. MIST will be incorporated into all suppression operations.

The strategy and tactics applied during an initial attack response is based on public, firefighter safety and values at risk. Fires in, or near, developed areas where there is a high likelihood of danger to the public or property, will receive a high level response based on expected fire behavior. During normal conditions, Susanville Interagency Dispatch Center (SIFC) uses a Computer Automated Dispatch sytem (CAD) to dispatch resources based on the closest forces concept. SIFC is provided with Run Cards which defines the pre-planned resources to be dispatched at each dispatch rating of "low, medium, and high" which SIFC inputs into the CAD system. These preplanned dispatches range from a low dispatch with one Duty Officer and a recon aircraft for an unplanned natural ignition which could be managed for resource objectives to a high dispatch with an air attack, Duty Officer, helicopter, wildland engines and handcrews for a fire with primarily suppression based objectives.

During lightning events, SIFC will activate the lightning plan, described in the pre-attack plan (Appendix G). During the lightning plan, the park will activate its own fire dispatch. SIFC remains able to dispatch large events and process resource orders, but initial dispatch to park fires will transition to the fire management Duty Officer.

Confinement as an Initial Action Strategy

Confinement may be selected if it is the best strategy option for:

- Public and Firefighter safety
- Maximizes availability of critical resources during periods of very high or extreme fire danger
- Minimizes suppression costs

Through Decision support processes and analysis confinement may be selected as a strategic management strategy when the fire is expected to exceed the initial action or planned management capability. If confinement is determined as the response to an individual ignition, it will be documented by the filling out the appropriate WFDSS documentation.

Response Times and Staffing Needs

When the park wide Staffing Level is 3 or higher, fire operations modules will have a 5-minute response time for assignments. Crews will be equipped so that they can leave directly from a project site, prepared for an unsupported 24-hour assignment, without having to return to the station. If the predicted Lightning Activity Level (LAL) is III or higher modules may have extended daily hours at the discretion of the Fire Management Officer and or Duty Officer. A sixth day of work may be authorized at the discretion of the park Fire Management Officer and or Duty Officer. The hours of the modules may be extended, and a seventh day of work may be authorized by the park Fire Management Officer and or Duty Officer if the predicted LAL is IV or higher.

Restrictions for Fire Management Activities

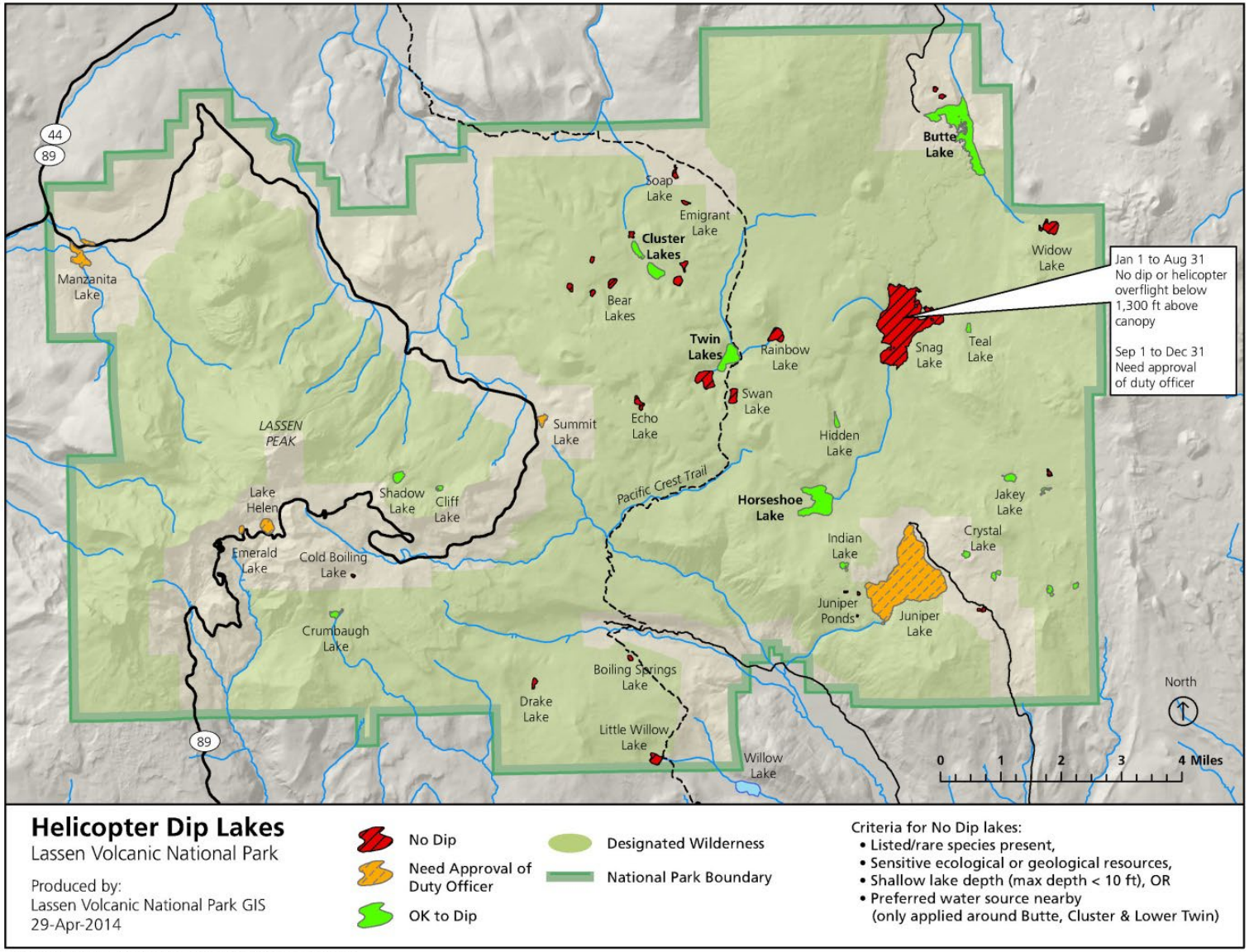
The following restrictions apply to all lands within the park:

- Aircraft operating above the park will maintain an altitude of 1500 ft above ground level (AGL). Emergency and Special Use flights are approved for flights under 1500 AGL upon approval of the Aviation Manager and/or Superintendent, or other qualified park staff.
- Helicopter use and landing at unimproved sites is allowed for emergencies or other activities approved by the Aviation Manager. New helispot construction is not allowed unless there is an imminent threat to life.
- The decision to use aerial retardant will be made by the Duty Officer or an Incident Commander under a Delegation of Authority. Retardant use must be limited to times when the risk to life or property is greater than potential resource damage from the retardant. Retardant must be kept away from lakes and streams if at all possible. All retardant use in the park shall be guided by park-provided maps detailing areas for retardant avoidance.
- Motorized equipment is not allowed in the unimproved and wilderness areas of the park without approval of the Superintendent. Chainsaw and portable pump use is allowed as the minimum safe, effective tool for wildfire management activities within the park. Use of chainsaws is limited to essential use and an MRA should document the decision for use on non-emergencies.
- Handline construction will meet MIST standards. Where possible, control line locations will use existing trails and natural barriers. Cold trailing of the fires edge is preferred to handline construction.
- Minimize disturbance to riparian areas by fire management activities and personnel.
- The park has a Helicopter Dip Lake Map which identifies approved water sources for use by helicopter bucket operations to support wildfire management activities. Lakes

within the park have either been identified as “No Dip, Need Approval of Duty Officer, or Ok to Dip” (see helicopter Dip Lakes Map figure 4.1).

- During helicopter bucket operations, only one lake may be used by the same bucket unless the bucket is sufficiently cleaned to prevent cross contamination from lake to lake.
- If an unidentified cultural resource is found, work will immediately be stopped so as not to disturb the site. If time allows, a resource advisor will be notified and will evaluate the site. The resource advisor will re-route any line construction or mitigate negative impacts to the site.
- A resource advisor will be notified of all new fire starts in the park that exceed the initial management action, and will be utilized during extended fire activities. Initial rehabilitation plans must be completed and significant progress must be made before incident management teams and resources are released.

Figure 6 – Dip Sites



N:\GIS_Maps\User_Maps\111_HelicopterDipLakes_FMP2014

Extended Attack

The Fire Management Officer, acting or Duty Officer will regularly validate that the fire is managed appropriately and will assess the need to complete additional decision support and analysis within WFDSS. Examples of situations that may indicate the need for additional incident analysis include when the fire is: 1) no longer meeting objectives, 2) not meeting containment objectives by the end of the second burning period, 3) incrementally increasing number of resources to achieve management objectives, and 4) exhibiting unexpected fire behavior. Completed WFDSS analysis will allow for the full range of strategic and tactical actions from full suppression on all perimeters to confinement within natural barriers.

The fire will initially be managed by an Incident Commander Type 5 or 4, (ICT5, ICT4) during the initial action. As the fire meets the above criteria and the Complexity Analysis and Organizational Needs Assessment dictate, command of the fire will transition to an Incident Commander Type 3 (ICT3). If the fire exceeds the capabilities of local resources, or if the management complexity of the fire exceeds the capabilities of these local resources, the park will manage the incident through a delegation to a Type 2 or Type 1, Incident Management Team.

When an Incident Management Team is assigned, the team will be briefed by the Superintendent (Agency Administrator's Briefing) and current IC or the FMO. The team will be given a written delegation of authority and will have an Agency Administrator's Representative assigned as a staff member to the incoming IC. The delegation of authority will provide the IC with the Agency Administrator's priorities, specific restraints, and other guidelines necessary to implement the Delegation of Authority (see Appendix P for a delegation of authority example).

Selecting a New Wildland Fire Strategy

There are several reasons for selecting a new wildland fire strategy:

- The fire complexity is exceeding current analysis and support documentation in WFDSS.
- When the initial wildland fire response has not been successful.
- Implementation of a prescribed fire is unsuccessful
- Initial strategy is unsuccessful and objectives are not being met.

A new wildland fire strategy will be developed through the WFDSS process.

Minimum Impact Suppression Tactics

The goal of MIST is to minimize fire suppression impacts on the land while ensuring operational objectives are met, the actions taken are safe, timely and effective. Strategies for suppression activities and tactical operations will be planned to have the least long-term

impact to the resource. All fire management activities within the park should adhere to MIST where possible.

Fire Report Records

Each fire within the park or any fire threatening to enter the park will be reported immediately to the Superintendent, or designated alternate. An ICS-209 (incident status summary) report will be completed according to national standards for extended fire situations with strategies and objectives ranging from full suppression to management for resource objectives. A DI-1202 (individual fire report) will be completed for all support actions as well as fires that occur inside the park. The fire reporting process is a critical element within the WFMI (Wildland Fire Management Information) and PDS analysis and must accurately reflect the fire load of the park.

The Fire Program Management Assistant along with the IC will maintain a complete accountability of fire costs for each fire. All human-caused wildfires within the park will be investigated. Any investigations involving potential claims against the government, trespass fires, or other illegal activities on federal lands will be immediately turned over to the Law Enforcement Branch of Resource and Visitor Protection Division.

Completion of the Individual Fire Reports is the responsibility of the ranking National Park Service employee on scene of the fire. These reports will be submitted to the Fire Management Officer within 48 hours after the fire is declared out. Within 10 days individual fire reports will be entered into Fire Reporting System.

Use of Wildland Fire

Use of Wildland fire is the management of either wildfire or prescribed fire to meet objectives specified in park land/resource management plans. Natural ignitions will receive the appropriate response to Wildland fire. The response will give consideration to values, hazards, and risks. Use of Wildland fire is the preferred means for achieving resource management objectives in the Use of Wildland Fire FMU where restoration and ecological values dominate considerations.
Wildland fire projects will be allowed to burn within current and predicted weather/climatological parameters and associated fire behavior that ensure:

1. Fire stays within a delineated area defined in the WFDSS analysis.
2. Vegetation changes are within an accepted ecological range of values for the affected ecosystem
3. Mitigation of threats to significant historic or cultural resources
4. Mitigation of threats to life or private property
5. Cooperation with state or federal air quality guidelines for particulate matter.
6. Concurrence of NPS regional staff during national preparedness level 4 and NPS national staff concurrence at preparedness level 5.

Procedures to ensure the results listed above:

1. Monitor weather and associated fire danger along with climatological comparisons to historical averages and past, known fire years.
2. Work closely with the appropriate Air Quality Manager for the given county where the fire is located. If available install portable air quality monitoring stations at smoke sensitive sites affected by the fire.
3. Complete adequate fire behavior spread predictions for all ignitions. A long-term fire behavior analyst will be used for all large fire or long term management actions.
4. Consult with park archeologists or fire archeologists.
5. Assign sufficient firefighting resources to manage the fire project. This includes operational and logistical resources for implementation as well as managers and decision-makers.
6. Consult with resource advisor and Chief of Resource Management.

All fire management activities in the park will rely on tactics that minimize resource damage while maintaining the safety of the public, firefighters, and other personnel. Tactical tools that are used will be chosen based on a minimum requirement analysis.

Unplanned Fire: What do we do?

All wildfire decisions will be supported through analysis in the WFDSS process and the appropriate wildfire response will be chosen. The procedures that will be followed are outlined in the web based WFDSS application. Assessment includes data gathering and situation analysis (i.e. internal and external values which are enhanced or require protection, management objectives, safety, climatology and weather, fuel conditions, and fire behavior). The *appropriate response* ranges from monitoring with minimal on-the-ground disturbance to intense suppression actions on some perimeters of the fire. The response will vary from fire to fire and on the same fire as it moves across the landscape.

Decision criteria and risk factors to consider in the WFDSS analysis are outlined in the web based WFDSS application. Parameters requiring in-depth analysis for the park often include: coordination with the Lassen National Forest, off-site impact of air quality, seasonal fire danger/drought and its relation to fire spread (including chances of fire spreading off-park into jurisdictions without the ability to manage fire for resource objectives), availability of resources, on-site impacts to cultural and natural resources, and threats to human life. If it is determined that the fire can be managed within the above constraints, then the ignition may be appropriate to manage for resource objectives.

- **Coordinate** with the Air District to manage the fire for resource based objectives on the day the ignition is confirmed if it is a "no-burn" day.
- **Choose the *response to the wildland fire*** based on supporting documentation and analysis from the WFDSS process. In this example, the decision is made to manage the fire for resource objectives because the agency administrator found the potential for

complexity, climatology, projected fire behavior, natural and cultural resource effects, and relative risk indicators to be acceptable.

- **Implement the *appropriate response to wildland fire*** – For use of wildland fire projects this may vary from periodic aerial reconnaissance or on-scene fire monitors to limited suppression action. If the management complexity of the fire exceeds the capabilities of local resources, the parks will manage the incident through delegation to an Incident Management Team (see Appendix P for a delegation of authority example).
- **Notify the public about the chosen management response.** Use contact lists and communication methods from the parks *Public Information, Education, and Prevention Plan.*
- **Continue to reassess the fire situation** – During use of wildland fire projects the park must constantly reassess the course of action, supporting documentation and decision in WFDSS. If the fire increases in complexity decision support processes and analysis will help determine and document decisions regarding the management of the ignition and assess if there is a need for a more detailed support documentation and analysis. The frequency of the course of action and decision that will be validated will be documented in the WFDSS analysis. Validation frequency can range from daily (high complexity, high-risk fires) to weekly (low complexity, low risk fires). If analysis indicates that the fire can no longer be successfully managed for resource benefit objectives incident management objectives will change and a new strategy will be developed through the WFDSS process.
- **Manage the fire until declared out** according to monitoring intensity and frequency guidelines indicated by the decision support processes and analysis in WFDSS. At the minimum, periodic ground or aerial reconnaissance will be used to reassess conditions and fire status. More in-depth monitoring may be necessary to ensure proper incident management if complexity or risk increases. The park will monitor for wind speed, wind direction, smoke plume rise and dispersal, temperature, humidity, fuel moisture, fire size, and fire behavior (rate of spread, direction of spread, intensity).

Tactical Options Managing Wildland Fire for Resource Objectives

<u>Use of Wildland Fire</u>

Use of Wildland fire is the management of either wildfire or prescribed fire to meet objectives specified in Land/Resource Management Plans.

WFDSS is the planning and decision document used for all unplanned ignitions within the park. This planning document allows for the opportunity to provide additional supporting documentation and analysis commensurate with evolving or increasing incident complexity to support management action.

The initial input into WFDSS establishes the information base for managing the fire. It documents fire discovery, allows for input of appropriate administrative information, provides for a current and predicted situation assessment, documentation and establishes an

initial action. It consists of incident documentation, situation documentation, establishing objectives, developing a course of action and reports.

As an incident increases in complexity, requires extended action and or continuation of management for resource objectives, the objectives are clearly defined, the fire situation is described, management actions commensurate with the fire situation are established in more detail, cost estimates may be prepared and the course of action and decision is constantly validated to determine if the incident remains at this management level or needs additional analysis and support documentation.

For large fire suppression, long term implementation actions and long-duration fire. It is anticipated that less than 20% of all of the fires will require the most extensive documentation and analysis. Analysis at this level requires managers to validate strategy and provide more detailed analysis in long-term risk assessment, advanced fire behavior predictions and generally includes a defined Maximum Manageable Area (MMA). While each use of wildland fire incident will have its own analysis and supporting documentation the most complex of incidents, including multiple fires that are combined into a complex will each 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. The WFDSS analysis must be prepared by qualified personnel.

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 the use of wildland fire and developed five general tactics for implementing various fire scenarios. These scenarios were developed to enhance success in managing fires within the boundaries of the park. In the planning document, 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 fire.

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 decision to use air tankers should be approved by the Duty Officer and retardant use limited to the first load with subsequent loads of water. 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 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 into the ecosystem.

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 humidity. 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 opportunity to use wildland fire 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 as a standalone 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 humidity, 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 fire. This scenario could also include checking a portion of the perimeter on an established fire for the above reasons. The objective of this scenario is to take advantage of the potential resource benefits from the use of wildland fire, but at an appropriate time. Timing for allowing a fire to burn will then be commensurate with favorable or improved extenuating circumstances (as listed above).

   Tactic: Fire spread on a new 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 naturally from where it was checked.

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 fire.
- 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 are increased through proactive, not reactive management.
- Threats to property and the park boundary are mitigated in pre planning.

Post-fire: What do we do?

- **Rehabilitation** will follow MIST Guidelines if on-the-ground actions are taken to check fire spread. In the event a fire covers large areas, has unnaturally severe effects on natural or cultural resources, or causes major impacts to the parks developed resources (i.e. trail system) a separate *Burned Area Emergency Rehabilitation Plan* will be developed by the Resource Management and Fire Management Office, and approved by the Superintendent.
- **Assemble monitoring data** as part of the final fire package.
- **Review incident** when deemed appropriate by fire management staff, superintendent, or fire management committee.

Staffing Needs and Responsibilities

Fires which go beyond the initial action will have the WFDSS analysis completed by the FMO, AFMO or other qualified personnel. Additional park staff serving as subject matter experts will be involved in planning as conditions, issues, and fire location dictate. Examples include Senior Management Team, archeologist, wildlife biologist, roads and trails supervisor, buildings and utilities manager, and fire information and education specialist. Fire complexity and risk will determine staffing needs.

The park will allow the use of wildland fire at all staffing levels (1-5). All qualified personnel identified in the planning document will be available to complete their identified tasks. The park fuels and monitoring crew will have primary responsibility for staffing fires with resource management objectives. When park wide Staffing Level is 3 or higher, all park fire crews will have a 5-minute response. The fuels and monitoring crew will be equipped so that they can leave directly from a project site without having to return to the station. If the predicted Lightning Activity Level (LAL) is 3 or higher, or if LALs of 3 or more have occurred within the last five days, fire crews may have extended daily hours. A sixth day of work may be authorized at the discretion of the park fire management officer, acting or duty officer.

The park Fire Management Officer or Duty Officer may authorize a seventh day of work for the monitoring crew if the predicted LAL is 4 or higher.

All Wildland fires will be managed by a qualified Incident Commander and staffed with a Resource Advisor if managed beyond the initial action. All personnel will be qualified at the appropriate complexity level according to the Wildland Fire Qualification System Guide (310-1). Additional staff may be assigned to the incident as complexity and implementation needs dictate.

Documentation and Cost Tracking

The fire package will contain copies of all documents. The package will include: all planning documents (WFDSS and amendments), delegations of authority, monitoring data and summary reports, revalidation and certification documents, fire time reports, maps, photos, and DI-1202). All expenditures (personnel, aircraft, supplies, and equipment) will be tracked and reported according to the standards established in the Department of the Interior Individual Fire Occurrence Form (DI-1202). All fires will have an appropriate fire management accounting code.

It will be the responsibility of the Fire Management Officer, or his/her incident commander on the fire to ensure fire report completion. The report is a valuable tool as it provides a historical record of the fire regime for the park. The DI-1202 is the basic document used by the National Interagency Fire Center (NIFC) to document a fire occurrence.

Special Considerations

The RAWS station at Manzanita Lake will be utilized for tracking ERC values for all fires because of the long history of quality weather data collected at this site. This data can be used in programmatic and individual fire analyses of climatological data (i.e. FireFamily+) for management of fire projects. Additional RAWS units at Bogard, and Chester have long history records and are available for aiding decision making. Weather data will also be available from a portable station that may be set up on site or a seasonal portable RAWS located at Mt Harkness.

4.1.3 Emergency Stabilization

Emergency stabilization (ES) is an extension of emergency actions and consists of planned actions taken to minimize threats to life or property resulting from the effects of a wildfire. These actions may also include stabilization, repair, replacement, or construction of physical improvements in order to prevent unacceptable degradation to cultural and natural

resources. The first priority in ES is to determine the need for emergency treatments, and then prescribe and implement the treatments. ES actions must be defined in a plan and taken within one year following the containment of a wildfire. ES plans must be submitted to the regional office within five (7) calendar days following control of a wildfire (RM18 2014).

All ES actions will follow current guidance in Departmental Manual Part 620, Chapter 3 and both the Interagency Burned Area Emergency Response and Rehabilitation Guidebooks.

ES is a long-term commitment to protect resources, which occurs outside of the suppression organization.

4.2 Burned Area Rehabilitation

Burned area rehabilitation (BAR) consists of non-emergency efforts undertaken to repair or improve wildfire-damaged lands unlikely to recover naturally, or to repair or replace minor facilities damaged by wildfire. The objectives of burned area rehabilitation are to (1) evaluate actual and potential long-term post-wildfire impacts to critical cultural and natural resources and to identify those areas unlikely to recover naturally from severe wildfire damage; (2) to develop and implement cost-effective plans to emulate historical or pre-wildfire ecosystem structure , function, diversity, and dynamics consistent with approved land management plans, or if that is unfeasible, to restore of establish a healthy, stable ecosystem in which native species are well represented; and to repair or replace minor facilities damaged by wildfire.

Every effort will be made to prevent excessive human-caused impacts during a suppression effort through careful planning and supervision, individual education and commitment, and the use of Minimum Impact Suppression Tactics.

When rehabilitation is necessary, efforts will be initiated by the Incident Commander while the fire is being managed and through mop-up. If performed after the incident, the Chief of Resources Management in conjunction with the fire management branch will designate an employee to organize and direct rehabilitation efforts. The intent of the BAR Plan is to follow Best Management Practices (Appendix R) and BAER guidelines to reduce damage to the natural resources caused by erosion and non-native encroachment. All burned area rehabilitation actions will follow current guidance in Departmental Manual Part 620, Chapter 3 and both the Interagency Burned Area Emergency Response and Rehabilitation Guidebooks.

BAR funding may be available for three years post fire but have to be requested annually.

4.3 Management of Planned Fuels Treatments

4.3.1 Prescribed Fire

Prescribed fires are ignited by management to achieve resource objectives, most often a combination of ecosystem restoration or maintenance objectives and reduction of high hazard fuel loadings. These objectives are not mutually exclusive and usually all prescribed fire operations contain a mix of them. In certain areas of the park where unplanned ignitions continue to be suppressed, prescribed fire may be used to replace the positive effects that may have been forfeited by these suppressed ignitions.

Prescribed fires must be described in a prescribed fire burn plan. The plan will contain a prescription defining goals, objectives, treatment methods employed to achieve the objectives and will also identify natural and cultural resource concerns with appropriate mitigation measures specific to the proposed project.

Prescribed fire may also be used in concert with manual/mechanical treatment. High hazard fuel conditions can be reduced while meeting structural objectives in areas immediately adjacent to infrastructure values or in boundary areas through a mix of manual/mechanical treatment and prescribed fire. Manual treatment may be used as the primary method of reaching structural goals while prescribed fire actually removes the hazardous fuels.

Examples:

- There is a hazardous accumulation of fuels adjacent to infrastructure values that can be mitigated with the use of prescribed fire. The main objective of the burn operation would be reducing high hazard fuels with ecosystem restoration as a secondary consideration.
- There is an area that requires restoration of the ecological fire process. There are no infrastructure values or boundary issues. The main objective of the burn would be restoration of ecological processes. The secondary objective would be reducing high hazard fuels.
- There is an area that has been prescribed burned for ecosystem restoration. For a variety of reasons, several constraints have precluded the use of wildfire for ecosystem maintenance. The area has missed 1 or 2 fire return intervals and is showing signs of high hazard fuels build-up, species composition shift, and increased stand density. The main objective of the burn would be for ecosystem maintenance purposes.

Planned Treatment - Prescribed Fire: What do we do?

- Comply with National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), the Clean Water Act, Wilderness Act and other federal land management regulations.
- **Annually update GIS data** according to fuels management accomplishments from the previous year.
- **Annually identify areas** that need prescribed fire and/or manual/mechanical treatments by evaluating values, hazards, and risks. The park geographic information system (GIS) is the primary data storage and analysis system employed to achieve this goal. Where appropriate, treatment across agency boundaries is encouraged and facilitated.
- **Select treatment priorities** based upon the analysis of the values, hazards, and risks. Consider managerial capabilities to accomplish treatments given practical limitations in planning, operations, finance, and logistical support.

- **Evaluate the annual and long term treatment plan** with consultation from fire and resource management staff. This describes the program for the up-coming field season and beyond, including descriptions of individual segment preparation and execution needs.
- **Complete resource surveys** and Minimum Requirements Analysis (MRA) for activities in designated wilderness as needed. This will include both cultural resource surveys, sensitive species surveys and plant surveys.
- **Assign burn bosses to individual treatment segments.** Each burn boss scouts the area so that the segment burn plan can be written and crews can begin prep work.
- **Work with Resources Management Division.** Fire management staff will include resources management staff in the planning stages of prescribed burn development. Resource management staff will identify resources in need of protection and suggest a plan to mitigate damage to these resources..
- **Complete burn plans** early enough before the burn so that park fire management staff, Chief Ranger, Chief of Natural and Cultural Resources and Superintendent has adequate time to address any remaining issues associated with the planned prescribed fire.
- **Submit the smoke management plan to the appropriate Air District for review.** The Air District has up to 30 days to review the plan. They are required to inform the park of concurrence or to request changes at the end of the 30-day period.
- **Request Pre-Ignition Forecasting.** No more than seven days prior to the earliest ignition date, a request will be submitted to the Air District to begin long-range smoke dispersal forecasting for the proposed ignition. The District will provide 96, 72, 48-hour outlooks, and 24-hour forecasts on days leading up to the proposed ignition date. The District retains final go/no-go authority until the time of ignition.
- **Notify the public about the annual project list**. At the beginning of fire season, notify local communities, media, businesses, agency partners, and employees about upcoming projects for the year.
- **Follow North East Air Alliance Operation Plan**.

<u>Project Implementation: What do we do?</u>

- **Notify the public about the upcoming ignition.** Use contact lists and communication methods from chapter 4.4. In addition to regular information about project logistics, location, and objectives, use appropriate smoke information and recommendations.
- **Monitor weather and fuels** against prescriptive criteria. Prescribed burns are ignited when weather conditions are favorable for dispersing smoke away from smoke sensitive areas (SSA's), or during conditions that dilute smoke so that impacts to SSA's do not exceed health standards. This will be accomplished by utilizing the most current and comprehensive weather forecasting information available for predicting smoke transport direction and concentration down wind. Fuel moisture is also a high priority prescription element that will be monitored pre-burn. Fuel moisture prescriptions are designed to provide the optimum balance between the need to moderate fire behavior, minimize undesired fire effects on other resource values, and minimize smoke production (drier fuels burn cleaner and produce less pollutants). Fuel moisture information will be obtained and analyzed pre-burn for all significant categories of fuels (litter/duff, 1-, 10-, and 1000-hour fuels) to ensure conformity with the prescription.

- **Assess effects of other park fire management workload** on successful outcome for the burn. Consider the cumulative air quality effects of the upcoming project and any unplanned managed ignitions that may already be burning in the park. If effects cannot be mitigated, postpone the planned prescribed burn. Consider long term burn-out periods for early season burns and if management can maintain constant watch on such burns until they pose no threat of escape. This scenario of early season burns also needs to factor in additional funds to watch the burn through the summer.
- **Obtain superintendent go/no go decision** on ignition.
- **Seek concurrence from the Air District** to proceed with ignition.
- **Hold briefing** and review burn plan operations with burn staff.
- **Ignite a test-fire.**
- **Make final go/no go decision on ignition** (burn boss and associates).
- **Provide interpretative information** if adjacent to visitor-use area.
- **Report daily fuel treatment accomplishments** to the Air District.
- If the fire exceeds prescription criteria and or on site holding forces and listed contingency resources are unable to contain the burn by the end of the next burning period, **notify the superintendent of the escape and initiate the WFDSS decision support process.**

Post-fire: What do we do?

- **Rehabilitation** will follow Minimum Impact Suppression Tactics (MIST) and BMPs identified in Appendix R. Identification and implementation of post-burn rehabilitation treatments are the shared responsibility of resource management and fire management staffs.
- **Assemble monitoring data** as part of the final fire package.
- **Review incident** when deemed appropriate by fire management staff, superintendent, or fire management committee.
- **Report final fuel treatment accomplishments** for the project in NFPORS and to the Air District.

Staffing Needs and Responsibilities

The FMO and AFMO are responsible for the implementation of the annual fuels treatment program. They are also responsible for the development of the annual program and associated *Long Term Fuels Treatment Plan*. The FMO, AFMO, GIS specialist and resource managers will create the plan. The AFMO is responsible for ensuring burn plans are completed on time.

Each burn will be staffed by an agency-certified burn boss (appropriate to the level required), as well as other staff necessary to conduct the operation safely and efficiently. Individual segment burn plans will comply with requirements described in RM-18 and the Interagency Prescribed Fire Planning and Implementation Procedures Reference Guide. Individual prescribed fire operations can last from one day to several months. Close coordination and

strong communication is required between operational overhead, the fire information and education specialist, fire effects and research program staff, resource management, general park staff, local air quality control district staff, and dispatchers.

All fire management activities in the park will rely on tactics that minimize resource damage while maintaining the safety of the public, firefighters, and other personnel. Tactical tools that are used will be chosen based on a minimum requirement / minimum tool analysis.

Documentation and Cost Tracking

The fire package will contain copies of all documents. The package will include: all planning documents (burn plan and any amendments, smoke permit, incident action plans), monitoring data and summary reports, fire time reports, maps, photos, and DI-1202. All expenditures (personnel, aircraft, supplies, and equipment) will be tracked and reported according to the standards established in the Department of the Interior Individual Fire Occurrence Form (DI-1202). All prescribed fires will have an appropriate accounting code.

It will be the responsibility of the burn boss to ensure fire report completion. The report is a valuable tool as it provides a historical record of the fire regime for the park. The DI-1202 is the basic document used by the National Interagency Fire Center (NIFC) to document fire occurrence for the Department of Interior.

Special Considerations

Climatological weather data analysis is used to assess the probability of season ending weather events as an aid in prescribed fire planning. It is especially important to determine ignition timing for landscape scale burns with minimal control lines due to low social value effects. The closest weather station at a similar elevation often serves as the representative record.

4.3.2 Non-Fire Fuel Treatment Applications (Manual and Mechanical)

Definition

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, or 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); 3) to thin dense stands of trees, near developed areas, to reduce the horizontal continuity of fuels; and 4) improve ecosystem or forest health.

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 and non-wilderness areas of the park that have a high fire hazard, are experiencing unnatural build up of hazardous fuels and ecosystem or 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.

Manual and mechanical treatments may be used in concert with prescribed fire treatment. High hazard fuel conditions can be reduced while meeting structural objectives in areas immediately adjacent to infrastructure values or in boundary areas through a mix of mechanical or manual treatment and prescribed fire. Manual and mechanical treatment can be used as the primary method of reaching structural goals while prescribed fire actually removes the hazardous fuels.

Planned Treatment – Manual or Mechanical Treatment: What do we do?

- Comply with National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), the Clean Water Act, Wilderness Act and other federal land management regulations.
- **Annually update GIS data** according to fuels management accomplishments from the previous year.
- **Annually identify areas** that need prescribed fire and/or manual/mechanical treatments by evaluating values, hazards, and risks. The parks geographic information system (GIS) is the primary data storage and analysis system employed to achieve this goal. Where appropriate, treatment across agency boundaries is encouraged and facilitated.
- **Select treatment priorities** based upon the analysis of the values, hazards, and risks. Consider managerial capabilities to accomplish treatments given any limitations in planning, finance, and logistical support. As manual treatments often must precede prescribed fire treatments, out-year planning is critical.
- **Evaluate the annual and long term treatment plan with consultation from fire and resource management staff.** This describes the program for the up-coming field season and beyond, including descriptions of individual segment preparation and execution needs.
- **Work with Resources Management Division.** Fire management staff will include resources management staff in the planning stages of manual/mechanical treatment plan development. Resource management staff will identify resources in need of protection and suggest a plan to mitigate damage to these resources. Make resource advisor(s) available for every incident and prescribed burn.
- **Complete resource surveys** and MRA for activities in designated wilderness as needed. This will include both cultural resource surveys, sensitive species surveys and non-native plant surveys.

- **Assign project leaders, contracting officer's representative (COR), and project inspectors to individual treatments.** These leaders scout the area so that the segment's mechanical treatment plan and scope of work (if project is contracted) can be written. All NPS owned structures will be protected to a reasonable extent from unplanned fire events by the clearance of hazardous fuels on an annual basis. Work will be performed by a combination of park fire crews, park residents, and maintenance grounds-keeping crews. In areas where the NPS has jurisdiction over park concessionaires and private property in-holdings, the NPS will require building owners or leasers to comply with state county and local standards.
- **Notify the public about the annual project list**. At the beginning of fire season, notify local communities, media, businesses, agency partners, and employees about upcoming projects for the year.
- **Review and follow** Non-native Plant Best Management Practices outlined in Appendix R.
- **Avoid or remove** sources of non-native seed and propagules to prevent new weed infestations and the spread of existing weeds. Ensure vehicles and other equipment are cleaned to reduce the transport of non-native plants and plant diseases. Educate personnel on non-native species of concern.

Project Implementation: What do we do?

- **Notify the public about the upcoming manual/mechanical project.** Use contact lists and communication methods from chapter 4.4.
- **If contracted,** schedule a walkthrough with vendor. Project inspector must review project status regularly to ensure compliance with contract.
- **Monitor vegetation/fuels** against prescriptive criteria.
- **Assess effects of other park fire management workload** on successful outcome for the project.
- **Notify the public** about the planned treatment.
- **Hold briefing** and review treatment objectives and operations with treatment staff.
- **Begin implementing project.** All projects involving treatment of fuels adjacent to structures must comply with California Public Resource Code 4290.
- **Provide interpretive information** if adjacent to visitor-use area.

Post-Project: What do we do?

- **Rehabilitation** will follow MIST, and BMPs identified in Appendix R. Identification and implementation of post-manual and mechanical treatments are the shared responsibility of resource management and fire management staffs.
- **Assemble monitoring data** as part of the final fire package.
- **Review project** when deemed appropriate by fire management staff, superintendent, or fire management committee.

Staffing Needs and Responsibilities

The FMO/AFMO and Park Natural and Cultural Resource Division are responsible for the implementation of the mechanical treatment program. They work closely together to make sure a COR and project inspector are assigned and available throughout the project if contracted.

All fire and fuels management activities in the park will rely on tactics that minimize resource damage while maintaining the safety of the public, firefighters, and other personnel. Tactical tools that are used will be chosen based on a minimum requirement analysis.

Documentation and Cost Tracking

The project package will contain copies of all documents. The package will include: all planning documents (treatment plan and any amendments, scope of work, incident action plans), monitoring data and summary reports, personnel time reports, maps, photos, and fuels accomplishment summary reports. All expenditures (personnel, aircraft, supplies, and equipment) will be tracked and reported according to the standards established in the Department of the Interior Individual Fire Occurrence Form (DI-1202). All projects will have an appropriate accounting code.

It will be the responsibility of the Fire Management Officer, or his/her project leader to ensure treatment report completion. The report is a valuable tool as it provides a historical record of the fuels treatment history for the parks. At this time DI-1202's cannot be completed for mechanical treatments. They are only completed for projects involving fire occurrence. Fuels accomplishment reports must be input into the Fire Reporting System for budgetary tracking in the Planning Data System (PDS). Guidance on the new Fire Program Analysis system will be forth coming.

Special Considerations

All attempts will be made to utilize biomass generated from manual/mechanical treatments in areas where it can be removed from the site without causing resource damage. In all other areas, the biomass (or *slash*) will be piled and burned on site following the "Park Wide Pile Burn Plan" on file in the Fire Management Office. Watershed attributes will be maintained by applying mitigations such as the identification and exclusion of Riparian Habitat Conservation Areas (RHCA).

4.4 Prevention, Mitigation and Education

An active fire prevention, mitigation and education program will be conducted in conjunction with other agencies to protect human life, property and prevent damage to cultural resources or park facilities. A program of internal and external education regarding

potential fire danger will be implemented. Visitor contacts, bulletin board materials, handouts and interpretive programs may be utilized to increase visitor awareness of fire hazards.
Fire Prevention activities will include continued participation in interagency fire prevention programs at local schools and community events. Trained employees will relate to the public the beneficial effects of natural and management ignited fires as opposed to unwanted human caused fires, with emphasis on information essential to understanding the potential severity of unwanted human caused wildfires and how to prevent them.

It is essential that employees be well informed about fire prevention and the objectives of the parks' fire management program. Further, employees must be kept informed about changes in conditions throughout fire season. This will be done in part through the implementation of the parks Fire Prevention Plan (Appendix I).

Lassen Volcanic National Park is dedicated to providing high-quality fire information and education for as many people as possible while maintaining a level of service that demonstrates the parks professionalism. Based on the ecological principles and operational procedures outlined in the revised Fire Management Plan, the Fire Information and Education (FI&E) Program has three goals:

GOAL #1 – To provide year-round educational activities on fire ecology and fire history of the Southern Cascades and Lassen Volcanic National Park to target audiences. Communicate how fire and fuels management practices meet natural resource management goals and thus the mission of the National Park Service.

GOAL #2 – To provide accurate and timely incident information for local, regional, and national fire operations as needed.

GOAL #3 – To provide local communities, park residents, and park permitees with year-round informational opportunities on fire safety, fire prevention, defensible space, and fuels management.

The FI&E Program will emphasize the major goals of the Fire Management Plan to increase public awareness and support. While there is a variety of management tools used in the park, the fire programs overall mission is to benefit park resources and society by restoring and maintaining the natural fire regime. The FI&E program will focus on this mission and will avoid dividing the program into small parts and isolating individual tools. For example, the park will not interpret the concepts of prescribed fire separate from the use of wildland fire , suppression, manual and mechanical treatments since it is the combination of all five strategies that supports the parks program.

Similarly, the FI&E Program will provide the public with unique fire information based on data specific to this park. Park visitors in Lassen Volcanic National Park want to connect with this park and its fire story, not just with generic messages about fire ecology nationwide. The park will generate interpretive stories for the public while maintaining a level of

sophistication appropriate to the topics of fire ecology, fire history, research, monitoring, operations, safety, and fire prevention.

The National Interagency Fire Center (NIFC) prepared the first *National Fire Communications Strategy* for the National Park Service in 2002. Lassen Volcanic National Park contributed to that document's development by attending the *Fire Connections Workshop* in November 2001. The FI&E Program outlined here, while tailored for the local area, complements the national strategy in its goals, target audiences and communication methods.

Staffing

The Interpretation Division in coordination with Fire staff are responsible for coordinating the FI&E Program. The success of this program depends on the cooperation and participation of many different partners: Interpretation, Natural Resources Management, Maintenance, Administration, Visitor and Resource Protection, United States Geological Survey (USGS), Lassen Association (LA), concession employees, and volunteers. The Fire Management Officer will serve as the liaison between these different groups to ensure the transfer of information and the consistency of content. When large incidents occur in the park, fire staff will recruit personnel for specific duties or outside resources will be requested through appropriate ordering procedures. The parks' Public Information Officer (PIO) will perform coordination of duties and additional park staff will assist. In the event that the PIO is unavailable, a lead Fire Information Officer will be ordered to take the lead and coordinate all information resources.

Target Audiences

The park has identified five target audiences for fire information and education messages:

1. **Park Visitors** (including in-park visitors, internet visitors, and special groups)
2. **Park Employees** (including NPS, LA, USGS, concessions, and volunteers)
3. **Local Communities** (including residents, businesses inside or near the park, civic groups, and clubs)
4. **Students/Teachers** (including K-12 students, college students, elder hostel groups, and teachers)
5. **Scientific/Professional Peers** (including other federal, state, and county agencies, and professional associations)

Communication Methods

The following methods will be used to communicate with the five target audiences listed above. There are both personal (face to face) and non-personal methods which will facilitate reaching the greatest number of people. Table 9-1 matches these communication methods with the appropriate target audiences. The park will continue to improve and expand this list.

It will be incumbent on the Fire Information/Education Specialist to verify the delivery of pertinent press releases and fact sheets to all media, park visitors, park employees, concession employees, park volunteers, surrounding communities, park in-holders, civic groups, clubs, political contacts and educational institutions.

Personal

1. **Interpretive Programs** – Park staff will integrate fire messages into hikes, walks, campfire programs, and special off-site presentations. Fire staff will monitor these programs to ensure content quality.

2. **Education Programs** – Park staff will incorporate fire ecology concepts into curriculum-based education with the Education Specialist in the Division of Interpretation.

3. **Employee Training** – Fire staff will coordinate park-wide employee training sessions to improve staff understanding of the fire and fuels management program. These sessions will be open to NPS, USGS, LA, concessions, and volunteers.

4. **Roving** – During fire operations, park employees will be stationed in high-use visitor areas, including trails, to answer questions about the current activity and/or explain the fire and fuels management program. Backcountry rangers will also provide information to backpackers about fire operations in their area.

5. **Conference Presentations** – Park staff will give peer presentations at conferences about current fire research, planning, or operations. These presentations will share information, generate feedback, and ultimately improve the park's fire and fuels management program.

6. **Special Events** – The park will, when possible, participate in local events to promote the fire and fuels program. For example, park employees can staff booths at local fairs or host community meetings.

Non-Personal

1. **Media Stories –** Park staff will communicate with print, radio, and television outlets through press releases and interviews. When necessary, Interpretation and Fire staff will facilitate special media projects (books, documentaries, etc.) by

guiding research, scheduling interviews with park staff, and coordinating filming schedules.

2. **Printed Handouts** – The Park will include fire information in regular park publications (like the park newspaper).

3. **Visitor Center Exhibits, Waysides, and Bulletin Boards** – The park will maintain and update the interpretive information in visitor centers and wayside exhibits on fire and fuels management. Interpretation Division will maintain permanent and non-permanent bulletin boards both inside and outside the park.

4. **Webpage** – The park has developed a fire and fuels management webpage that is linked to the main park webpage, with current fire activity GIS maps, interpretive information, and photos.

5. **Scientific Papers** – Park researchers will publish papers in scientific journals and/or periodicals regarding new information from the park's fire and fuels management program.

6. **Updates** – Interpretation Division will use email, web, fax, and bulletin boards to provide specific fire updates. In general, updates will appear as needed (perhaps biweekly during fire season) but during fire operations they will be released more often.

Table 4-1 Target Audiences and Communication Methods

Target Audiences	Communication Methods
Park Visitors	

In-park visitors Internet visitors Special Groups	Interpretive Programs Visitor Center Exhibits & waysides Publications Bulletin Boards Roving interpreters Print, radio, and television Special events Webpage (local and national) Documentary film projects
Park Employees	
NPS employees LA employees USGS employees Concession employees	Updates: email or fax Voice mail Radio Announcements Trainings Publications Webpage (local and national) Daily Situation Report
Local Communities	
Residents Businesses inside/near the park Civic Groups/Clubs (Mineral, Chester, Old Station, Burney, Susanville, Red Bluff, Redding & Chico)	Print, radio, and television Direct mail (newsletter) Bulletin Boards Phone calls to smoke sensitive people Community meetings/events Publications Updates: email or fax
Students/ Parents/Teachers	
K-12 students College students Elder Hostel groups Teachers	Interpretive Programs / Presentations Curriculum-based education programs Teacher workshops Field experiences (Manzanita Lake Discovery Center) Webpage (local and national)
Scientific/Professional Peers	

Lassen National Forest Lassen Volcanic National Park CalFire Tehama-Glen Ranger Unit United States Geological Survey Susanville Interagency Fire Center	Updates: email or fax Talks/Presentations at conferences Cooperation on interagency incidents Participation in working groups Publish scientific papers

CHAPTER 5 - MONITORING AND EVALUATION

5.1 Introduction

Wildland fire monitoring at Lassen Volcanic National Park is a critical task assigned to the Klamath Network Fire Ecology Program. As directed by NPS fire management policy (DO-18), a program of wildland fire monitoring has been developed for the park that: 1) determines whether fire and resource management objectives are being met (at both treatment unit and landscape scales); and 2) documents consequences to fuels and vegetation from fire management activities. This chapter summarizes the components of the wildland fire monitoring program for Lassen Volcanic National Park. Specific details of the monitoring program can be found in the Lassen Volcanic National Park Wildland Fire Monitoring Plan (Appendix F).

5.2 Purpose and Need

Recent federal policy and fire/fuels program initiatives recognize that the programmatic use of fire is important to fire-adapted landscapes to sustain diverse, functioning ecosystems and to prevent damage from uncharacteristically severe fire that is likely to occur from fire exclusion. Information about the results of fire restoration efforts supplied by the monitoring program is useful not only to land managers, but also to policy-makers and the general public.

Environmental and fire condition monitoring is essential baseline information needed for effective decision making, and the proper and timely collection and transmission of this data is important. Feedback from the monitoring of environmental and fire conditions can directly affect how a wildland fire is managed. During wildfire incidents, the park's fire managers will use this information to prioritize fires for assignment of critical resources. For example, a wildfire that is being suppressed might receive resources more quickly if the information relayed indicates that the fire is about to spread into a different fuel type that will result in a higher resistance to control. For use of wildland fire projects, the environmental and fire conditions information will be used to help determine the level of monitoring needed for each fire.

A vegetation and fuels monitoring program will help determine whether specific fuel reduction and structural restoration objectives are sufficiently met to accomplish wildland fire program goals. The monitoring program provides a consistent and reliable method of documenting the prescribed fire program's achievements. Additional analysis can also be used to determine if any unexpected consequences of fire and fuel treatments are occurring. If objectives are not met, managers must determine whether management actions need to be adjusted in order to attain objectives, or if management objectives need to be revised given the current situation.

5.3 Wildland Fire Monitoring Framework

The NPS Fire Monitoring Handbook (NPS 2001) identifies four monitoring levels to guide fire effects monitoring efforts as summarized in Table 5-1 below:

Table 5-1 NPS Fire Monitoring Handbook - Minimum Recommended Standards.

Monitoring Level	Minimum Recommended Monitoring Standards
Level 1 – Reconnaissance	Fire cause, location, size, fuel and vegetation types, relative fire activity, potential for spread, current and forecasted weather, resource or safety threats and constraints, and smoke volume and movement.
Level 2 – Fire Conditions	Fire monitoring period, ambient conditions – topographic and fire weather, fuel model, fire characteristics, and smoke characteristics .
Level 3 – Immediate Post Fire Effects	Fuel reduction, burn severity, vegetative change or other objective dependent variables within 1 to 5 years post-burn.
Level 4 – Long-term Change	Continued monitoring of Level 3 variables to measure trends and change over time.

5.3.1 Use of Monitoring Levels 1 and 2

The first two monitoring levels provide information to guide fire management strategies for both wildland fires.

Monitoring Goal: Environmental monitoring and fire observations provide the baseline information needed for decision-making before, during, and after fire events.

Monitoring Objectives: Collect information on environmental conditions (current and forecasted weather, and fuel models) and fire conditions (name, location, slope, aspect, spread, intensity, smoke transport and dispersal) for all wildland land fires. Use the information collected in a timely manner to adapt to changing conditions and successfully manage each fire.

5.3.2 Use of Monitoring Levels 3 and 4

Monitoring levels 3 and 4 describe short- and long-term monitoring of the effects of fire on fuels and vegetation to guide wildland fire activities and can also be applied to non-fire treatment activities aimed at reducing fuels and/or biomass including: thinning, creation of shaded fuel-breaks, and pile burning.

Monitoring Goal: Specific fire-related management objectives guide fire program activities to achieve desired resource target conditions. Vegetation and fuels monitoring provides information needed to determine whether the fuels- and vegetation-related management objectives are being met and to detect any unexpected consequences of prescribed burning or other treatments.

Monitoring Objectives: Collect information on fuels and vegetation to determine if specific fire- and fuels-related management objectives have been achieved. Use the information collected to determine if progress is being made towards the desired resource target conditions for each monitoring type as shown in Table 6-2 below.

Table 5-2 summarizes the resource target conditions for each forest type found in the park. The desired target conditions vary with the state of the ecosystem and the management phase (restoration versus maintenance). The target conditions have been developed in response to the broader resource management objectives documented in the park's current Resource Management Plan.

The primary management objective for Natural Resources stated in the 1999 RMP is to perpetuate native plant life as part of a natural ecosystem. Specific objectives include:

- Plant communities that have been substantially altered by the effects of domestic grazing and fire suppression are restored to natural conditions.
- The spread of exotic plants and exotic plant diseases are prevented. Existing exotic plants that have invasive characteristics are eliminated or controlled.
- Rare plant species are protected from further impact and are monitored to detect significant changes in population trends. No native plant species now existing are lost from the park.

Table 5-2 Resource Target Conditions by Forest Type (Restoration and Maintenance phases).

Forest Type and Monitoring Type Code	**Fuel Reduction Goal [restoration phase]**	**Stand Density by diameter class and species composition [restoration phase]**	**Fuel Load Distribution (% of landscape) [maintenance phase]**	**Gap/Patch Size Distribution (% of landscape) [maintenance phase]**
Jeffrey Pine (13,739 ac)	30-80% reduction in total dead fuel load	40 - 250 trees/ac all sizes 10 - 80 trees/ac ≥ 31.5 in (60-90% pine, 10-30% other)	> 70% of area is 2-10 tons per ac	60-75% 0.25-2.5ac 10-25% 2.5-25.0 ac 1-5% 15-1247 ac 0% 247-1483 ac
White Fir (9,238 ac)	60-75% reduction in total dead fuel load	50 - 300 trees/ac all sizes 10 - 80 trees/ac ≥ 31.5 in (40-60% fir, 15-40% pine, 0-20% other)	> 70% of area is 10-30 tons per ac	60-75% 0.25-2.5ac 10-25% 2.5-25.0 ac 1-5% 15-1247 ac 0% 247-1483 ac
Lodgepole Pine (13,389 ac)	35-55% reduction in total dead fuel load	Unknown density (80-90% pine, 0-10% fir, 0-10% hemlock)	To be determined	To be determined
Red Fir/ W. White Pine (47,827 ac)	60-75% reduction in total dead fuel load	60 - 350 trees/ac all sizes 10 -100 trees/ha ≥ 31.5 in (30-70% fir, 20-50%	To be determined	To be determined

		pine 0-20% other)		
Mtn. Hemlock (7,073 ac)	35-55% reduction in total dead fuel load	Unknown density (15-60% hemlock, 0-40% fir, 0-10% pine)	To be determined	To be determined

5.4 Monitoring Design

The following sections summarize when, where and how monitoring data will be collected for each of the fire management options. Additional information on fire regimes, resource objectives, and monitoring objectives can be found in the Lassen Volcanic National Park Wildland Fire Monitoring Plan (See Appendix F).

Table 5-3 shows the levels of monitoring that are necessary and recommended for the fire management options available under this Fire Management Plan:

Table 5-3 Suggested Monitoring Levels by Fire Management Option.

Monitoring Level	Fire Management Option		
	Use of Wildland Fire	Prescribed Fire	Non-Fire Treatment
Level 1 – Reconnaissance	Yes	Yes	No
Level 2 – Fire Conditions	Yes	Yes	No
Level 3 – Post Treatment Effects	Maybe	Yes	Maybe
Level 4 – Long-term Change	Maybe	Yes	Maybe

5.4.1 Wildland Fire Monitoring

Field Measurements

The following information will be collected for all wildfires regardless of management strategy:

- fire name
- location
- cause
- current size
- air temperature
- relative humidity
- wind speed & wind direction
- percent slope & aspect
- representative Fire Behavior Prediction System (FBPS) fuel model(s) and description
- current fire activity (smoldering, creeping, running, torching)
- rate of spread & direction of spread
- flame length
- perimeter and area growth
- smoke transport & dispersal

All fires managed for resource benefit objectives will have a WFDSS prepared. In addition to the data listed above, the following information will be collected for fires with resource objectives which are managed under long-term management plans:

- canopy cover
- tree inventory (seedling/sapling/overstory)
- shrub inventory
- non-native plant frequency

- dead and down fuels inventory
- photo record

Timing of Monitoring

Weather conditions for all wildfires will be monitored regularly from the time of discovery/ignition and throughout the duration of the fire. The monitoring frequency will be identified in the WFDSS.

Monitoring Site Locations

On-site environmental, weather and fire conditions for all wildfires will be monitored as indicated in the WFDSS.

Vegetation and fuels data will be sampled at a density determined by the Fire Ecologist in consultation with the Strategic Planner or Incident Commander at the time of the incident, depending on current and predicted fire activity and vegetation/fuel types.

All plot locations will be located using a handheld GPS. In addition, accurate documentation of plot locations will be maintained by the Fire Ecology Program office.

Sampling Design

Sampling unit shapes and sizes are described in the Lassen Volcanic National Wildland Fire Monitoring Plan. A combination of variable and fixed plots, and planar transects are specified to collect information about short-term changes to vegetation.

Intended Data Analysis Approach

The following data summaries will be compiled if short-term vegetation data is collected:

1) tree density - grouped by species, dbh grouping, or crown code; live vs. dead
2) percent crown – calculated using tree height and height to live crown
3) percent canopy cover
4) percent shrub cover by species
5) percent live versus dead for shrubs as a group and by species
6) average height by shrub group and species

7) tons per acre by fuel class

8) percent frequency classified by herbaceous species, by native vs. exotic, and rare vs. common.

Data Sheet Examples

Please refer to the Lassen Volcanic National Park Wildland Fire Monitoring Plan.

Information Management

Data will be entered, checked for errors, and managed by the Fire Ecology Program staff and supervised by the Park Fire Ecologist. Original copies of all data will be kept by the Fire Ecology Program office and disseminated as requested.

Responsible Party

The person in charge of the fire (Duty Officer, Incident Commander) is responsible for ensuring that the fire monitoring data is collected, transmitted, acted upon, and filed according to established protocols.

The Park Fire Ecologist is responsible for collecting, analyzing, and managing vegetation and fuels data collected on fires managed for resource benefits.

5.4.2 Prescribed Fire Monitoring

Field Measurements

The following information will be collected for all planned prescribed fires:

- Ignition type (aerial, hand)
- Planned size
- National Fire Danger Rating System (NFDRS) fuel model appropriate index (energy release component (ERC) or burning Index (BI))
- Live fuel moisture (if applicable)
- Dead fuel moisture (1 hour, 10 hour, 100 hour, 1000 hour, litter, duff) as indicated in the site specific burn plan prescriptions
- Road or sensitive site visibility
- Smoke column mixing height

- Smoke transport and dispersal direction; smoke particulate data may be collected at smoke sensitive locations as indicated in the site-specific burn plan.

The field measurement protocols follow those found in the NPS Fire Monitoring Handbook (NPS 2001) to acquire standardized information on fire behavior and the effects of fire on fuels and vegetation. Exceptions to the standard protocols are noted in the park-specific fire monitoring plan. This monitoring plan offers a complete description of the monitoring design (measurements, timing, location, objectives, etc.) that will be used to monitor short- and long-term changes that result from prescribed fire.

Timing of Monitoring

All prescribed fires will have the environmental conditions monitored at least two weeks in advance of the planned ignition date. On-site weather and fire conditions monitoring will occur throughout all active ignition phases of each fire on a schedule determined by the burn boss with consultation from the lead Fire Effects Monitor (FEMO) assigned to the fire.

All prescribed fires will have short-term and long-term fuels and vegetation data collected prior to the ignition date. Timing of data collection will be coordinated through the Fire Ecologist. Generally, data will be collected at the peak of flowering season. Depending on elevation and aspect, this time may vary from late May through July.

Monitoring Site Locations

On-site environmental conditions for all prescribed fires will be monitored at a representative location within the burn area, as determined by the burn boss with consultation from the lead monitor assigned to the burn.

Permanent sampling points for vegetation and fuels data collected as part of the short-term and long-term monitoring effort will be located using stratified random techniques coordinated by the Park Fire Ecologist.

No monitoring plots will be established on slopes greater than 60%, or on any areas identified by specialists as having significant resource value (e.g., cultural resource isolated finds).

All plot locations will be located using a handheld GPS. In addition, accurate documentation of plot locations will be maintained by the Fire Ecology Program office.

Sampling Design

Sampling unit shapes and sizes are described in the Lassen Volcanic National Park Wildland Fire Monitoring Plan. Pilot sampling may be used during the establishment of plots in previously un-sampled monitoring types.

A minimum sample size will be calculated as soon as data from the initial 10 plots per monitoring type are available. Minimum sample size will be calculated for each objective variable in a monitoring type, based on pre-burn or pre-treatment data and then recalculated post-treatment to determine final sample sizes.

Intended Data Analysis Approach

Data will be analyzed by running minimum sample size equations after all plots have reached one-year post-burn. Tests will be performed to determine if the data fit a normal distribution or if data are skewed. If normal, a paired t-test will be used to determine if objectives have been met. If the data is skewed a statistician will be consulted for assistance.

Data Sheet Examples

See the National Fire Monitoring Handbook and/or the Lassen Volcanic National Wildland Fire Monitoring Plan.

Information Management

Data will be entered, checked for errors, and managed by the Fire Ecology Program staff and supervised by the Park Fire Ecologist. Original copies of all data will be kept by the Fire Ecology Program office and disseminated as requested.

Responsible Party

The person in charge of the fire (burn boss) is responsible for ensuring that the fire monitoring data is collected, transmitted, acted upon, and filed according to established protocols.

The Lead Biological Technician (Fire Effects), in coordination with the Park Fire Ecologist is responsible for hiring and training seasonal fire effects monitors, collecting field data, storing data electronically, performing data quality checks, and assisting with data analysis as needed.

5.4.3 Non-Fire Treatment Monitoring

Field Measurements

The following information will be collected for all non-fire treatments:

- Project name
- Location

- Treatment objectives
- Project size & project perimeter
- Treatment prescription & methods

Additional data collection may include all or some of the following, based on treatment objectives and resource monitoring needs:

- Canopy cover
- Tree inventory (seedling/sapling/overstory)
- Shrub inventory
- Non-native plant frequency
- Dead and down fuels inventory
- Photo record

Timing of Monitoring

All non-fire treatments (thinning, shaded fuel breaks, etc.) may have short-term and long-term fuels and vegetation data collected prior to treatment. Timing of data collection will be coordinated through the Park Fire Ecologist. Generally, data will be collected at the peak of flowering season. Depending on elevation and aspect, this time may vary from late April through mid-June, or as necessary for effective project completion.

Monitoring Site Locations

Permanent sampling points for vegetation and fuels data collected as part of the short-term and long-term monitoring effort will be located using stratified random techniques coordinated by the Park Fire Ecologist.

No monitoring plots will be established on slopes greater than 60%, or on any areas identified by specialists as having significant resource value (e.g., cultural resource isolated finds).

All plot locations will be located using a handheld GPS. In addition, accurate documentation of plot locations will be maintained by the Fire Ecology Program office.

Sampling Design

Sampling unit shapes and sizes are described in the Lassen Volcanic National Park Wildland Fire Monitoring Plan. A combination of variable and fixed plots, and planar transects are specified.

Intended Data Analysis Approach

The following data summaries will be compiled for data if collected:

- Tree density - grouped by species, dbh grouping, or crown code
- Live vs. dead
- Percent crown will be calculated using tree height and height to live crown
- Percent canopy cover
- Percent shrub cover by species
- Percent live versus dead for shrubs as a group and by species
- Average height by shrub group and species
- Tons per acre by fuel class
- Percent frequency by herbaceous species, by native vs. exotic, and by rare vs. common

Data Sheet Examples

See the Lassen Volcanic National Park Wildland Fire Monitoring Plan.

Information Management

Data will be entered, checked for errors, and managed by the Fire Ecology Program staff and supervised by the Park Fire Ecologist. Original copies of all data will be kept by the Fire Ecology Program office and disseminated as requested.

Responsible Party

The Park Fire Ecologist is responsible for collecting, analyzing, and managing vegetation and fuels data collected on non-fire treatment projects in coordination with the project manager.

5.5 Fire Critiques and Annual Plan Review

All wildland fires and fire related incidents must be reviewed at some level. Fire management activities will be reported as part of the parks wilderness character monitoring. The level and extent of each review will be commensurate with the scope and complexity of the incident. Lowest level reviews start at After Action Reviews (AAR) and increase in complexity to Incident Management Team (IMT) Closeout and Review, Park Level Review, Regional Level Review, National Review, Entrapment and Fire Shelter Deployment Review, and various Program Level Reviews. The National Park Service has developed an NPS

Wildland Fire Program Review Guide that describes the review framework. Additional detail on reviews can be found in RM-18, Chapter17. Reviews are conducted for one or more of the following purposes:

A. To examine the progress of an ongoing fire incident and to confirm effective decisions or correct deficiencies.

B. To identify new or improved procedures, techniques, or tactics.

C. To compile consistent and complete information to improve or refine park, regional, or national fire management programs.

D. To examine anomalous fire-related incidents in order to determine cause(s), contributing factors, and where applicable, recommends corrective actions. If negligence is indicated, the circumstances will be reported and investigated in accordance with applicable regulations, policies, or guidelines.

E. To determine cost effectiveness of a fire operation.

Program Certification

The Fire Management Officer will present the annual updates and proposed program to the Park Leadership Team and Compliance Council by mid-April. . A determination will be made weather changes and actions proposed are within the scope of the companion Environmental Assessment (EA) for the *Fire Management Plan*. If the nature of any part of the proposal is found to be outside the scope of the plan's EA, additional environmental compliance will be required for the non-conforming actions. Recommend changes may then be forwarded to the superintendent. The update and annual program must be signed by the superintendent prior to implementation.

Periodic Review

Five years after final approval, and every five years thereafter, the *Fire Management Plan* will receive thorough review to determine whether it remains adequate to direct future fire and fuels management actions. If new information, policy changes, or scientific knowledge (such as new information on the effects of global climate change) needs to be incorporated into the fire and fuels management program resulting in effects or consequences beyond that which can be captured in an amendment, a new EA will have to be completed. If no substantial changes to program direction or effects are discovered during the review, the plan may be renewed for an additional five years with proper documentation.

CHAPTER 6 - ORGANIZATIONAL AND BUDGETARY PARAMETERS

6.1 Description of Organization

The Fire Management Program at Lassen Volcanic National Park is its own division within the park and is supervised by the Fire Management Officer. The current Fire Management organization includes eight permanent-full-time or subject-to-furlough employees. These include: Fire Management Officer (FMO), Assistant Fire Management Officer-Fuels (AFMO), Fire Program Management Assistant (FPMA), Fire Information Officer (FIO), Engine Captain, Fire Engine Operator (FEO), , Fuels Captain and Fuels Crew Lead. In addition to the permanent staff, the program receives 4 suppression seasonals. Three provide staffing for the Park's Type VI engine and a Fire Lookout. These positions are funded for 11 pay periods during the fire season. The ten person Fuels Crew is base funded through WUI funds.

The Park Superintendent has direct supervision over the Fire Management Officer. The FMO is responsible for supervising the AFMO, Fire Program Management Assistant and the Fire Information Officer. All other positions are supervised by the AFMO (Fire Captain and Fuels Captain). These employees receive all of their funding through PDS and are expected to spend a minimum of 80% of their time working on fire related projects. The approved organizational chart is included in Appendix Q.

The Fire Management Program maintains one, Type 6 Engine which is a DOI vehicle. Fire Management also maintains four GSA fleet vehicles. The FMO and AFMO have vehicles assigned to them. All other vehicles are for transporting the suppression and fuels crews.

<u>Fire Management Organization and Responsibilities</u>

Superintendent – Mineral Headquarters

- Has overall responsibility for all fire management activities in the park
- Is responsible for managing the program within Departmental and National Park Service policy and ensuring the Director's Order 18 is followed
- Will ensure that a comprehensive fire management program is adequately planned and implemented, and the Fire Management Plan is reviewed annually and revised as necessary
- Approves prescribed burn plans, WFDSS, etc

Fire Management Officer – Mineral Fire Station

- Responsible to the Superintendent for managing all aspects of the fire management program
- Manage wildland fire plan implementation, review, and revision. Provides comprehensive oversight for the wildland fire and aviation management programs
- Coordinates the structural fire program

- Coordinates with other Lassen Volcanic National Park divisions; participates in Park workgroups
- Coordinates with the fire management staff at the Pacific West Regional office and other NPS units
- Coordinates with interagency partners; serves on regional and national interagency workgroups
- Directly supervises the Assistant Fire Management Officer, Fire Information Officer, and Fire Program Management Assistant> Jointly supervises the shared GIS Specialist, Fire Ecologist and Fire Archeologist

Assistant Fire Management Officer– Mineral Fire Station

- Fuels program manager
- Responsible for wildland fire readiness (initial attack suppression/wildfire management)
- Supervisor of Fuels Captain, Engine Captain and Cache Manager
- Coordinates with interagency partners. Lead Contracting Officer Representative (COR) for fire management program

Fire Program Management Assistant – Mineral Fire Station

- Responsible for administrative operations of the program – budget, payroll, travel, correspondence
- Maintains park-wide red card qualification data base
- Training Coordinator
- Subject matter expert Fire Business Rules

Fuels Captain –Mineral Fire Station

- Supervises crew lead and field operations of fuels crew
- Responsible for coordinating and maintaining fuel moisture tracking, fire management weather stations and data-loggers, fuels mapping plot installation, and other fire management programs as assigned
- Prepares fire monitoring, fuels mapping, and other prescribed fire reports
- Assists with prescribed fire and project plan development

Fuels Crew Lead – Mineral Fire Station

- Functions as assistant to the Fuels Crew Captain
- Serves as point of contact for Fuels Crew field operations
- Assists with Fuels Crew administrative duties
- Assists with coordinating and maintaining fuel moisture tracking, fire management weather stations and data-loggers, fuels mapping plot installation, and other fire management programs as assigned
- Assists with fire training instruction

Engine Captain – Mineral Fire Station

- Responsible for a Type 6 Engine
- Supervises FEO and three firefighters
- Acts as Duty Officer as needed
- Responsible for Mineral Fire Station, including readiness and cleanliness
- Park Coordinator for Fire Extinguisher/Smoke Detector Program

Fire Engine Operator – Mineral Fire Station

- Fire Engine Operator on a Type 6 Engine
- Leads engine module employees in absence of Captain
- Ensures compliance with NPS policies with regard to employees and fire management within the park
- Assists in the preparation of fire readiness of equipment and employees
- Participates in instructing fire training to park personnel

6.2 Planning Data System (PDS) Funding

As of 2009, PDS is the new funding mechanism for Fire Preparedness and Fuels positions requested for more than one pay period. Hazardous Fuel, Wildland-Urban Interface and Community Assistance programs are funded through NFPORS (National Fire Program Operations System).

Emergency fire suppression funds will be requested through the Regional Office for all incidents outside the Parks boundary. Accounts for in-park incidents may be established in house using the FireCode provided by Susanville Dispatch Center.

Step-Up accounts will be created as conditions warrant under the staffing plan. The FMO and FPMA are responsible for tracking all expenditure associated with these accounts and will maintain a file that verifies the fire danger conditions or specific event that authorized the expenditure of Emergency Suppression Funds. Severity requests will go through the Regional Office with documentation from Fire Family Plus. The Regional Office will establish a Regional account for Park Severity actions. Comprehensive documentation must be kept on this account justifying all expenditures.

The program receives its primary funding through two different funding sources – Preparedness and WUI. A breakout of the funding structure is shown in Table 6.1

Table 6.1 Fire Management Funding Structure

Position	Functional Area	Pay Periods	Comment

Fire Management Officer	PP85.Y	26	Funded at GS12
Assistant FMO	WF85.Y	26	Funded at GS 11
Fire Program Management Assistant	PP85.Y	26	Funded at GS 7
Fire Information Officer	WF85.Y	26	Funded at GS11
Engine Captain	PP85.Y	26	Funded at GS7
Fire Engine Operator	PP85.Y	15	Funded at GS6 –
Fuels Captain	WF85.Y	18	Funded at GS7
Fuels Crew Lead	WF85.WP	13	Funded at GS6
Temporary Firefighters	PP85.Y PP85.Y WF85.WM	11 9 10	Three suppression employees Fire Lookout Fuels Crew

6.3 Relationship of Fire Management Organization to NPS Unit

Fire Management is a division with in Lassen Volcanic National Park. The Division has three main priorities which are; the management of wildland fire and fuels, park aviation, and structure fire. In addition, the Fire Division also supports other Divisions based on park-wide priorities. Due to the relative small size of the park and staff, success for all Divisions often depends on the cooperation of all employees.

The Fire Management Division also supports numerous councils in the park. Fire Management has representatives on:

- Compliance Council
- Safety Council
- Lassen Operations Team
- Lassen Employee Association

6.4 Interagency Coordination

Susanville Interagency Fire Center (SIFC) is an interagency dispatch center which manages fires within Lassen, Tehama, Shasta and Plumas Counties. It is comprised of four cooperators: Lassen National Forest, BLM Susanville District, Lassen Volcanic National Park and Lassen-Modoc-Plumas Unit, CalFire. SIFC provides all wildland fire dispatching for the park. The park provides fairshare funding in support of the services received. Susanville dispatches Lassen Volcanic National Park resources to initial attack, mutual aid and support fires. The park provides daily resource and fire status reports to Susanville for inclusion in the area resource and fire status for the Northern California Area Command Center.

6.5 List of Key Interagency Contacts by Function

The park maintains close working relations with surrounding fire agencies, including the Lassen National Forest and Susanville District BLM.

Table 6.2 Key Fire Management Contacts

Position	***Office Location***	***Phone Number***
Center Manager (BLM)	Susanville Interagency Fire Center	530-257-5575
Center Manager (FS)	Susanville Interagency Fire Center	530-257-5575
Forest FMO	LNF Headquarters	530-257-2151
Forest AFMO	LNF Headquarters	530-257-2151
DFMO	Hat Creek Ranger Station	530-336-5521
DFMO	Almanor Ranger Station	530-258-2141
DFMO	Eagle Lake Ranger Station	530-257-4188
FMO (BLM)	Susanville - SIFC	530-252-5367
AFMO (BLM)	Susanville - SIFC	530-252-5368
DOI Rep	North Ops	530-226-2801

ECC Chief (LMU)	Susanville - SIFC	530-257-8509
ECC Chief (TGU)	Red Bluff	530-528-5109
DIV Chief (TGU)	Red Bluff	530-528-5106

Table 6.2 above notes the primary fire cooperators and the phone numbers that are important to the operations of the fire management program. The FPMA and FMO maintain this information.

6.6 List of Fire Related Agreements

Lassen Volcanic National Park has a number of active agreements with local, county, state and federal cooperators. These agreements are essential to provide for a collaborated effort in the management of planned or unplanned incidents related to the protection of life, property and natural or cultural resources and general program support.

Most important to the purpose of this document is the Five Party Agreement and the Manzanita Lake Interagency Agreement. The Five Party agreement is between the State of California, Office of Emergency Services; State of California, Department of Forestry and Fire Protection; Pacific Southwest Region, USDA Forest Service; USDI Bureau of Land Management, California State Office; and USDI National Park Service, Pacific West Region for effective and efficient exchange of protection area responsibilities and emergency apparatus or personnel (local responsibility area is not part of this agreement).

The Manzanita Lake Interagency Agreement is between the USDI National Park Service, Lassen Volcanic National Park and the USDA Forest Service, Lassen National Forest. It describes responsibilities and outlines the support that each agency is required to provide for implementation of an interagency fire station at Manzanita Lake.

The park also has an Interagency agreement with the USDA Forest Service, Lassen National Forest for aviation support of Mount Harkness Lookout as well as cooperative agreements with Shasta and Tehama County for automatic aid and coordination with all risk incidents.

A copy of all cooperative agreements that Lassen Volcanic National Park is currently engaged in can be found on file in the Fire Management office.

CHAPTER 7 - FIRE RESEARCH

The primary objective of fire research in the National Park Service is to provide information for making fire management decisions (RM 18, chapter 18). Research plays a critical role in fire management programs by identifying area-specific fire regimes; determining whether human activity has affected native ecosystems and natural processes; developing techniques for predicting fire behavior; documenting and analyzing fire effects and other topics as needed. Research may also provide the framework needed to justify maintaining historic scenes, investigate techniques to create these scenes, and determine the impacts of fire control actions and management on cultural and natural resources.

Research serves to define the natural and aboriginal role of fire for use in formulating and implementing such actions as prescribed fire, suppression strategies and tactics, hazard fuel abatement, and prevention measures (RM 18, chapter 18). As the park's fire management plan is implemented and tested, additional research will inevitably be identified for such purposes as refining prescriptions, improving the understanding of fire behavior and fire effects, developing monitoring protocols, defining fire return cycles, describing fuels dynamics, describing the impacts on cultural and natural resources, threatened and endangered (T&E) habitat areas, etc. as well as other information needed for operational fire and resource management.

7.1 Summary of Existing Fire Research

Forest Fire Regime Studies

Bekker and Taylor (2001) found that plant species distribution and abundance in the southern Cascades are influenced by both environmental gradients and fire regimes; and that variation in fire regimes may not be independent of environmental gradients or vegetation patterns. Furthermore, modifications to historical fire regimes can and has led to shifts in landscape scale vegetation patterns.

In various studies, Taylor (1990a, 1990b, 1995, 2000) found that approximately 35% of the park's vegetation has been substantially altered by 20th century anthropogenic activities. These changes have been wrought by excessive grazing and logging (both inside and outside the park), fire suppression, and park management activities. Studies from other similarly affected ecosystems in California and the west have shown that more than a century of widespread fire suppression has produced dense, low vigor forest stands which are highly susceptible to insect epidemics, increased pathogen incidence, and high intensity wildfire. An aggressive ecosystem restoration program which uses Wildland fire has been recommended to help restore natural regimes to the park's major forest types. Changes brought about by anthropogenic agents, however, must be clearly separated from natural vegetation changes (such as those resulting from climatic changes) which have been recently documented in the park's sub-alpine forest vegetation.

The historical fire regime characteristics for the major vegetation types found within the park are summarized in Table 7-1. 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 >.

Table 7-1 Historical fire regime characteristics and the Fire Regime Classes -Interagency FRCC Guidebook.

Vegetation Type (park acres)	**Mean Fire Return Interval (range)**	**Fire Regime Characteristics**	**Fire Regime Class**	**Fire Frequency & Severity Class**
	(consolidated from fire ecology literature[1])		(from Hann & Bunnell 2001)	
Sedge Meadows (886 ac)	Unknown	Infrequent Fire	?	Unknown
Montane Chaparral (1,823 ac)	Unknown (10-50)	Fields maintained or cycled by frequent fire; shrubs typically re-sprout and dominate within 5 years	II	0-35 years frequent stand replacement
Jeffrey Pine (13,739 ac)	16 years (9-32)	Frequent surface fires Low/Moderate severity	I	0-35 years frequent low severity
White Fir (9,238 ac)	30 years (15-38)	Frequent surface fires Low/Moderate severity	I	0-35 years frequent low severity
Lodgepole Pine (13,389 ac)	47 years (28-54)	Mix of crown/surface fires Mixed severity	IV	35-100 years less frequent stand replacement

Red Fir (14,669 ac)	41 years (4-127)	Mix of crown/surface fires Mixed severity	III	35-100 years less frequent mixed severity
Red Fir/ Western White Pine (33,158 ac)	70 years (26-109)	Mix of crown/surface fires Mixed severity	III	35-100 years less frequent mixed severity
Mountain Hemlock (7,073 ac)	115 years	Mix of crown/surface fires High severity	V	>100 years infrequent stand replacement

[1] (Bekker & Taylor 2001, Taylor 1993, Taylor 1999, Taylor 2000, Taylor & Solem 2001)

Effects of Litter and Duff Mound Removal on Tree Mortality

Another example of ongoing research at Lassen Volcanic National Park concerns the slow decline and eventual mortality of large diameter trees after prescribed burns. The cause of death appears to be cambium injury from the duff mound smoldering at the base of the tree. Fire suppression has led to much more duff than had been present historically. As a result, wildfires or prescribed fires can ignite duff mounds that smolder for hours around trees. This type of fire is much less dramatic, but can cause fatal damage to trees. Consequently, attempts to use prescribed fire to reduce fuel in areas of large diameter and old-growth trees are causing increased mortality of these high-value trees.

Studies are being conducted to meet the local management need of knowing how to best prescribe burn in areas of large-diameter and old-growth trees to reduce fuels without killing desirable trees. Objectives include evaluating the economic feasibility and biologic effectiveness of removing duff mounds away from trees to reduce large tree mortality and developing prescribed fire guidelines to reduce damage to large-diameter ponderosa and Jeffrey pine in areas of deep duff.

7.1.1 Lassen Volcanic National Park Fire Ecology Publications

There have been numerous articles published which contain specific references to the plant community types, fire effects to vegetation and/or fire regimes found in or associated with Lassen Volcanic National Park. The following is a partial list of available publications:

Agee, J.K. 1994. Fire and weather disturbances in terrestrial ecosystems of the Eastern Cascades. 1994 Portland, OR: U.S. Depart of Agriculture, Forest Service, Pacific Northwest Research Station. GTR-PNW-320. 52 p.

Agee, J.K. 1993. *Fire Ecology of Pacific Northwest Forests*. Island Press, Washington, D.C.

Agee, J.K., R.H. Wakimoto, and H.H. Biswell. 1978. Fire and fuel dynamics of Sierra Nevada conifers. Forest *Ecology and Management* 1:255-265.

Barbour, M.G. 1988. Californian upland forests and woodlands, pages 131-164. *In*: Barbour, M.G. & W.D. Billings, (eds.), North American Terrestrial Vegetation. Cambridge University Press, Cambridge.

Beaty, R.M., and A.H. Taylor. 2001. Spatial and temporal variation of fire regimes in a mixed conifer forest landscape, Southern Cascades, California, USA. *Journal of Biogeography* 28:955-966.

Bekker, M. F., and A. H. Taylor. 2001. Gradient analysis of fire regimes in montane forests of the southern Cascade Range, Thousand Lakes Wilderness, California USA. *Plant Ecology* **155**:15–28.

Brown, J.K., and J.K. Smith (eds.). 2000. Wildland Fire in Ecosystems: Effects of Fire on Flora. United States Department of Agriculture, Forest Service, Rocky Mountain Research Station. Ogden, Utah. General Technical Report. RMRS-GTR-42-Vol. 2.

Kauffman, J.B., and R.E. Martin. 1989. Fire behavior, fuel consumption, and forest-floor changes following prescribed understory fires in Sierra Nevada mixed conifer forests. *Canadian Journal of Forest Research* 19:455-462.

Kilgore, B.M. 1973. The ecological role of fire in Sierran conifer forests. *Quaternary Research* 3:496-513.

Nelson, R.L. 1971. Trees and shrubs of Lassen Volcanic National Park. Loomis Museum Association, Mineral CA.

Parker, A.H. 1991. Forest environment relationships in Lassen Volcanic and Yosemite National Parks, California, USA. *Journal of Biogeography* 18:543-552.

Parker, A.H. 1992. Spatial variation in diameter structures in forests of Lassen Volcanic National Park, California. *Professional Geographer* 44:147-160.

Parker, A.H. 1993. Structural variation and dynamics of lodgepole pine forests in Lassen Volcanic National Park, California. *Ann. Assoc. AM. Geog.* 83:613-629.

Parker, A.H. 1994. Latitudinal gradients of coniferous tree species, vegetation, and climate in the Sierran-Cascade axis of Northern California. *Vegetatio* 115:145-155.

Parker, A.H. 1995. Comparative gradient structure and forest cover types in Lassen Volcanic and Yosemite National Parks, California. *Bull. Torrey Botanical Club* 122(1):58-68.

Pinder III, J.E., G.C. Kroh, J.D. White, and A.M.B. May. 1997. The relationship between vegetation type and topography in Lassen Volcanic National Park. Plant Ecology 131:17-29.

Savage, M. 1994. Anthropogenic and natural disturbance and patterns of mortality in a mixed conifer forest in California. *Canadian Journal of Forest Research* 24:1149-1159.

Savage, M. 1997. The role of anthropogenic influences in a mixed conifer forest mortality episode. *Journal of Vegetation Science* 8:95-104.

Skinner, C.N., and C.R. Chang. 1996. *Fire regimes past and present. Sierra Nevada Ecosystem project: final report to Congress, II, Assessments and scientific basis for management options,* pp. 1041-1069. University of California Davis, Center for Water and Wildland Resources, Davis CA.

Skinner, Carl. N. 2009. Fire history of sparsely treed shrub fields in the vicinity of Manzanita Lake, Lassen Volcanic National Park. Final Research Report for CESU Project #LAVO-

00811, January 2009. On File, National Park Service, Klamath Network Fire Monitoring Program Office.

Taylor, A.H. 1990a. Habitat segregation and regeneration patterns of red fir and mountain hemlock in ecotonal forests, Lassen Volcanic National Park, California. *Physical Geography* 11:36-48.

Taylor, A.H. 1990b. Tree invasion in meadows of Lassen Volcanic National Park, California. *Professional Geographer* 4:457-470.

Taylor, A. H. 1993. Fire history and structure of red fir (*Abies magnifica)* forests, Swain Mountain Experimental Forest, northeastern California. *Canadian Journal of Forest Research* 23:1672-1678.

Taylor, A.H. 1995. Forest expansion and climate change in the mountain hemlock (Tsuga mertensiana) zone, Lassen Volcanic National Park, California, USA. *Arctic and Alpine Research* 27:207-216.

Taylor, A.H. 2000. Fire regimes and forest changes in the mid and upper montane forests of the southern Cascades, Lassen National Park, California, USA. *Journal of Biogeography* 27:87-104.

Taylor, A.H. 2001. Fire regimes and stand dynamics in an upper montane forest landscape in the southern Cascades, Caribou Wilderness, California. *Journal of the Torrey Botanical Society* 128(4):350-361.

Taylor, A.H., and C.B. Halpern. 1991. The structure and dynamics of *Abies magnifica* forests in the southern Cascade Range, USA. *Journal of Vegetation Science* 2:189-200.

Taylor, A.H., and C.N. Skinner. 1998. Fire history and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA. *Forest Ecology and Management* 44:1-17.

Taylor, A.H., and C.N. Skinner. 2003. Spatial patterns and controls on historical fire regimes and forest structure in the Klamath Mountains. *Ecological Applications* 13(3):704-719.

White, J.D., G.C. Kroh, and J.E. Pinder III. 1995. Mapping forest species at Lassen Volcanic National Park, California using Landsat Thematic Mapper data and a geographical information system. Photogrammetric Eng. & Remote Sensing 61:299-305.

7.2 Current Fire Research Needs

Park managers have identified several fire-related resource management questions and concerns that need to be answered as funds become available. Each concern has been

described using a format that consists of a problem statement and a description of a recommended project or activity and is fully documented in the current Resource Management Plan. The following is a list of some of these research needs: Conduct Forest Fuel Inventory, Prepare Vegetation Map, Establish Permanent Yellow Pine Ozone Injury Plots, Develop Protocols for Monitoring Vegetation changes and Monitor Blister Rust on White Pine.

More recent management concerns related to fire management that have not been documented in the Resource Management Plan include: 1) uncertainty about the historic abundance and distribution of montane chaparral within the park; 2) effects of spring burning on land-bird breeding and montane chaparral habitat; and 3) the effects of fire suppression in altering natural successional pathways related to tree encroachment in the park's wet meadow habitats.

CHAPTER 8 - PUBLIC SAFETY

8.1 Description of Public Safety Issues and Concerns

Managing a fire program is among the highest risk operations that any land management agency can undertake. The first priority consideration in any fire management action is firefighter and public safety. Safety of visitors, employees, residents and incident personnel will be the number one responsibility given to any supervisors acting on behalf of Fire Management. Evacuation of visitors at risk is the first priority for all fire responses. Accurate and consistent monitoring and evaluation of current and expected fire behavior will provide the basis for developing contingency plans, contacts, and briefings that ensures public and personnel safety.

In addition to active wildfire, fuels treatments and prescribed fire activities are potentially hazardous. The burn boss or project leader will identify potential public safety hazards and ensure the public has been notified. The Superintendent or designee may close all or some portions of the park (including roads and trails) when a wildland fire poses an immediate threat to public safety. The Superintendent may also close park areas during fuels treatment projects, such as mechanical thinning or prescribed fire. For longer term restrictions or closures a special order will be approved by the Superintendent and given wide distribution. For all restrictions and closures, signs will be posted and maintained in appropriate areas.

During a fire, the Chief of Resource and Visitor Protection will inform the other divisions of all potentially hazardous fire situations. The Superintendent, Interpretation Division and Fire staff will coordinate public notification efforts within and outside the Park. The Chief Ranger will coordinate evacuation efforts with the fire command. Fire activity reports will be updated daily, or when significant changes warrant, to inform park personnel of potential threats. The extent of public notice and evacuation will depend on the specific fire situation. A list of public safety actions is as follows:

1. Incident Commander will determine the proximity of visitors and neighbors to the fire, identify current and potential hazards, and initiate evacuations if necessary.
2. The Park Public Information Officer (PIO) will prepare and distribute information listing location, behavior, expected hazards, areas to avoid, and precautions to be taken. Information will be posted on appropriate park bulletin boards, at visitor service facilities and trailheads, along roadways, and distributed to park concession operations. The park website will contain similar information.
3. The Superintendent will close roads, trails, campgrounds, and day use sites if public safety hazards are identified by the Incident Commander.
4. Visitor use may be limited or prevented near wildland fires and potentially affected areas. Park personnel will patrol, contact visitors and educate them about the fire status and potential safety hazards.
5. Press releases and public notifications will be delivered by the PIO.
6. Park personnel will inform visitors obtaining backcountry use permits of the exact location of fire activity.

7. Nearby residents, adjacent to the park, will be notified if a fire poses a threat to their property.
8. Burned over areas will be evaluated for hazards and will remain closed until those hazards are mitigated.

8.2 Mitigating Actions

The following program elements will be followed, with the intention of mitigating the issues and concerns:

- The local police, fire, and emergency medical services will be notified of the location of any wildfires, and prior to the ignition of prescribed burns.
- Interagency coordination will continue to assure an appropriate response to National Park Service incidents.
- The park's Incident Information Plan will be implemented. Information will be provided to the public by means of the media, public meetings, park interpretive programs, and through signing key locations within affected communities, park entrance stations, trail heads, campgrounds, picnic areas, and other recreational sites.
- Initiated closures through close cooperation with the Ranger Division. Closures may consist of but not be limited to trails, roads, campgrounds, areas and/or air space through a Temporary Flight Restriction.
- In areas where trails or roads remain open escorts or pilot cars may be provided to insure safe passage.
- Execute public evacuations in areas threatened by an incident or event.

CHAPTER 9 - PROTECTION OF SENSITIVE RESOURCES

9.1 Summary of Cultural Resources Requiring Sensitive Treatment or Special Protection

Numerous archaeological sites, historic structures, cultural landscapes, and ethnographic resources exist within the park. Research in the park indicates that the archaeological record extends back at least 4,200 years. Currently only a small percentage, approximately 14% of the park, has been surveyed for archeological resources. Documentation, including GIS data, for archeological sites and other cultural resources are maintained by the park Resource Management Division. Historic structures are listed on the park List of Classified Structures (LCS) and cultural landscapes are listed on the park Cultural Landscape Inventory (CLI). Currently there is no list or GIS data for ethnographic resources, although the park has recently completed a Traditional Use Study.

Over five hundred fifty acres within the park have been designated as a historic zone and have been entered into the National Register of Historic Places as a regional level of significance. The Preservation Subzone and the Nobles Emigrant Trail comprise 505 acres of this historic zone. The remaining Adaptive Use/Preservation Subzone of 50 acres includes structures being used for administrative purposes but of sufficient historic importance to merit preservation of their original character and appearance. These structures include a potential historic district of rustic administrative, residential, and maintenance buildings at Mineral, and a second historic district at Manzanita Lake including the kiosk, ranger residence, park signs, Chief Naturalist's residence and the Loomis Museum, seismograph vault and home. Other significant structures within the park include: Horseshoe Lake, Summit Lake, and Warner Valley ranger stations; and Prospect Peak and Mt. Harkness fire lookouts.

The following is a list of cultural values at risk within Lassen Volcanic National Park:

Table 9.1 Values at Risk with Lassen Volcanic National Park

Name	**Type**
Hat Creek	Private lands w/ buildings
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 Administrative Site
Manzanita Lake	Campground, housing, ranger station, museum and education

	center, water supply
Mt. Harkness	NPS fire lookout
Warner Valley	NPS ranger station, historic buildings, campground, guest ranch
Southwest Entrance	SW Visitor Services Facility, other buildings, campground, water supply
Butte Lake	NPS ranger station, campground, water supply
Crags and Lost Creek	NPS campgrounds

Fire program activities have the potential to adversely affect cultural resources present at Lassen Volcanic National Park. Effects from these activities include the direct effect of fire itself, the direct effect of fire program operational activities, and the indirect effects of fire and operational activities on cultural resources. Identification of historic properties located within the area of potential effect, assessment of potential adverse effects, and development of appropriate management actions to minimize or mitigate identified potential adverse effects to historic properties will be completed for all planned fire management projects. These procedures will ensure compliance with the National Historic Preservation Act of 1966, as amended. Typical strategies used to protect cultural resources include fire-fighter awareness training, fuel reduction near cultural materials, excluding fire from cultural materials with hand lines, water/foam, or fire shelters, use of MIST strategies, and consulting with cultural resource specialists.

In general, and under normal weather conditions, fuel levels within prescribed fire planning units should produce only low to moderate fire-line intensities with smaller areas of higher intensity resulting in varying severity throughout project areas. Also, it is reasonable to assume that the majority of surface artifacts within the park have been exposed to surface fire of moderate intensity during the last two centuries.

<u>Protection Measures</u>

- During all prescribed fire preparation and implementation, mechanical fuel reduction, wildfire suppression or monitoring, and fire rehabilitation crews will be briefed on park cultural resource protection measures when such resources are present or work is conducted in an archeologically sensitive area.

- Fire control methods near cultural sites, especially the construction of control lines that expose mineral soil, will be developed in consultation with a Resource Advisor or Archeological Technical Specialist to avoid adverse effects to cultural materials;

- Prior to all prescribed fire and non-fire fuel treatments, projects will insure compliance with NHPA and project areas will be inventoried for cultural resources and strategies to negate or minimize identified potential adverse effects will be developed and implemented;

- During all wildland fire activities, known cultural resources in affected areas will be identified and mitigation measures will be implemented to prevent adverse impacts;

- Fire retardant use will be prohibited in the vicinity of any historic structure, unless there is imminent threat to the historic structure;

- A designated Cultural Resource representative will 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 will be maintained in a current status and available on CDs during fire season to expedite the management decision making process.

- The Park Natural and Cultural Resource staff, Klamath/Cascade Network Fire Archeologist, or PWR Fire Archeologist, if available, will be notified in the event of an unplanned ignition and will participate in the WFDSS planning process.

- An archeological resource specialist and/or resource advisor is recommended if extended attack is required and the fire is in an archeologically sensitive area.

- When American Indian Cultural Sites are threatened by a fire or fire suppression activities the affiliated American Indian Tribes will be notified.

- Identified historical structures, cultural landscapes, ethnographic and archeological sites determined eligible or listed on the National Register of Historic Places will be priorities in resource protection planning.

- All fires managed with resource objectives will include a 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 will participate in the planning and execution of rehabilitation efforts following all unplanned fires.

- No handlines exposing mineral soil will be allowed through cultural sites as defined or delineated in archeological survey reports;

- Camps and toilet facilities are restricted from being located within 200 feet of known cultural resource sites;

- Crews will implement Minimum Impact Suppression Tactics (MIST) fire suppression guidelines to minimize and/or eliminate adverse soil impacts resulting from ground crew activities.

9.2 Summary of natural resources requiring sensitive treatment or special protection

Scenic Resources and Air Quality

The Park has identified scenic views extending beyond park boundaries that are an important part of the park experience and worthy of protection. For example, key features that can be viewed from Lassen Peak include: Eagle Lake, Crater Mountain, Antelope Mountain, Kelly Mountain, Morgan Mountain, Turner Mountain, Inskip Hill, Potato Buttes, Clover Mountain, and Burney Mountain.

Lassen Volcanic National Park is a Federally designated Air Class 1 area and protecting visibility is a major concern to park management. This designation provides for the highest degree of regulatory protection from air pollution impacts. The primary means by which the protection and enhancement of air quality is accomplished is through implementation of National Ambient Air Quality Standards (NAAQS).

Protection Measures

Since federal land managers (National Park Service, Forest Service, Fish and Wildlife Service, and Bureau of Land Management) were required by the Clean Air Act to protect visibility at designated Class 1 areas, these agencies established the Interagency Monitoring of Protected Visual Environments (IMPROVE) particulate monitoring network. Among other measurements, IMPROVE gathers data on particulate matter of 2.5 micrometers and 10 micrometers ($PM_{2.5}$ and PM_{10}) (DOI, 2001c). In addressing air pollutant emissions from fires managed with resource objectives, the EPA considers $PM_{2.5}$ and PM_{10} as the primary indicators of public health impacts (EPA, 1998). In general, IMPROVE uses scenery, optical, and aerosol monitoring (DOI, 2001d). Lassen Volcanic NP is a part of the IMPROVE network and monitors particulate and ozone levels for its visibility program.

Plants

Periodic fire from natural ignition sources has influenced this ecosystem for several thousand years. The area's flora and fauna have evolved with this powerful natural force and have adapted to its presence. In some cases, fire-induced adaptations allow for coexistence with fire. In others, fire is necessary for species perpetuation and vigor. Fire can also play a role in the management of many rare, threatened and endangered plant species. A detailed list of listed plant species is included in Appendix C.

Protection Measures

- Park staff will survey for threatened, endangered, or sensitive plant species in treatment areas prior to ignition of prescribed fires and post-fire treatment. Surveys cannot be more than two year prior to ignition

- If threatened, endangered, or sensitive plant species are found in a treatment unit, a buffer surrounding the plants will be imposed that prohibits physical damage to the identified population. The assigned Resource Advisor will be consulted when determining the appropriate buffer;

- Best Management Practices (Appendix R) will be followed to reduce the transport of non-native weeds.

- Park staff will stage fire management operations away from known noxious weed infestations, and will construct fire lines away from known patches;

- Park staff will survey for noxious weeds in treatment units prior to ignition of prescribed fires.

Threatened, Endangered or Sensitive Wildlife and Plants

The Federal 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 Federal Endangered Species Act requires that Federal agencies conserve endangered and threatened species and ensure that Federal actions are not likely to jeopardize the continued existence of any endangered or threatened species or result in adverse modification of their critical habitat. National Park Service policy mandates that state and locally listed species shall be managed similarly. Species of management concern will be managed to maintain their natural distribution and abundance.

Federally Listed Species

The 4 Federally listed species described below have not been found in Lassen Volcanic National Park and suitable habitat does not exist for these species within the park. No critical habitat for any species exists within the park.

California Red-legged Frog (*Rana aurora*). This species has not been positively identified within Lassen Volcanic National Park. It inhabits elevations from sea level to about 5,000 feet. Nearly all of the known occurrences are from below 3,500 feet. Elevations within the park boundaries range from 5,230 feet to over 10,000 feet. The most recent northernmost occurrence of California red-legged frogs was documented in Cottonwood Creek west of Red Bluff.

Delta Smelt (*(Hypomesus transpacificus)*). This species occurs in the Sacramento River Delta . No streams within Lassen Volcanic National Park have been found to support these species.

Shasta crayfish *(Pacifastacus fortis)*. This species is only known from the Pit River in Shasta County in lower elevation waters outside of Lassen Volcanic National Park where they inhabit cool, clear, spring-fed lakes, rivers, and streams and most are found in still and moderately flowing waters.

Conservancy fairy shrimp (*Branchinecta conservation*). This species is found in vernal pools within the Central Valley of California. There are eight known populations within the central valley of California.

Candidate Species

Whitebark pine (*Pinus albicaulis*) was determined by the U.S. Fish and Wildlife Service in 2011 to warrant protection under the Endangered Species Act, but listing was precluded by listing actions of a higher priority. It was added to the list of candidate species with a listing priority number of 2, meaning the threats to the species are of high magnitude and are imminent. Threats to whitebark pine include habitat loss and mortality from white pine blister rust, mountain pine beetle, catastrophic fire and fire suppression, environmental effects resulting from climate change, and the inadequacy of existing regulatory mechanisms. Whitebark pine is experiencing an overall long-term pattern of decline, even in areas originally thought to be mostly immune from the above threats.

Whitebark pine is typically found in cold, windy, high elevation or high latitude sties in western North America, and as a result, many stands are geographically isolated. It is a stress-tolerant pine and its hardiness allows it to grow where other conifer species cannot. Whitebark pine is considered a keystone species because it regulates runoff by slowing the progress of snowmelt, reduces soil erosion by initiating early succession after fires and other disturbances, and provides seeds that are a high energy food source for some birds and mammals.

Most of the park's populations of whitebark pine occur on the higher slopes of Lassen Peak, Chaos Crags, and Reading Peak. These populations are being encroached upon by Mountain Hemlock (*Tsuga mertensiana*) throughout the park which increases the likelihood of high severity burns in these communities.

The California Endangered Species Act (CESA) was passed in 1970. It states that "all native species of fishes, amphibians, reptiles, birds, mammals, invertebrates and plants and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation , will be protected or preserved".

State listed Wildlife

Bald Eagle (*Haliaeetus leucocephalus*) (California endangered). Until recently, the Bald Eagle was the one species listed on the Federal Threatened and Endangered species list known to occur within Lassen Volcanic National Park. In 2007, however, Bald Eagles were removed

from the Federal list. This species is still classified as "Endangered" by the State of California. Bald Eagles build their nests in trees greater than 30 inches in diameter, within a ¼ - ½ mile from a fish-providing water source. Because of scarce food supply and relatively harsh nesting season climatic conditions, the park has extremely marginal Bald Eagle nesting habitat. There are two known Bald Eagle nests in Lassen Volcanic National Park. One located at Snag Lake and the other is at Manzanita Lake. The Snag Lake nest was discovered in 1980. This nest was monitored until 2001 when the nest tree fell over during the winter of 2000/2001. From 2002 until 2009 the pair or Bald Eagles used Snag Lake and even produced young but no new nest was located. A new nest was located in 2009 along the west shore of Snag Lake and two young were fledged from this nest. Hunting territory for this pair comprises most of the eastern half of the park. The Manzanita Lake nest was located in 2018 and is located west of Manzanita Lake near the park boundary. This nest fledged one young in 2018.

California wolverine (*Gulo gulo luteus*) (California threatened) are believed to be extirpated from Lassen Volcanic National Park and typically avoid developed areas. Surveys for this species have occurred throughout the State over the past 10 years. A photographic bait station did take a picture of a wolverine on the Tahoe National Forest in 2008. An intense effort was undertaken to recover hair samples for DNA analysis from this animal. Hair samples were recovered and DNA analysis confirmed this wolverine was a male that was not a descendant from the historic California population but from a genotype found throughout the Northern Rocky Mountains.

Sierra Nevada red fox (*Vulpes vulpes necator*) (California threatened). They generally occur above 5,000 feet in forest and fell fields but may visit lower elevation areas as well in summer. There are currently no known den sites and most of the sightings have been in developed areas along the main park road within Lassen Volcanic National Park. This species is known to beg at parking areas and campgrounds throughout the park. A study was done on this species within Lassen Volcanic National Park and surrounding areas from 1997 to 2004. Five Sierra Nevada red foxes were captured and radio collared with this project. During the study, three of the collared red foxes died. Two of natural causes and one was fatally wounded by a domestic dog attack. Beginning in 2015 The California Department of Fish and Wildlife (CDF&W) has been deploying camera traps along trails within Lassen Volcanic National Park to detect SNRF. In 2017 the park conducted a parkwide camera survey to detect mesocarnivores (medium sized carnivores) and did detect SNRF during these surveys. In the winter of 2018 CDF&W set out traps and successfully caught and radio collared threeSNRF (one male and two females). One of the females was pregnant upon capture and radio telemetry data led staff to a den located on the eastern flank of Lassen Peak. This female had one pup in 2018. Data from these three collared SNRF will be used in developing a comprehensive strategy to manage this species into the future.

American Peregrine Falcon (*Falco peregrinus anatum*) (California endangered). There is one known Peregrine Falcon nest (monitored annually by park staff since 1997) located on U.S. Forest Service land bordering Lassen Volcanic National Park's western boundary (Blue Lake Canyon). Peregrine Falcons can be seen hunting in the higher elevations around Lassen Peak in the late summer and early fall as well.

Greater Sandhill Crane (*Grus canadensis*) (California threatened). This species is found in wetland habitats such as meadows, pastures, grain fields, bogs, fens, marshes and fields. There have been sightings in Kings Creek Meadow, Cameron Meadow, Spencer Meadow, Snag Lake, Horseshoe Lake, and Warner Valley. In 2018, photos from a remote camera trap captured images of two adults and one young in the Twin Meadows area. This is currently the only confirmed record of this species breeding within the park. Most sightings of this species is in the fall when they are seen flying over Lassen Volcanic National Park during migration.

Little Willow Flycatcher (*Empidonax traillii brewsteri*) (California endangered). This species nests in dense willow thickets in montane meadows and along streams. Records indicate this species historically bred in Sulfur Creek Meadows and around Snag Lake in Lassen Volcanic National Park. This species is currently found in the Warner Valley area of Lassen Volcanic National Park where a breeding pair was discovered in 2004.

Species of Park Concern

American marten (*Martes americana*). Martens require a variety of different aged stands, particularly old growth conifers and snags which provide cavities for denning and nesting. This species is found in the old growth areas of Lassen Volcanic National Park.

Sierra Nevada snowshoe hare (*Lepus americanus tahoensis*) occur in thickets of brush, pine, fir, and riparian vegetation within Lassen Volcanic National Park.

Seven bat species have been identified by the USFWS as likely to occur in the park – pale Townsend's big-eared bat (*Corynorhinus (=Plecotus) townsendii pallescens*), spotted bat (*Euderma maculatum*), small-footed myotis (*Myotis ciliolabrum*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), Yuma myotis (*Myotis yumanensis*), and long-eared myotis (*Myotis evotis*). Only the latter four, however, have been positively identified in the park. These species likely depend on late successional old-growth forest, where they roost beneath loose bark or in cavities. Other landscape features more commonly associated with day roosts, hibernacula, and maternity colonies (such as significant lava tubes, caves, and abandoned mines) are largely absent from the park. Cliff and rock slopes are also possible habitat areas.

Cascades frog (*Rana cascadae*) This species inhabits lakes and meadows in the Lassen region and is one of two frog species known to historically occur in Lassen Volcanic National Park. The Cascades frog is a highly visible and charismatic species that historically occupied lakes and wetlands throughout the Cascade Range, with Lassen Volcanic National Park and the surrounding region representing the southernmost extent of the species. This frog was once so abundant in Lassen Volcanic National Park that "one frog for nearly every meter" of lakeshore was reported during surveys conducted in 1925 by Joseph Grinnell. Numerous amphibian studies have shown this species to be declining throughout the Sierra Nevada and Cascade ranges. A fish and amphibian survey conducted during the summer of 2004 in Lassen Volcanic National Park found this species only to occupy some of the ponds in the Juniper Lake area. A resurvey of the Juniper Lake area in 2007 discovered only one female Cascades frog left in the Juniper Lake area. Surveys in the Juniper Lake area in 2008 and 2009, failed to detect any Cascades frogs and there have been no verified sightings within Lassen Volcanic National Park since 2007. The Cascades frog is believed to have been

extirpated from the park. Many factors, individually and likely in combination, have contributed to the species' decline within the Lassen Region (Lassen National Forest, Lassen Volcanic National Park, and private timber lands). Nonnative fishes and pathogens (especially Batrachochytrium dendrobatidis [Bd]) have been found to have widespread impacts, and several other factors, particularly climate change, have been identified as potentially contributing factors affecting this species and its habitats.

California Spotted Owl (*Strix occidentalis occidentalis)* is associated with multi-storied coniferous forests with greater than 70% canopy cover and large trees (>30 inches in diameter) used for nesting. Currently there are two known active California Spotted Owl nests located within Lassen Volcanic National Park. One is located near the Nobles Immigrant Trail and one in Warner Valley. There are also four known historic nests located within the park. Park staff conduct surveys for spotted owls annually within areas where fire management activities are planned and also monitor historic sites as time allows.

American Dipper (*Cinclus mexicanus*) requires clear fast-moving water. It is confined to clear, clean streams and rivers with rocky shores and bottoms in mountains. This species does occur in Lassen Volcanic National Park.

Northwestern pond turtle (*Clemmys marmorata marmorata*) use slow streams, ponds, lakes, and wetlands and associated uplands from sea level to 6,000 feet. This species has been documented historically in Lassen Volcanic National Park in the Manzanita Lake, Reflection Lake area.

Prairie Falcon (*Falco mexicanus*) requires sheltered cliff ledges for cover. There are historic breeding records of this species at Eagle Peak.

Vaux's Swift *(Chaetura vauxi)* requires hollow trees and snags for nesting and roosting. It shows an apparent preference for foraging over rivers and lakes. It has been documented in Lassen Volcanic National Park.

Rufous Hummingbird (*Selasphorus rufus*) does not breed in Lassen Volcanic National Park but are found in the park during spring and fall migration. They are found in open meadow areas where they forage on wildflower nectar.

Northern Goshawk (*Accipiter gentilis*) is a secretive species found in mature or old growth coniferous forests within the park. Park staff has confirmed this species to nest in the park.

Sensitive species and their critical habitat can potentially warrant special protection from the negative impacts from fire or fire management activities such as smoke, heat, ground disturbance, fire retardants, etc. Potential impacts on sensitive species will be analyzed and mitigation measures specified for wildfires managed with resource objectives and prescribed burns. Location maps and habitat information will be maintained in the Resources Management Office. When impacts from management actions seem likely, on-site surveys will be conducted in areas that may have not been previously surveyed.

Special protection measures for sensitive species may be appropriate in accordance with the management goal of preserving natural biological diversity. Special protection may be warranted if sensitive species have declined due to human impacts on critical habitat. Impact analysis for sensitive species must include information about the beneficial as well as detrimental effects of burning.

Generally, direct impacts of fire on fauna include disturbance or mortality of individuals or groups of individuals. Larger mammalian vertebrates such as deer will generally move away from a fire. However, the availability of adjacent suitable habitat may be critical for some local populations. A local herbivore population decline may in turn result in a loss of prey for carnivores.

Birds are less likely to be directly affected by fire, but some loss in nesting sites may occur if fires coincide with nesting season. Riparian-dwelling reptiles and amphibians are usually protected from heat and loss of cover. Loss of some snakes, salamanders, lizards, and toads will occur, but immediate population declines are typically insignificant.

Indirect effects on wildlife include habitat modification and shifts in species composition of communities. Animals with specific habitat requirements or territorial animals with narrow ranges may be impacted by habitat loss.

Protection measures

- A Resource Advisor will be assigned to the incident during extended attack and during all subsequent phases of fire suppression. The Resource Advisor will work with the Incident Commander to identify and mitigate the effects of fire and fire suppression actions on listed sensitive features.

- The sensitive natural areas will be clearly identified on the pre-attack map and in the pre-attack plan.

- Sensitive areas have been identified as high priority areas for protection in the constraints for each Fire Management Zone.

- Fuels adjacent to these areas are considered high priority zones for fuels treatments.

- Fuel reduction will be conducted directly adjacent to old growth and mature ponderosa pines, sugar pines, and Douglas fir trees in bald eagle, spotted owl and goshawk habitat prior to prescribed burning.

- The use of water from sensitive areas for fire suppression or holding actions must be approved by the resource advisor, or the Chief of Natural Resources Management.

Bald Eagle

- A limited operating period (LOP) will minimize impacts to nesting sites and be in place from January 1st to August 31st (nesting season). A ½ mile no fly zone will exist around all known bald eagle nest sites. Nest locations will be provided prior to any fire management activity.

- 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 will be removed.

- Avoid using Snag and Manzanita Lakes 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.

<u>California Spotted Owl</u>

- A limited operating period (LOP) will be placed from March 1st through August 31st (nesting season) around all known spotted owl nest trees. This will consist of a quarter-mile diameter circle around known nest trees. Nest tree locations will be provided prior to any fire management activity.

- 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 will 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.

Northern Goshawk

- A limited operating period (LOP) will be placed from February 15th through September 15th (nesting season) around all known goshawk nest trees. This will consist of a quarter-mile diameter circle around known nest trees. Nest tree locations will be provided prior to any fire management activity.

- Avoid disturbance in the LOP during the nesting season (February 15th to September 15th). Disturbance includes mechanical thinning operations, controlled burning operations, line -clearing operations using power tools, heavy equipment use and aircraft noise.

- No known nest trees will 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 goshawk in treatment areas prior to ignition of prescribed fires.

American Peregrine Falcon

- A limited operating period (LOP) will be placed from February 1st through July 31st (nesting season) around all known peregrine falcon nest sites. This will consist of a half-mile diameter circle around known nest sites. Nest locations will be provided prior to any fire management activity.

- 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 will 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.

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 mechanical thinning projects if pups are known to be in the area.

- Locations of known den sites will be provided prior to any fire management activity.

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 prior to any fire management activity.

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.

- Known territory locations will be provided prior to any fire management activity.

Greater Sandhill Crane

- Wetland areas where sandhill cranes are present should be avoided during the breeding season (May 1st to August 31st).

- A list of known meadows inhabited will be provided prior to any fire management activity.

American marten

- 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 mechanical thinning projects if young are known to be in the area.

- A list of known marten dens will be provided prior to any fire management activity.

Bat Species

- Construct a fire line around known roost sites a radius of 50 feet and burn out from this line to protect the roost.

- A list of known roost sites will be provided prior to any fire management activity.

Vaux's swift

- Construct a fire line around known nest sites a radius of 50 feet and burn out from this line to protect the nest.

- A list of known nest sites will be provided prior to any fire management activity.

Northwestern pond turtle

- Lakes with current existing populations of Northwest pond turtle will be avoided as helicopter dip sites and drafting sites. A list of the current populated lakes will be given to the Resource Advisor prior to any fire management activity.

CHAPTER 10 - CONSULTATION AND COORDINATION

Mike Klimek, Fire Management Officer, Lassen Volcanic National Park
Daniel Ostmann, Assistant Fire Management Officer, Lassen Volcanic National Park
Anna Mateljak, Fire Program Management Assistant, Lassen Volcanic National Park
Jason Mateljak, Chief of Natural Resources, Lassen Volcanic National Park
Vacant, NEPA And Wilderness Coordinator, Lassen Volcanic National Park
Mike Magnuson, Wildlife Biologist, Lassen Volcanic National Park
Vacant, GIS Specialist, Lassen Volcanic National Park
Vacant, Ecologist/Botanist, Lassen Volcanic National Park
Calvin Farris, Fire Ecologist, National Park Service (Pacific West Regional Office)
Mike Minton, Regional Fire Management Officer, Pacific West Regional Office